SAP PRESS

SAP S/4HANA®

An Introduction

- Learn what SAP S/4HANA offers your company for financials and logistics
- Get the scoop on SAP S/4HANA deployment options, implementation, extensibility, and more
- Consult SAP S/4HANA customer case studies

2nd edition, updated and expanded

Bardhan · Baumgartl
Chaadaev · Choi · Dudgeon
Lahiri · Meijerink · Worsley-Tonks

Rheinwerk Publishing

SAP PRESS is a joint initiative of SAP and Rheinwerk Publishing. The know-how offered by SAP specialists combined with the expertise of Rheinwerk Publishing offers the reader expert books in the field. SAP PRESS features first-hand information and expert advice, and provides useful skills for professional decision-making.

SAP PRESS offers a variety of books on technical and business-related topics for the SAP user. For further information, please visit our website: http://www.sap-press.com.

Michael Jolton, Yosh Eisbart
SAP S/4HANA Cloud: Use Cases, Functionality, and Extensibility
2017, 334 pages, hardcover and e-book
www.sap-press.com/4498

Bhattacharjee, Monti, Perel, Vazquez
Logistics with SAP S/4HANA: An Introduction
2018, 400 pages, hardcover and e-book
www.sap-press.com/4485

Silvia, Frye, Berg
PSAP HANA: An Introduction (4th Edition)
2017, 549 pages, hardcover and e-book
www.sap-press.com/4160

Singh, Feurer, Ruebsam
SAP Hybris: Commerce, Marketing, Sales, Service, and Revenue with SAP
2017, 329 pages, hardcover and e-book
www.sap-press.com/4394

Devraj Bardhan, Axel Baumgartl, Dmitry Chaadaev,
Nga-Sze Choi, Mark Dudgeon, Asidhara Lahiri, Bert Meijerink,
Andrew Worsley-Tonks

SAP S/4HANA®

An Introduction

Rheinwerk
Publishing

Dear Reader,

It almost goes without saying (though I'll say it loudly just this once!) that the author team we've gathered together for this second edition of *SAP S/4HANA: An Introduction* is an impressive one with a broad range of SAP knowledge. It has been my privilege to work with Axel, Dmitry, Nga-Sze, Mark, Asidhara, Bert, Andrew, and Devraj over the last six months, and we're all excited to send this book out into the world!

The unique perspective that a team from IBM Global Business Services adds to the conversation is invaluable—as you'll see in the following pages. Whether you're new to the SAP world and want to see what this "S/4HANA" thing is all about, or you're an existing customer deciding when is the right time to make the leap, you should find this book to be a valuable guide. We give a broad view of what the new suite can do, from finance to logistics to industry solutions, talk through your deployment options (on-premise? cloud? hybrid?), and show you what it looks like to plan your digital transformation.

What did you think about *SAP S/4HANA: An Introduction*? Your comments and suggestions are the most useful tools to help us make our books the best they can be. Please feel free to contact me and share any praise or criticism you may have.

Thank you for purchasing a book from SAP PRESS!

Meagan White
Editor, SAP PRESS

meaganw@rheinwerk-publishing.com
www.sap-press.com
Rheinwerk Publishing • Boston, MA

Notes on Usage

This e-book is **protected by copyright**. By purchasing this e-book, you have agreed to accept and adhere to the copyrights. You are entitled to use this e-book for personal purposes. You may print and copy it, too, but also only for personal use. Sharing an electronic or printed copy with others, however, is not permitted, neither as a whole nor in parts. Of course, making them available on the Internet or in a company network is illegal as well.

For detailed and legally binding usage conditions, please refer to the section Legal Notes.

This e-book copy contains a **digital watermark**, a signature that indicates which person may use this copy:

Imprint

This e-book is a publication many contributed to, specifically:

Editor Meagan White
Acquisitions Editor Emily Nicholls
Copyeditor Melinda Rankin
Cover Design Graham Geary
Photo Credit iStockphoto.com/503560460/© tunart
Production E-Book Marissa Fritz
Typesetting E-Book III-Satz, Husby (Germany)

We hope that you liked this e-book. Please share your feedback with us and read the Service Pages to find out how to contact us.

The Library of Congress has cataloged the printed edition as follows:
Names: Baumgartl, Axel, author. | Bardhan, Devraj, author.
Title: SAP S/4HANA : an introduction / Devraj Bardhan, Axel Baumgartl, Dmitry Chaadaev, Nga-Sze Choi, Mark Dudgeon, Asidhara Lahiri, Bert Meijerink, Andrew Worsley-Tonks.
Description: 2nd edition. | Bonn ; Boston : Rheinwerk Publishing, 2017. | Previous edition by Axel Baumgartl and six others. | Includes index.
Identifiers: LCCN 2017038227| ISBN 9781493215980 | ISBN 9781493215997 (ebook)
Subjects: LCSH: SAP HANA (Electronic resource) | Database management. | Management information systems. | Business enterprises--Data processing.
Classification: LCC QA76.9.D3 B3935 2018 | DDC 005.74--dc23
LC record available at https://lccn.loc.gov/2017038227

ISBN 978-1-4932-1598-0 (print)
ISBN 978-1-4932-1599-7 (e-book)
ISBN 978-1-4932-1600-0 (print and e-book)

© 2018 by Rheinwerk Publishing, Inc., Boston (MA)
2nd edition 2018

Contents

Foreword from Uwe Grigoleit 19
Foreword from Cameron Art 21
Preface 23

1 The Digital Transformation: An Introduction 29

1.1 Defining the Digital Transformation 30

1.2 Business Value Scenarios 36
1.2.1 Customer Centricity and Experience 39
1.2.2 Customer Insight and Improved Decision-Making 46
1.2.3 Digitally Enabled Supply Chain 50

1.3 Architecture at a Glance 55

1.4 Summary 60

2 Finance 61

2.1 Industry Pain Points and SAP S/4HANA Benefits 61
2.1.1 Integration of Information 62
2.1.2 Enterprise Cost Reductions 64
2.1.3 Measuring Business Performance 64
2.1.4 Optimize Planning, Budgeting, and Forecasting 66
2.1.5 Continuous Finance Process Improvements 66
2.1.6 Provide Inputs to Enterprise Strategy 67
2.1.7 Develop Talent in the Finance Organization 68

2.2 Key Functionalities 70
2.2.1 Universal Journal 70
2.2.2 Material Ledger and Transfer Pricing 74
2.2.3 New Asset Accounting 78
2.2.4 Cash Management 79

2.2.5 SAP BPC for SAP S/4HANA Finance ... 82
2.2.6 Profitability Analysis ... 86
2.2.7 Central Finance ... 92
2.2.8 Real-Time Data and Soft Close ... 100

2.3 Outlook ... 102

2.4 Summary ... 104

3 Manufacturing 105

3.1 Industry Pain Points and SAP S/4HANA Benefits ... 105

3.2 Key Manufacturing Functionality ... 110
3.2.1 MRP Live ... 110
3.2.2 Product Master Optimization ... 113
3.2.3 Embedded Production Planning and Detailed Scheduling ... 114
3.2.4 Complex Manufacturing ... 115
3.2.5 Demand-Driven MRP ... 116
3.2.6 General Process Optimization/Simplification ... 116

3.3 Outlook ... 118

3.4 Summary ... 119

4 Supply Chain 121

4.1 Industry Pain Points and SAP S/4HANA Benefits ... 121

4.2 Key Supply Chain Functionality ... 125
4.2.1 Data Model Simplification ... 125
4.2.2 Simplified Inventory Valuation ... 126
4.2.3 Embedded EWM ... 127
4.2.4 Transportation Management ... 135

4.3 Outlook ... 137

4.4 Summary ... 138

5 Sales, Marketing, Commerce, and Service Management 139

5.1 Industry Pain Points and SAP S/4HANA Benefits ... 139

5.2 Key Sales Functionality ... 142

5.2.1 Data Model Simplification ... 142

5.2.2 Sales Order Fulfillment Cockpit ... 144

5.2.3 Condition Contract Settlement ... 145

5.2.4 Advanced ATP ... 146

5.2.5 General Process Optimization/Simplification ... 153

5.3 Key Marketing and Commerce Functionality ... 154

5.3.1 Customer Relationship Management ... 155

5.3.2 SAP Billing and Revenue Innovation Management ... 156

5.4 Key Service Management Functionality ... 157

5.4.1 Optimized Service and Service Master Data Management ... 157

5.4.2 Service Parts and Service Agreement Management ... 158

5.5 Outlook ... 158

5.6 Summary ... 159

6 Sourcing and Procurement 161

6.1 Industry Pain Points and SAP S/4HANA Benefits ... 161

6.2 Key Sourcing and Procurement Functionality ... 164

6.2.1 Operational Purchasing ... 164

6.2.2 Invoice and Payables Management ... 169

6.2.3 Sourcing and Contract Management ... 170

6.2.4 Supplier Evaluation and Analytics ... 171

6.3 Outlook ... 173

6.4 Summary ... 173

7 Research and Development and Asset Management 175

7.1 Industry Pain Points and SAP S/4HANA Benefits ... 176

7.2 Key Research and Development Functionality ... 178

7.2.1 SAP Innovation Management ... 178
7.2.2 SAP Portfolio and Project Management ... 179
7.2.3 SAP Commercial Project Management ... 180
7.2.4 SAP Product Lifecycle Costing ... 180

7.3 Key Asset Management Functionality ... 181

7.3.1 Maintenance Planning and Scheduling ... 181
7.3.2 Maintenance Operation and Execution ... 182
7.3.3 Mobile Asset Maintenance ... 182

7.4 Outlook ... 183

7.5 Summary ... 185

8 Industry Solutions 187

8.1 Retail ... 187

8.1.1 Technical Simplifications ... 188
8.1.2 Available Functionality ... 190
8.1.3 Removed and Nonstrategic Functionality ... 192
8.1.4 Retail Integration ... 193
8.1.5 SAP S/4HANA 1709 ... 193

8.2 Oil & Gas ... 195

8.2.1 Technical Simplifications ... 195
8.2.2 Upstream and Downstream ... 196
8.2.3 Trader's and Scheduler's Workbench ... 198
8.2.4 Transportation and Distribution ... 199
8.2.5 Secondary Distribution ... 200
8.2.6 SAP S/4HANA 1709 ... 200

8.3 Summary ... 201

9 SAP S/4HANA Architecture 203

9.1 The Journey from SAP ERP to SAP S/4HANA ... 203
9.1.1 The Evolution of SAP S/4HANA ... 203
9.1.2 SAP S/4HANA as the Digital Core ... 209
9.1.3 The Roadmap to SAP S/4HANA and Innovations ... 212

9.2 SAP HANA Platform ... 216
9.2.1 SAP HANA Database ... 216
9.2.2 Virtualization ... 220
9.2.3 Scalability ... 224
9.2.4 Recoverability ... 226
9.2.5 SAP HANA Operations ... 234
9.2.6 SAP HANA Logical Deployment Options ... 239
9.2.7 SAP HANA Platform Services ... 242

9.3 SAP S/4HANA Security ... 245

9.4 SAP S/4HANA Core Data Models ... 248

9.5 User Interface and User Experience ... 249

9.6 Data Lifecycle Management ... 253

9.7 DevOps ... 254

9.8 Summary ... 259

10 Deployment Options 261

10.1 Cloud Concepts ... 261

10.2 SAP S/4HANA Versions ... 264
10.2.1 On-Premise SAP S/4HANA ... 264
10.2.2 SAP S/4HANA Cloud ... 271
10.2.3 Hybrid Model ... 274

10.3 Cloud Vendor ... 275

10.4 Integration ... 277

10.5 Summary ... 278

11 SAP S/4HANA Cloud 281

11.1 Value Proposition ... 281

11.2 Current Scope of the Solution ... 283

11.3 Deployment ... 284

11.3.1 Fit-to-Standard ... 285

11.3.2 Deployment Resources ... 286

11.3.3 SAP Best Practices Explorer ... 290

11.3.4 Self-Service Configuration User Interface ... 291

11.4 Extensibility ... 291

11.5 Content Lifecycle Management ... 291

11.6 Summary ... 294

12 Extending SAP S/4HANA 297

12.1 Extensions for SAP ... 298

12.1.1 Overview ... 298

12.1.2 In-App Extensibility ... 301

12.1.3 Side-by-Side Extensibility ... 303

12.2 SAP Cloud Platform ... 308

12.3 Internet of Things and Cognitive Analytics ... 312

12.4 SAP Leonardo and Machine Learning ... 314

12.5 Summary ... 319

13 Adopting SAP S/4HANA 321

13.1 New Implementation Options and Approach ... 323

13.1.1 Business Scenario Recommendations ... 323

13.1.2 SAP S/4HANA Value Advisor ... 324

13.1.3 SAP S/4HANA Transformation Navigator ... 325

13.1.4 Getting Started ... 326

13.1.5 Sizing Requirements 326
13.1.6 SAP S/4HANA Implementation Guidelines 327

13.2 System Conversion Options and Approach 329
13.2.1 Scenarios 330
13.2.2 Adoption Paths 330
13.2.3 Tools for System Conversion 333
13.2.4 Code Remediation, HANAtization, and Optimization 339
13.2.5 Application-Specific Conversion Steps 344

13.3 SAP S/4HANA Conversion Prerequisites 345
13.3.1 SAP S/4HANA Transformation Considerations 346
13.3.2 SAP S/4HANA Application Prerequisites 347
13.3.3 SAP S/4HANA Functional Restrictions 348

13.4 Housekeeping Activities 354

13.5 System Conversion Considerations 356
13.5.1 Greenfield Implementation 356
13.5.2 Brownfield Implementation 358

13.6 SAP S/4HANA Migration Cockpit 360
13.6.1 On-Premise SAP S/4HANA 361
13.6.2 SAP S/4HANA Cloud 363

13.7 Tools and Techniques for Minimizing Downtime 364
13.7.1 Data Volume Management 365
13.7.2 Optimizing Database Migration Option Performance 365
13.7.3 Near-Zero Downtime 366

13.8 Summary 368

14 Using SAP Activate 369

14.1 SAP Activate Overview 369

14.2 SAP Activate Methodology 374
14.2.1 Prepare 375
14.2.2 Explore 376
14.2.3 Realize 377
14.2.4 Deploy 378
14.2.5 Quality Gates 379

14.3 SAP Best Practices for SAP Activate 380

14.4 SAP Activate Tools 384

14.4.1 Self-Service Configuration 385

14.4.2 Expert Configuration 386

14.4.3 SAP Solution Builder Tool 386

14.4.4 SAP Solution Manager 387

14.5 Summary 387

15 SAP S/4HANA and the SAP Landscape 389

15.1 Sourcing and Procurement: SAP Ariba 390

15.1.1 Sourcing and Contracts 390

15.1.2 Requests and Purchases 392

15.1.3 Invoices and Payments 394

15.1.4 SAP Ariba and SAP S/4HANA 396

15.2 Contingent Workforce Management: SAP Fieldglass 398

15.2.1 Vendor Management System 399

15.2.2 SAP Fieldglass and SAP S/4HANA 400

15.3 Travel and Expense Management: Concur 401

15.3.1 Spend Management 401

15.3.2 Concur and SAP S/4HANA 402

15.4 Human Resources: SAP SuccessFactors 402

15.4.1 Employee Data 403

15.4.2 Talent Management 403

15.4.3 SAP SuccessFactors and SAP S/4HANA 406

15.5 Customer Relationship Management: SAP Hybris 408

15.5.1 Commerce 409

15.5.2 Marketing 410

15.5.3 Revenue and Billing 412

15.5.4 Sales and Service 414

15.5.5 SAP Hybris and SAP S/4HANA 414

15.6 Master Data Management: SAP Master Data Governance 415

15.7 Supply Chain Planning: SAP Integrated Business Planning 417
15.7.1 Sales and Operations Planning 417
15.7.2 Demand Planning 419
15.7.3 Inventory Planning 419
15.7.4 Response and Supply Planning 420
15.7.5 Control Tower 422
15.7.6 SAP IBP and SAP S/4HANA 423

15.8 Summary 423

16 Analytics and Reporting 425

16.1 Evolution of Analytics 426

16.2 Operational Reporting 429
16.2.1 ABAP-Based Reports 430
16.2.2 Embedded Analytics 430
16.2.3 Native SAP HANA Applications 435
16.2.4 Embedded SAP BW and SAP BPC 436

16.3 Enterprise-Wide Reporting 438
16.3.1 SAP HANA Enterprise Analytics 439
16.3.2 SAP Business Warehouse on SAP HANA 439
16.3.3 SAP BW/4HANA 441
16.3.4 SAP Analytics Cloud 442

16.4 Cognitive Analytics 442

16.5 Big Data Analytics and Data Lakes 444
16.5.1 Data Lake 444
16.5.2 SAP Vora 447

16.6 Summary 448

17 Building a Transformation Roadmap 449

17.1 Envisioning the What and the Why 451
17.1.1 Digital Transformation 451

17.1.2 Business Value ... 458
17.1.3 Making the SAP S/4HANA Case ... 458

17.2 Developing Your Roadmap ... 462
17.2.1 Engage Phase: Analyzing the Current Mode of Operations ... 465
17.2.2 Envision Phase: Exploring the Target Operational Model ... 466
17.2.3 Evaluate Phase: A Deep Dive into the Transformation Approach ... 467
17.2.4 Enable Phase: Build Your Roadmap ... 467

17.3 Understanding the Current Mode of Operations ... 468
17.3.1 Pain Points ... 468
17.3.2 Objectives ... 469
17.3.3 Approach ... 469

17.4 Defining the Future Mode of Operations ... 471
17.4.1 Considerations ... 471
17.4.2 Approach ... 471

17.5 Choosing How to Adopt SAP S/4HANA ... 474
17.5.1 Evaluate Phase ... 474
17.5.2 Enable Phase ... 475

17.6 Summary ... 476

18 Customer Case Studies 477

18.1 Multinational Industrial Company ... 477
18.1.1 Vision ... 479
18.1.2 IT Project ... 480
18.1.3 Benefits ... 480
18.1.4 Path Forward ... 481

18.2 Multinational Service Company ... 482
18.2.1 Vision ... 483
18.2.2 IT Project ... 483
18.2.3 Benefits ... 483
18.2.4 Path Forward ... 486

18.3 Manufacturing Company ... 486
18.3.1 Vision ... 487
18.3.2 IT Project ... 487

18.3.3 Benefits 488
18.3.4 Path Forward 489

18.4 Food Industry Group 489
18.4.1 Vision 489
18.4.2 IT Project 490
18.4.3 Benefits 491
18.4.4 Path Forward 491

18.5 Automotive Company 491
18.5.1 Vision 491
18.5.2 IT Project 492
18.5.3 Benefits 492
18.5.4 Path Forward 492

18.6 Summary 493

The Authors 495
Index 499

Service Pages I
Legal Notes II

Foreword from Uwe Grigoleit

Digital transformation is no longer a future or emerging concept; businesses the world over recognize the radical reshaping of processes, products, and entire industries currently in progress. Today, a generational shift is underway, and it's obvious that every company is, or must become, data-driven. Since its launch just over two and a half years ago, SAP S/4HANA has helped companies capture rapidly emerging opportunities and cope with equally fast-moving threats.

Now, with more than 1,000 live customer implementations, it's safe to say that SAP S/4HANA is mainstream. Designed for in-memory computing, it provides the flexibility and responsiveness that companies demand, integrating disparate sources of data to enable true real-time insight and the ability to execute immediately. Companies that are deploying SAP S/4HANA as their digital core have a distinct advantage in today's marketplace.

Today's business world is one of constant, accelerating change. New technology trends regularly emerge with the power to deliver greater customer value while lowering barriers to entry. Companies that embrace digital transformation, then, recognize flexibility as a key competitive asset. Meeting ever-increasing customer expectations requires more than front-office, customer-facing changes. Innovation must occur throughout the organization to support new products, new processes, and new business models.

Of course, no one has a perfect view of the future, so companies must be ready with a foundation that provides the flexibility to pursue a variety of opportunities, regardless of when or where they emerge. For IT, that might mean a system that scales easily and consistently across geographies, regardless of software consumption—on-premise or in the cloud. For business, a system must allow for immediate execution with current, relevant decision-support information. Users can no longer wait for overnight or even hourly batch reports. In fact, the data needed to evaluate a new opportunity might be radically different from that which any prebuilt datamart can provide.

When insight, flexibility, and responsiveness are critical to success—today and tomorrow—companies can't rely on yesterday's technology. I encourage you to explore the power of SAP S/4HANA, our next-generation business suite, for your next-generation business.

Uwe Grigoleit
Senior Vice President and General Manager of SAP S/4HANA, SAP SE

Foreword from Cameron Art

For the past twenty years, much of what has been written about technology's impact on business has revolved around the Internet, with many words penned about how "dot-com" and "born on the web" companies are reshaping industries and their competitors. In today's market, huge inflows of capital are fueling a seemingly endless appetite to find the next big thing. Even after the dot-com bubble burst, however, much of what has been written has focused on the *what* of the Internet instead of the *how* of new technologies.

Every day we see the impact of technology on business models and industries. In every corner of the globe, there are new startups challenging established companies as well as existing companies moving into new markets, aided in part by technology. Consumers' expectations have shot skyward based upon an expectation of deep engagement with products and services provided through technology. For individual companies, the focus is now becoming clearer. The goal is to use the conceptual framework of the Internet to recreate, reinforce, and reimagine the business itself.

This has created a unique point in time for every business—a time of opportunity—and a time of risk. This is amply illustrated by the Dow Jones Industrial Average, as thirty percent of the companies listed there made their debut in the past 10 years. Even this example does not do justice to the massive change throughout the global economy, as business success is now driven through technology. It is a time of digital reinvention.

The clearest vision of this digital reinvention is illustrated through IBM's long time business partner: SAP. SAP S/4HANA is bringing all the benefits of Internet technologies to everyday business. It allows us to do all of those things that make consumers and constituents find Internet-native companies so attractive. It provides real-time visibility into operations, is available anywhere and anytime, is always on, and is flexible to meet a company's needs. It allows every business to compete and prosper.

We have been fortunate to partner with SAP in this digital revolution. This platform for business has allowed us to invest heavily our own R&D into the digital transformation journey. For many, the most efficient way to get started will be through our SAP S/4HANA Impact Assessment tool and they'll find the quickest time to value through our Impact Industry Solutions. As part of our Digital Transformation partnership with SAP, we are proud to be a part of this journey for many clients. SAP S/4HANA extends

to clients the opportunity to bring together the latest technologies in artificial intelligence, cloud, IoT, big data, blockchain, and cognitive computing.

This book provides a comprehensive introduction to SAP S/4HANA and how it can address and support the digital transformation your company. It covers all relevant aspects, from value scenarios to a full digital transformation roadmap. The authors use their experience from different industries and concrete examples of when and how to use SAP S/4HANA, in combination with lines of business solution from SAP, to show you how to support your digital journey. Between these pages, the authors provide you with practical information and project examples of how to approach the changes to your ERP landscape.

My hope for all readers is that you will find it as inspiring as I have. In this new digital world, what we are capable of is changing due to technology. What businesses are capable of is changing due to technology. What governments are capable of is changing due to technology. What the world is capable of is changing due to technology. It is a time of great opportunity.

Cameron Art
Managing Partner, Enterprise Cloud Applications, IBM Global Business Services

Preface

As the leading global packaged application provider, SAP supports the changing demands of its customer base by providing a solution that can support their organizations' needs. With the introduction of the SAP HANA database in 2010, SAP provided the ability to use in-memory capabilities to accelerate its business applications and to integrate transaction and reporting capabilities into a single database. In 2013, SAP made the move to using SAP HANA as the platform for all its business applications. In addition to the changes on the platform level, there was a significant move toward the consumption of "as a service" models. This allowed companies to reduce their implementation and maintenance costs and increase productivity with cloud-based deployment options.

SAP's acquisition of other companies such as SuccessFactors and Hybris has added functionalities needed to build an end-to-end digital platform. To simplify the processes and to address the demand of a more user-centric solution, SAP introduced SAP Fiori as part of the overall platform. The combination of those changes and capabilities led to a renovation of SAP ERP toward a new product line called SAP S/4HANA and led to a new way of implementing SAP products: SAP Activate.

Why Read This Book?

With all the changes introduced in the past years and the innovations that are coming alongside those changes, there is a need for more detailed information about and experience with SAP S/4HANA. We know that there is detailed information available for certain aspects of SAP S/4HANA, but we believe that other sources only cover a subset of the overall information and that only address a specific audience. With this book, we provide a comprehensive overview of the different aspects of SAP S/4HANA from industry, business, and technical perspectives.

We also share the experiences we've gathered in different client situations, as well as challenges and how to solve them, with concrete examples. In addition, we've identified a need to prepare customers for the digital transformation and to provide them with the right setup from the strategic, organizational level on down to the technical and operational levels. We aim to close the gap at the strategic level by discussing concrete best practices and how to apply them.

This overview should help both new SAP clients and experienced SAP customers understand the different aspects of and changes to their environments.

Audience

This book is geared toward CxOs, business owners, enterprise architects, and project managers who want to get a consolidated overview of the value of SAP S/4HANA and the related products supporting the digital transformation. We cover the industry perspective and the implications, as well as the strategic, imperative results of the industry transformation. Because of this scope, we believe the book is relevant for all SAP-interested readers across all industries.

We also included information to help business teams understand SAP S/4HANA's functional capabilities (e.g., finance and logistics), as well as how the value scenarios improve day-to-day work.

On the other side, we look at the technical platform and the migration, upgrading, and deployment options that are useful for enterprise architects and project managers.

We want to encourage the readers of the book to take a closer look at the concepts we introduce and consider them in future transformation and implementation projects.

Structure of the Book

This reference book on SAP S/4HANA provides both a complete overview and important details on each topic. The structure guides you from a strategical level to a practical level and covers all key aspects of each topic. This book also serves as a compendium: You can pick it up at a specific chapter and read through that chapter for detailed information on a selected topic. Each chapter is complete as a standalone source. However, we recommend that you start from the beginning and work through the book because some chapters do refer to previous chapters and build on each other.

Chapter 1 provides an overview of the digital transformation and introduces its main drivers. It also describes the fundamentals of SAP S/4HANA, including the different editions and deployment options. We provide an overview of business value scenarios and how they support the digital transformation. Within the value scenarios, you'll see concrete optimization and savings potential. We wrap up with a

high-level overview of the SAP S/4HANA architecture and the principles behind SAP S/4HANA.

In **Chapter 2**, we introduce the key functionalities of SAP S/4HANA Finance and how they address some key business challenges. This chapter also provides an outlook of future capabilities that will be available with further releases.

Chapter 3 looks at the manufacturing capabilities of SAP S/4HANA with information on MRP Live, optimization of product master data, production planning (PP), and detail scheduling (DS). It also contains information on general process simplification and the outlook of manufacturing capabilities.

Chapter 4 covers the supply chain in SAP S/4HANA, from inventory valuation to embedded Extended Warehouse Management (EWM) and embedded SAP Transportation Management. Once again, we conclude the chapter with a look at the future of the supply chain in SAP S/4HANA.

Chapter 5 looks at sales, marketing and commerce (which are often grouped together), and service management. Some highlights of this coverage include the sales order fulfillment cockpit, advance available to promise (AATP), new customer relationship management functionality, and optimized service master data management.

In **Chapter 6**, we look at sourcing and procurement in SAP S/4HANA. Functionality covered includes operational purchasing, invoice and payables management, sourcing and contract management, and supplier analytics.

Chapter 7 rounds off our logistics-based chapters with coverage of research and development (R&D) and asset management. We'll look at SAP Innovation Management, SAP Project and Portfolio Management, SAP Commercial Project Management, and SAP Product Lifecycle Costing. We'll also examine a few areas of asset management, from maintenance planning and scheduling to maintenance operation and execution to mobile asset maintenance.

In **Chapter 8**, we look at two major industry solutions: SAP S/4HANA Retail for merchandise management and SAP S/4HANA Oil & Gas. For both, we look at some technical simplifications and the functionality available within them.

In **Chapter 9**, we explain the details of and the concept behind the SAP HANA platform and how it addresses the typical issues of an IT department and serves as the database for SAP S/4HANA. We get into the principles of the SAP HANA database concepts, scalability, virtualization, and operations. These features are being extended by security and user experience (UX) to complete the architecture.

Chapter 10 presents the different deployment options from on-premise to cloud and possible hybrid scenarios. The requirements for hybrid scenarios are increasing, so we provide an overview of possible integration scenarios and capabilities.

Chapter 11 looks at SAP S/4HANA Cloud, discussing its value proposition, the current scope of the solution, and some tasks and considerations specific to its deployment. We also briefly cover extensibility options and the content lifecycle management process for SAP S/4HANA Cloud.

Based on the fundamentals of the SAP HANA architecture, Chapter 12 describes the extension possibilities of future SAP solutions and how SAP S/4HANA can be extended via in-app and side-by-side extensions. We also introduce SAP Cloud Platform and possibilities for Internet of Things (IoT) and SAP Leonardo as fundamental pieces of the digital value chain.

Next, Chapter 13 helps you get prepared from a technical perspective for a move to SAP S/4HANA and provides the relevant prerequisites. We discuss the different implementation options and approaches, as well as the recommended housekeeping activities and relevant tools.

An essential part of a successful SAP S/4HANA implementation project is having the right approach and method. In Chapter 14, we explain the principles of the SAP Activate framework in the context of SAP S/4HANA and provide an overview of the available tools.

After we introduce SAP S/4HANA and its functional capabilities, we broaden your view in Chapter 15 by introducing the extended functionality provided by the line of business (LOB) solutions outside the digital core (e.g., SAP SuccessFactors, SAP Ariba, SAP Hybris, and SAP Integrated Business Planning) and how they integrate with SAP S/4HANA. Therefore, we provide a high-level overview of the functional capabilities of these solutions and how they complement each other.

In Chapter 16, we discuss analytics and reporting in the context of SAP S/4HANA. We look at operational reporting, embedded SAP BW and SAP BPC, enterprise-wide reporting, cognitive analytics, and big data.

After we explain SAP S/4HANA and its benefits, architecture, principles, methods, and tools, we use Chapter 17 to demonstrate how you can build your own transformation roadmap. We also discuss what methods and tools should be used to make the right decision for your company.

In Chapter 18, we illustrate and prove the value of SAP S/4HANA with a review of concrete, real-world cases that show what benefits can be achieved.

Acknowledgments

Creating this book took a lot of work, so you can imagine that it couldn't be accomplished by a small group. We the authors want to say thank you to all of the supporters who helped us complete this book successfully.

First, we want to thank our families for helping us find the time and the peace to write this book. We also want to thank our friends and colleagues who helped us get this project done. We want to express our gratitude to Subhajit Basak, Mike Beer, Avijit Dhar, Sean Freeman, Piotr Górecki, Dinesh Thigale, and Partha Trapathi for providing significant support to the author team and making significant contributions to some chapters.

We also want to say thank you to all of those who aren't mentioned by name but supported us in the book project.

And, last but not least, we really want to say thank you to Meagan White and Emily Nicholls from SAP PRESS, who had patience with our team and provided encouragement and support.

—**Devraj Bardhan, Axel Baumgartl**, **Dmitry Chaadaev**, **Nga-Sze Choi**, **Mark Dudgeon**, **Asidhara Lahiri**, **Bert Meijerink**, and **Andrew Worsley-Tonks**

Chapter 1
The Digital Transformation: An Introduction

The digital economy is here, and businesses will flourish or wither in this new battleground. Organizations must understand the economic and technical implications of this digital transformation. This chapter describes what digital transformation really means and how to keep pace with changing requirements and what value SAP S/4HANA brings.

Within the past 30 years, digitalization of the world has massively increased. It began with the Internet and the ability to instantly and digitally access information, and it continues to grow via the use of smartphones and social media, which connect us all on a global level and enable us to exchange information, interact, and stay connected. By 2020, an estimated 2.5 billion people will be connected on personal and business social networks worldwide. At the same time, an estimated 200 billion devices will be linked to each other via the Internet of Things (IoT).

For example, a smart home contains different IoT devices (e.g., smart thermometer, smart plugs, etc.) to control and monitor your home. These devices can be combined with data provided by weather data suppliers and enhancement services to control your home. From a business perspective, this IoT data can be used to extend or enhance current services to the consumer or even build new business models.

To give another example, huge growth has occurred in the automatization of the manufacturing industry. According to the International Federation of Robotics (IFR), the demand for industrial robots increased by 48% from 2010 to 2014 and has increased exponentially over the past three years. In short, digitalization is everywhere, from the personal to the global economy.

In this chapter, we'll discuss exactly what the digital transformation is and what it means for you or your industry. In addition, we'll discuss some business scenarios that can help you understand the value of SAP S/4HANA and how it's different from your current enterprise resource planning (ERP) solution. We'll end the chapter by

briefly discussing the architecture of SAP S/4HANA (for a more in-depth look at the architecture, see Chapter 9).

1.1 Defining the Digital Transformation

First, let's begin with some recent history of how the digital transformation started and how it's now maturing and influencing different business areas. Figure 1.1 shows the evolution of digitalization that began with individual digital products in the 1980s and has now matured into the ability to build completely new business models.

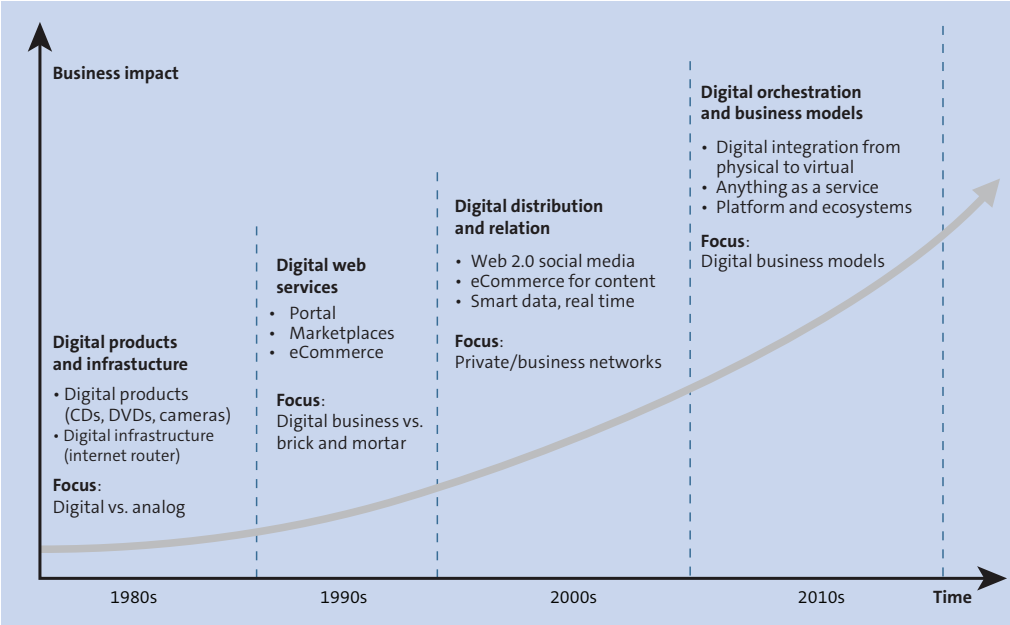


Figure 1.1 Phases of Digitalization from Products to Business Models

These new business models include companies such as Amazon for commerce, Facebook for social media, and Uber and Lyft connecting different services and building collaborative networks.

Does this mean that traditional companies will no longer exist or are being taken over by the new challengers? For example, Google is aggressively going into the mobility space and engaging with autonomous cars. At the same time, German automotive producers BMW, Daimler, and Audi jointly acquired Nokia HERE to extend

their capabilities toward supported and autonomous driving. We see that, though there is the potential for traditional companies to lose market shares to new challengers, there is also a huge potential for them to extend their current market or market segments.

This shows one way in which traditional business models are being challenged. The digital transformation is driving existing businesses to accelerate their speed and leverage digital potential. Although many traditional chief experience officers (CxOs) see the digital transformation as a short-term topic that needs to realize benefits on a quarterly basis, we believe it's a continuous adoption process that goes beyond the here and now.

Equally, if it's a short- or long-term adoption process, all these changes have an implication for how companies will run their businesses in the future and how they need to adapt. This subsequently has implications for the ERP capabilities that will support companies in building their digital platform cores as a foundation to gain value from the digital transformation journey.

Returning to the question of what we mean by the phrase *digital transformation*, we can see that it has different implications for different people, such as the following:

- For some, it's about technology as an enabler.
- For others, digital is a new way of engaging with customers.
- For still others, it represents an entirely new way of doing business and defining new business models.

Digital transformation isn't limited to these aspects, however. In the same way that you have different stakeholders within organizations, you will find different interests and views on the same topic. In terms of how the digital transformation is influencing industries, companies, and consumers, we can define the term *digital transformation* as follows:

> *Digital transformation is the way in which businesses are being impacted by leveraging new technologies (e.g., cloud computing or process automation via robots) and how this affects the overall organization of a business. It's about hyperconnectivity and the utilization and interpration of new data that can provide better insight and generate predictable results to reimagine business models from procurement to sales and services and to improve the entire value chain.*

Based on that definition, what are the fundamental pieces of the digital transformation? From a technical perspective, the following technical megatrends will have the biggest impact on business:

- **Cloud computing and services**
  Cloud computing accelerates time to value, drives higher adoption of new technologies, and connects value chains in real time. Although this has relevance for all CxOs, it's especially relevant to chief marketing officers (CMOs), who rely on accelerated time to value in this digital age. Organizations need to evaluate exactly which delivery models will help them innovate faster in today's digital economy. Most organizations already operate in a hybrid world in which cloud technologies interact with on-premise apps. Four key cloud models are relevant for customers:
  - **Infrastructure as a service (IaaS)**
    IaaS is an enterprise class-optimized infrastructure built using open standards. Businesses are leveraging IaaS (e.g., IBM SoftLayer) to get up and running in a matter of hours without significant capital expense.
  - **Platform as a service (PaaS)**
    PaaS provides an entire computing platform in the cloud, including hardware, software, and open application programming interfaces (APIs) to build new businesses and create new solutions. Examples include Apple, SAP Cloud Platform, and IBM BlueMix, with their range of APIs and services that will also be a disruptive platform for business. Another model of PaaS is managed PaaS for enterprise applications, in which customers move their on-premise platforms to public or private clouds (e.g., SAP HANA Enterprise Cloud, IBM C4SAP).
  - **Software as a service (SaaS)**
    SaaS is a mature trend, with offerings such as SAP Ariba providing solutions via the cloud. SAP is currently the leader in this area, with over 80 million users leveraging SaaS. With SaaS growing more than 20 percent, we see more apps moving into the cloud. Although this trend is dominated by customer relationship management, procurement, and human resources solutions (think SAP SuccessFactors), other solutions, such as SAP ERP, are also moving into the cloud.
  - **Business process as a service (BPaaS)**
    BPaaS enables business transformation. An example is outsourcing commodity business processes (e.g., payroll, expense payments) to a commercial "as a service" pricing model.
- **Mobile solutions and user experience (UX)**
  In the digital era, being mobile-first and providing a first-class UX are essential technology components. The chief value of mobility for CMOs is having a readily available, personal channel available for customers. However, they also need to provide

a consistent UX across all channels their customers use (e.g., in store, browser, mobile).

When consumers check out a vendor's offerings, they expect to search for products, read reviews, and experience standard pricing, whether they're shopping from their smartphone or laptop, by telephone, or in a brick-and-mortar store. Their purchase decisions and brand loyalty are heavily dependent on a positive buying experience. Businesses must now deliver an omnichannel experience through the customer journey.

Internally, *design thinking* is an essential part of today's digital transformation strategies. Design thinking is an effective way to structure complex tasks with an integrated method that takes both people and the collaboration between teams into account to generate extraordinary results. It also uses a six-phase iterative innovation process that considers the place as a factor to increase collaboration and effectiveness. The interaction with the end user and the usability and effectiveness play especially important roles in the adoption of a mobile solution.

- **Big data**
  Big data, including extended sources of data beyond traditional systems of record (e.g., social media, IoT), is emerging as a key technology trend. However, it's the analytics performed on this data that add business value—that is, innovative insight directly answering business and industry pain points.

  One of the major blocks of big data is the mining and interpretation of social business data to understand the individual, deepen relationships and connect, and communicate and share information across structured and nonstructured data from a variety of resources. In today's digital age, feedback (positive or negative) on a customer's product is essential information to provide the business with more insight.

- **Internet of Things**
  For organizations across industries, IoT will become one of the biggest, richest sources of data. IoT is also the vehicle for delivering cognitive capabilities in products, services, and processes. Due to security, regulations, cost, or simply speed, a large portion of IoT data processing needs to happen at the edge, where data is created and where human interaction occurs.

  However, IoT presents a data-processing challenge. If we want to accomplish transformational outcomes, we can't continue to ignore IoT data at the network's edge. There is massive opportunity to be had, but IoT also presents a significant data challenge as the scale, complexity, and diversity of IoT data threatens to overwhelm traditional computing systems.

Traditional programmable systems are designed to handle specific scenarios and data sets. Nevertheless, IoT data doesn't play by traditional rules. Images, videos, sounds, and machine-to-machine data all come together through IoT. All this data is then combined with data sources such as social media, weather reports, and enterprise data, which provide additional context and relevancy that sharpens the value of insights.

- **Cognitive computing**
  Although big data, and particularly the insights into data it can provide, is one aspect of technology enablers on the CMO agenda, cognitive computing is another emerging technology. Cognitive computing enables companies to rethink the role of nonhuman channels by allowing all channels to be "human-like" and even tailored to individual customers' desires. For example, cognitive computing can guide people through complex decisions, such as choosing tax-efficient investments or using natural language to learn about and advise a customer, all while considering an exhaustive set of options. For large companies, this can drive significant cost benefits while improving customer satisfaction. The following are possible scenarios and capabilities provided by cognitive computing:
  - Understand unstructured data through sensing and interaction
  - Reason about data by generating hypotheses, considering arguments, and reviewing recommendations
  - Learn from training by experts, from every interaction, and from continually ingesting data
  - Understand, learn from, and reason through data to reshape an organization's industry

  Cognitive computing-enabled processes are key to unlocking the value of big data and provide additional information that helps to automate processes or make informed decisions. In analytics, we also see the move from traditional descriptive and diagnostic analytics (describes what happened and why it happened) to predictive analytics (describes what will happen) and cognitive analytics (describes what should be done and how you can make it happen). Cognitive computing can help make sense of the explosion of data created by the Internet of Everything (IoE), meaning that all different information sources, such as devices, sensors, smartphones, and so on, are being considered and used to extract valuable insights.

Digital transformation has different meanings to different people, but we still see a common agreement that technology is an enabler and a game changer for chief executive officers (CEOs). It's clear that, due to the digital transformation, the business

model is influenced by technology and has implications for the business strategy. This also makes a change in the influence of the chief information officer (CIO) and the CIO's organization, as they must transform from pure service providers to the innovation drivers of a company.

This requires transformation from a reactive mode into a more proactive mode to support an organizational, platform, and skills shift. As the new role of the CIO organization is to envision possible business for the company to lead and extend its current business model by harvesting existing data and providing better customer insights, building the right platform to transform into a customer-centric organization is essential.

Driving Digital Transformation

Companies need to ask what they need to do, from a business perspective, to drive forward the digital transformation and ensure that there is a real benefit from their investments. In short, companies must ask themselves the following:

- Do we have a clear digital strategy?
- What capabilities are needed, based on our digital strategy?
- Where can we boost our existing business model with digital?
- From which industries can we be disrupted? Are there other industries that break into our current business?
- What can we forecast? Are there any trends that could have an implication on our current business?
- Can we adopt from the industry as a fast follower and adopt the first-mover strategy from others?

These are the initial questions businesses need to answer to drive forward their digital transformation with the following objectives:

- Creating value with better customer insight and customer experience based on aggregating different sources of information and tailoring personalized offerings
- Extending the business and getting into new markets by leveraging all channels that are digitally enabled by the newest technologies
- Enhancing current products with digital services or information
- Improving time to market with new products by digitalization and automatization to increase efficiency and effectiveness
- Building up core capabilities on the business and technology levels to support the digital transformation

1.2 Business Value Scenarios

Most of you likely have an existing SAP solution in place and have invested a lot of money to ensure that it fulfills your current requirements. Some of you may be uncertain about the business value and the migration costs that come along with moving to SAP S/4HANA, but there is a huge opportunity to reconsider the current processes with a focus on the digital transformation and the ability to support the future creation of business models. Therefore, it's essential to understand the value SAP S/4HANA brings from a functional perspective, as well as the technical capabilities that must be embedded in your strategy to tailor an individual roadmap that fits your future business.

Looking at the impact of the digital transformation (see Figure 1.2), you'll see five different layers that need to be supported to achieve the highest transformation toward creating new business models.

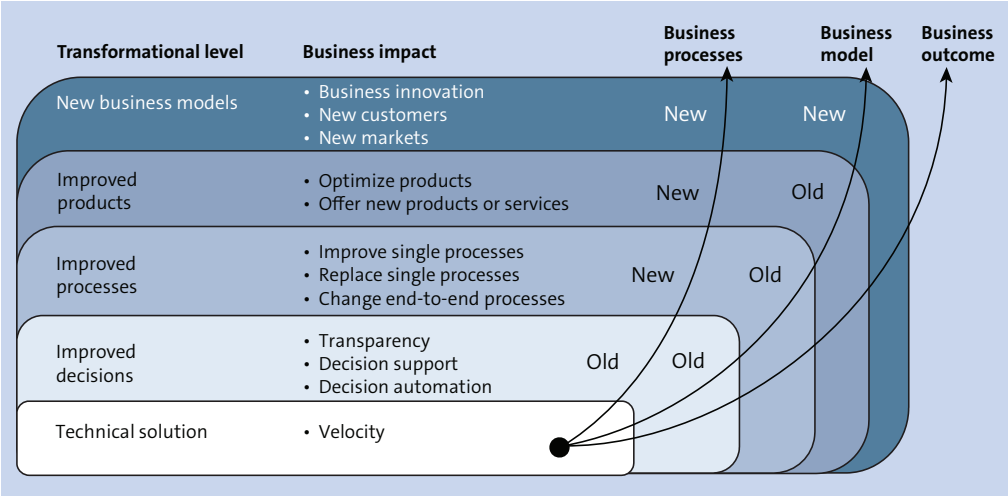


Figure 1.2 Digital Transformation Adoption Model

How does SAP S/4HANA address those challenges? Platform speed is increased with the migration to SAP HANA as an in-memory database. Speed is also increased by simplifying the data model and reducing the redundant application data. Creating a single data source for end-to-end processes (described in Section 1.2.2) aids in decision-making, and simplified and improved processes are enriched by role-based, user-specific UX (discussed in Section 1.2.1).

In addition, having a single data source and the ability to aggregate data on the fly, in combination with the storage of customer behavior from different sources, provides better insight into customer behavior. You can understand what customers may do, what they're doing right now, and what they've done in the past. All this information is available in real time and is part of the future digital platform with SAP Hybris (discussed in Section 1.2.2). All these capabilities are provided as part of SAP S/4HANA and the supporting LOB solutions that are tightly integrated to support the digital value chain.

For each of the layers shown in Figure 1.2, we'll outline potential use cases to help you understand the value of SAP S/4HANA.

Let's begin with Figure 1.3, which contains a summary of the key innovations available in the current release. As you can see, it's in line with the digital transformation model and is based on the following three main changes:

- **Rearchitecting the in-memory platform**
  This supports the first four layers of the digital transformation model, from the technical solution up to improved products (see Section 1.2.2). This is part of the SAP S/4HANA core solution and leverages the simplification of the technical architecture by combining online transaction processing (OLTP) and online analytical processing (OLAP) to drive analytics as part of the transactional processes. As an example, you can look at the decision-support cockpit for material requirements planning (MRP).
- **Responsive UX design**
  This supports improved decisions, processes, and products by providing a single entry point for all customers and users (see Section 1.2.1). It provides the capability to work from any device (e.g., smartphone, smart watch, etc.) and improves the effectiveness of users significantly with the redesign of transactions into user-centric SAP Fiori apps.
- **Unifying functionality in the core**
  This simplifies SAP S/4HANA and follows the *principle of one* as a key driver for simplification. The elimination of functional, technical, and data redundancies optimizes SAP S/4HANA and avoids complexity (see Section 1.3).

All these changes have implications for the innovation capability of SAP S/4HANA and are the foundation for the different scenarios and simplifications in finance and logistics.

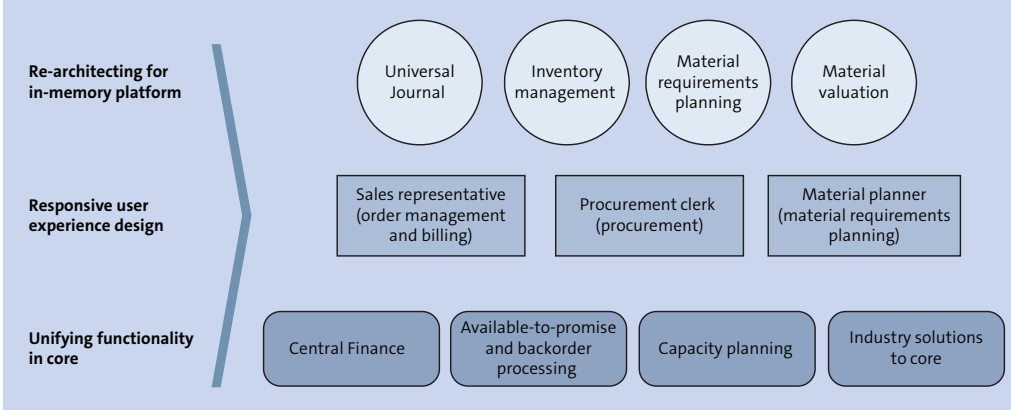
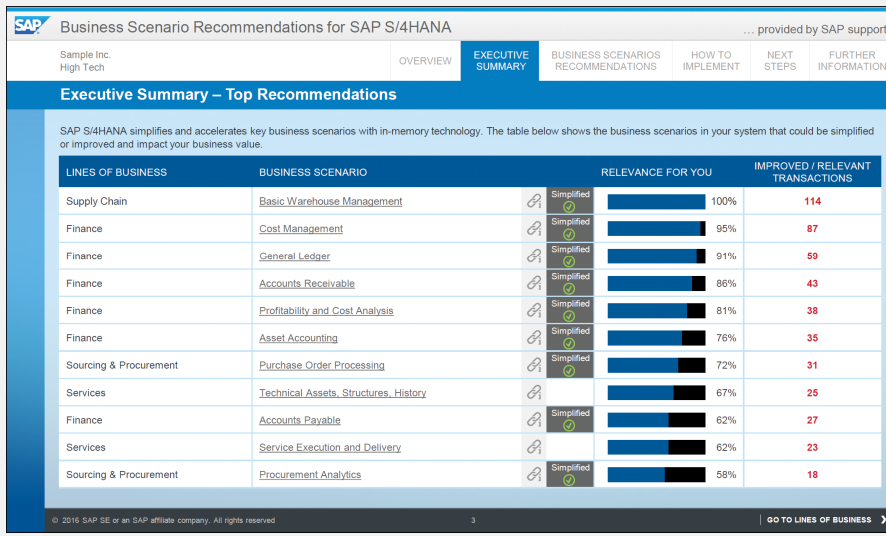


Figure 1.3 Key Innovations for SAP S/4HANA Enterprise Management

Note

You can create your own business scenario recommendations report based on your transaction usage. For a guide to on how to do this, visit *https://www.s4hana.com/how-to-guide*. The report provides you with a detailed overview of the recommended business scenario, the relevance for your company based on the analyzed transactions, and the improved or relevant transactions that are affected. For illustrative purposes, a sample of an executive summary is shown in Figure 1.4.



LINES OF BUSINESS	BUSINESS SCENARIO		RELEVANCE FOR YOU	IMPROVED / RELEVANT TRANSACTIONS
Supply Chain	Basic Warehouse Management	Simplified	100%	114
Finance	Cost Management	Simplified	95%	87
Finance	General Ledger	Simplified	91%	59
Finance	Accounts Receivable	Simplified	86%	43
Finance	Profitability and Cost Analysis	Simplified	81%	38
Finance	Asset Accounting	Simplified	76%	35
Sourcing & Procurement	Purchase Order Processing	Simplified	72%	31
Services	Technical Assets, Structures, History		67%	25
Finance	Accounts Payable	Simplified	62%	27
Services	Service Execution and Delivery		62%	23
Sourcing & Procurement	Procurement Analytics	Simplified	58%	18

Figure 1.4 Business Scenario Report Executive Summary

Now, let's look at the three main areas in which SAP S/4HANA can add value to your business: through improved customer centricity and experience, increased customer insight and a better decision-making process, and a new digitally enabled supply chain.

1.2.1 Customer Centricity and Experience

As part of the digital transformation, the way users will access ERP solutions is different than in the past. Users want access via different devices (e.g., mobile) via a simplified, user-friendly experience. In recent years, there has been a massive change in the behavior of specific target groups, such as Generation Y or Millennials; they're looking for a customized and focused UX that's simple to handle. Based on changing requirements and the future of digitally enabled enterprises, SAP decided to provide customers with a new UX called *SAP Fiori*. SAP Fiori applies the following new design principles to reimagine the UX:

- **Role-based**
  This design principle focuses on fulfilling individual working requirements.
- **Responsive**
  This design principle focuses on supporting every possible way of working—from the desktop to mobile—to be responsive to customer needs.
- **Simple**
  This design principle focuses on only providing the user with what is essential and important.
- **Coherent**
  This design principle focuses on providing a fluid and seamless experience.
- **Delightful**
  This design principle focuses on satisfying users' needs and making an emotional connection.

With usage of SAP Fiori, there is a significant shift from the purely functional view that was available in the old SAP ERP to a role-based UX with a single entry point and a common design in SAP S/4HANA (see Figure 1.5) across business applications, whether cloud or on-premise. From a strategy perspective, all new or existing SAP solutions will use SAP Fiori to harmonize the unified UX for SAP Ariba, SAP SuccessFactors, SAP Hybris Cloud for Customer, SAP Fieldglass, and both SAP S/4HANA and SAP S/4HANA Cloud.

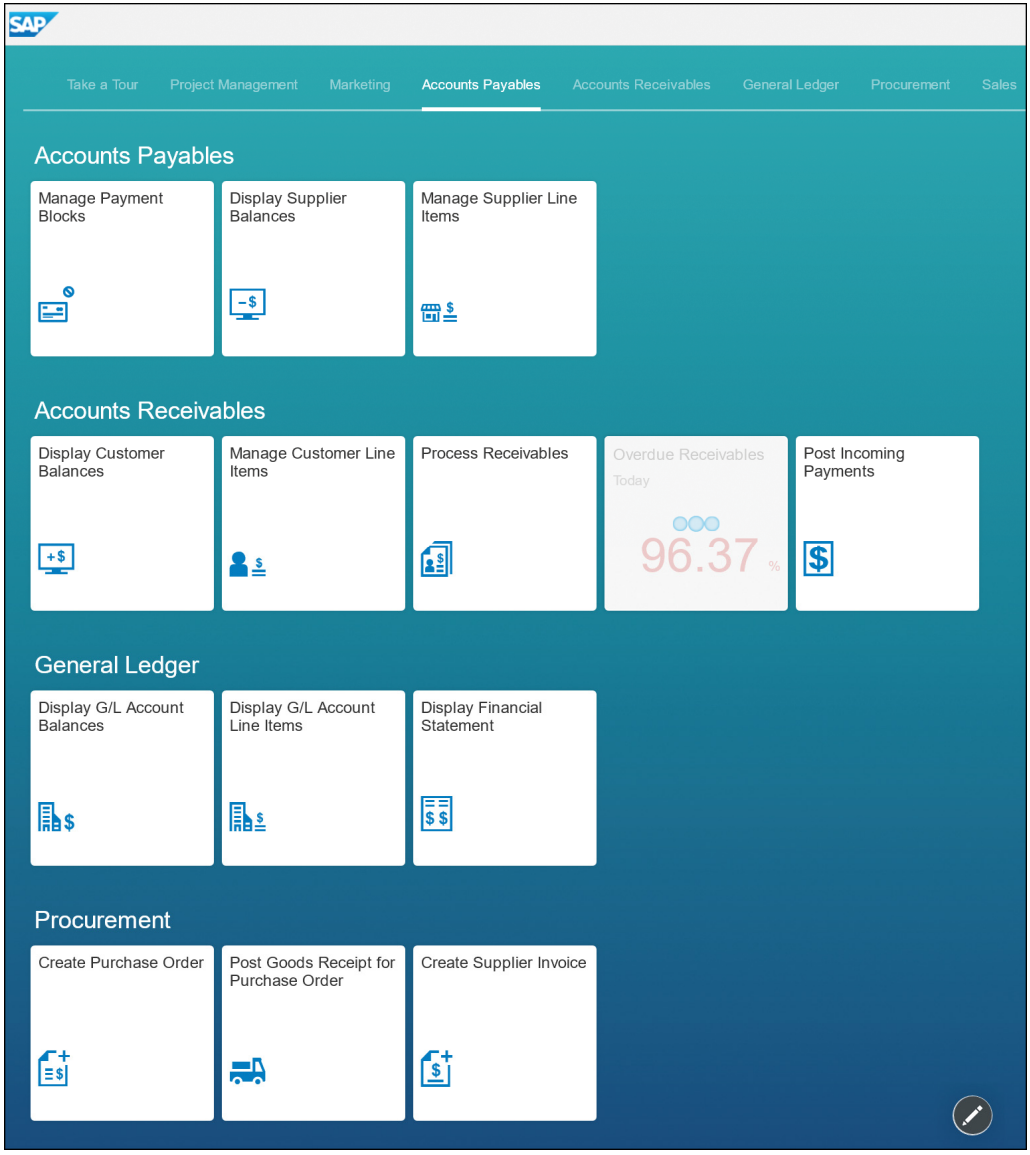


Figure 1.5 Role-Based View with SAP Fiori as Part of SAP S/4HANA Cloud

Now, what's the real business value? Aside from the creation of a nice UI, SAP Fiori also affects how people work. This is evident in nonmonetary benefits such as the following:

- **Increased user satisfaction**
  The efficiency and effectiveness of work is increased because all applications can be accessed via a single entry point with the same look and feel.
- **Increased customer loyalty**
  Using the unified UX (e.g., recruiting or procurement) increases both internal and customer loyalty.
- **Increased solution adoption**
  Reduced maintenance costs and user errors result from increased solution adoption.

Those nonmonetary benefits will lead to significant business results, such as the following:

- Gain productivity through the avoidance of errors, which will help free up additional team members for more productive work
- Save training costs through easier solution adoption, which will reduce the overall change management costs for implementation of new functionality

To give an example from an existing client, one food-delivery business improved its productivity by 60 percent after adopting the new processes based on SAP Fiori. Another customer eliminated training effort due to the intuitive SAP Fiori design and the user-specific UI.

Note

SAP provides a tool to calculate the business value for selected scenarios at *http://www.sapcampaigns.de/us/UX_Calculator/*.

Based on the design principles described earlier, the changing UX strategy has the goal to support the simplification of the SAP S/4HANA solution, which is why SAP S/4HANA and SAP Fiori are tightly integrated. At present, not all SAP solutions are enabled fully with SAP Fiori, but solution development will continue. More SAP Fiori apps will be available in later releases that will simplify the overall solution. In addition, not all transactions are being replaced with SAP Fiori apps because there will be a move to a more role-based UX, and the processes will be streamlined and condensed to the necessary core functionality.

SAP S/4HANA Cloud is fully based on SAP Fiori, and it's not possible to access transactions via the SAP GUI for SaaS solutions. Because only SAP Fiori apps can be used, this

limits the functionality provided with SAP S/4HANA Cloud. As the product evolves, more processes will be supported by SAP Fiori apps as the simplification process continues. All this effort is based on the desire to reduce the redundancy on any level, ranging from the SAP HANA database up to the SAP Fiori UX.

The simplification process from SAP ERP to SAP S/4HANA doesn't just consist of the new UX design. Based on the simplification of the data model, redesign of the business logic, code pushdown, and role-based tailoring of the solution, there is also a process redesign coming along with the move to SAP S/4HANA.

How many processes are supported by SAP Fiori? Within SAP S/4HANA 1610, 609 SAP Fiori apps were supported; this increased to 890 in release 1709.

If you want to realize the benefits of SAP S/4HANA, you should first look at the roles and the usage of the transactions to get a better understanding of where the best case for simplification or value realization resides. Second, you should look at the currently available SAP Fiori apps and review how they fit into your role requirements and where the gaps are. This will give you a good overview of the functionality your end users need and an understanding of what the current release covers.

Note

Not all users will be SAP Fiori users at the beginning, so you should plan for traditional SAP GUI users or a combination of both user types as well.

To identify currently available SAP Fiori apps, you can browse the SAP Fiori apps reference library (see Figure 1.6) at *https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/#*.

In the SAP Fiori apps reference library, you can select an area of interest to review the related available apps. All apps are assigned to different roles; for example, under **Accounts payable accountant**, there are apps available for **Create Manual Payment** and **Create Single Payment** (see Figure 1.7). You can see the details regarding app availability, the required backend product, and any additional documentation. You can also take a detailed look via the list view and select different product suites for a quick glimpse.

If you want a recommendation based on your system usage, you can select this as an option within the library. A detailed guide on running an SAP Fiori relevance and readiness analysis is available at *https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/docu/Relevance_and_Readiness_Document.pdf*.

The results of the analysis provide a list of possibly relevant SAP Fiori apps based on your transaction usage, as well as the relevant prerequisites.

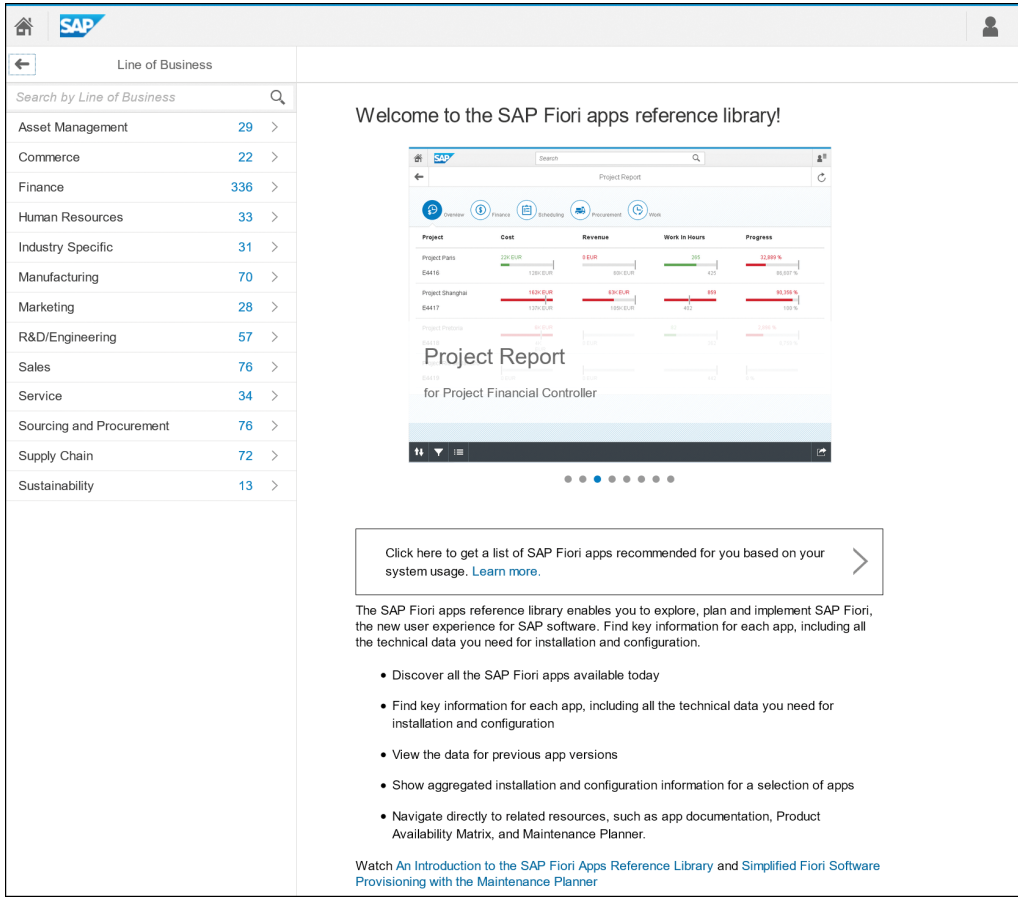


Figure 1.6 Overview of SAP Fiori Apps Reference Library

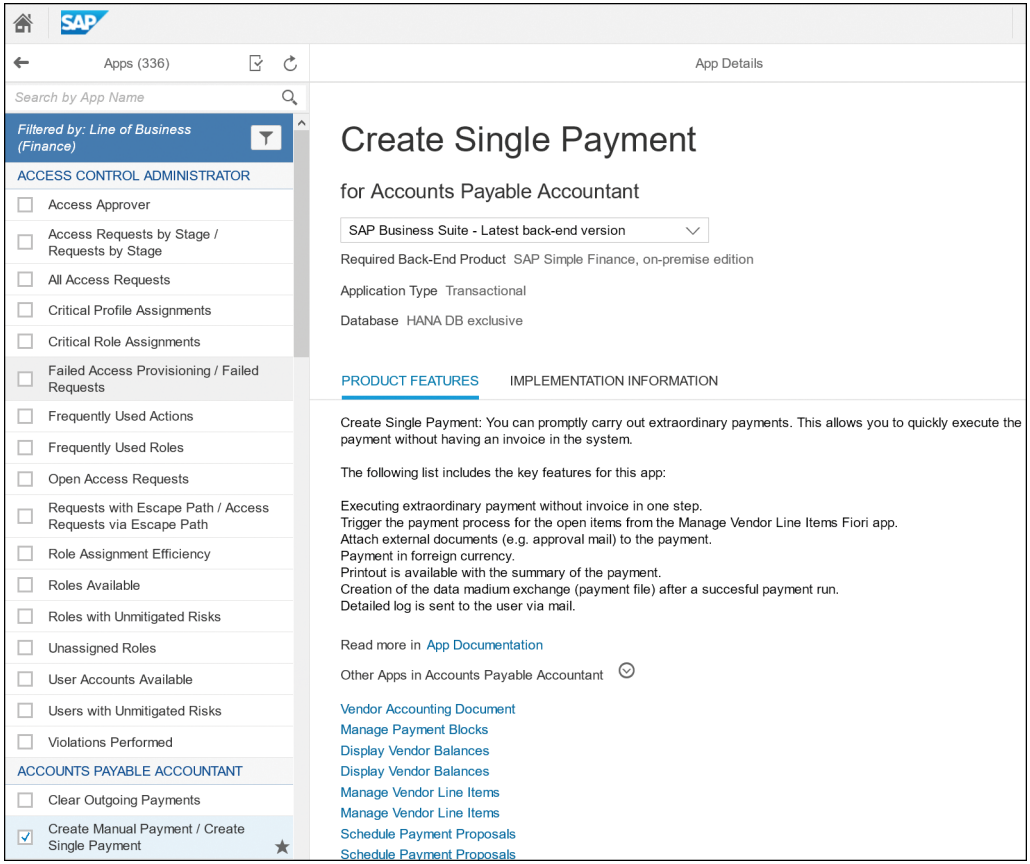


Figure 1.7 Sample of Identifying SAP Fiori Apps in Finance LOB

As a sample for the improved process time via SAP Fiori within SAP S/4HANA, let's look at the finance area to see how SAP S/4HANA Finance has been improved and simplified—in this case, for an account receivables accountant processing incoming payments (see Figure 1.8). Table 1.1 summarizes the differences between SAP GUI and the new SAP Fiori app available via SAP S/4HANA for posting received customer payments and cleared customer invoices. This process was traditionally handled by Transactions F-04, F-28, and FB05.

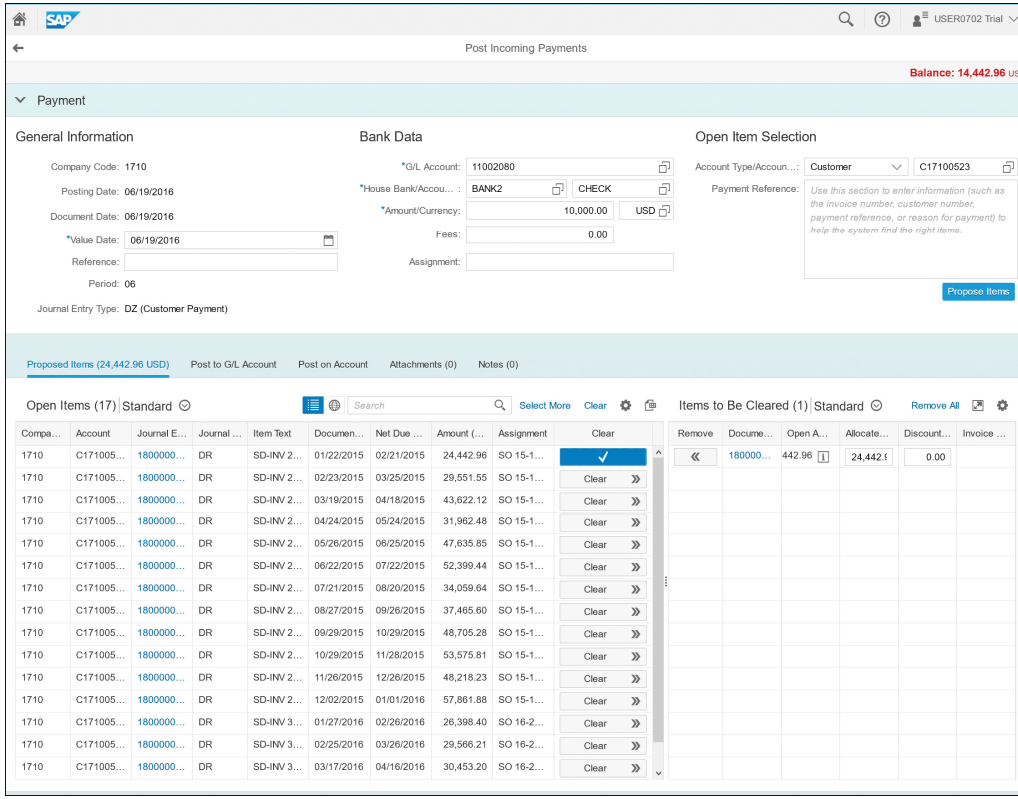


Figure 1.8 Clearing Invoices from Incoming Payments

SAP GUI (Traditional)	SAP Fiori (Simplified)	Improvement
Duration: 1:26 min	Duration: 0:59	31% reduction
Clicks: 27	Clicks: 17	37% reduction
Screen changes: 14	Screen changes: 2	86% reduction
Fields filled: 14	Fields filled: 7	50% reduction

Table 1.1 Comparison of Activities and Savings between SAP GUI and SAP Fiori

As you can see, there is a significant improvement running the clearing process via the SAP Fiori app, not only in the total duration but also in the change of screens and the information that needs to be entered manually. This is a simplification example that really demonstrates the value that SAP S/4HANA brings with its unified UX.

In short, SAP Fiori isn't just about a nice UI; it's more about redesigning processes from an end-user perspective to be more efficient and to reduce costs. SAP Fiori can provide business value for your organization from a UX perspective, and there are tools available to identify the relevant business scenarios for your organization.

1.2.2 Customer Insight and Improved Decision-Making

As part of the digital transformation, it's not only important to improve the UX, as outlined in the previous section; it's also become increasingly critical to better understand client behavior so that you can offer a tailored service or product. Therefore, it's essential to collect all necessary data, make the data available in real time, and create actionable results based on the analysis and prediction of data. With the transition to SAP S/4HANA, several changes enable you to provide better customer information and support the decision-making process. Due to the use of an in-memory database, the redesign of the data model, and the data footprint reduction that comes with SAP HANA, it's now possible to provide a single platform across the different solutions with one copy of the data and less integration effort.

SAP S/4HANA is designed to fulfill the end-to-end requirements of a digital value chain. It contains optimized, end-to-end processes that reside on a single data source, with SAP HANA as the digital backbone. It also contains IoT integration via SAP Cloud Platform, which allows companies to get insights and automatically initiate business processes from social media tools, as well as analyze structured and unstructured big data in real time.

This value chain is only possible because SAP S/4HANA also integrates SAP's existing portfolio of LOB cloud solutions, as follows:

- **SAP Hybris**
  This is the industry-leading omnicommerce platform for customer engagement that delivers exceptional and consistent customer experience across every channel of interaction.
- **SAP SuccessFactors**
  This is the leading solution for human resource management.
- **SAP Integration Business Planning**
  This is SAP's platform for real-time supply chain planning that's built on SAP HANA and fully integrated with SAP S/4HANA.
- **SAP Fieldglass**
  This solution helps manage contingent labor.

- **SAP Ariba**
  This is the indirect material procurement network via which companies trade between each other in a fully digitized way.
- **Concur**
  This business travel and expense-management solution provides the best possible experience for the business traveler at the lowest possible cost for the company, all fully integrated with the transactional system.

This portfolio enables customers to run their entire company digitally, in a fully integrated manner. More information on the extended portfolio is provided in Chapter 15, which explains how those solutions fit into the overall strategy of SAP S/4HANA.

The step toward SAP S/4HANA and the plan to integrate all LoB solutions into a single data source combined with the capabilities of an in-memory database enables customers to move from a traditional, separated transactional and analytic data approach toward a unified one (see Figure 1.9). This significantly reduces the delay between the different data sources and enables customers to drive real-time analysis and make decisions on live data. You also can embed analytics as part of transactions to improve the process and provide better information based on real-time data instead of aggregating the data manually and spending additional time and manpower to produce outdated data.

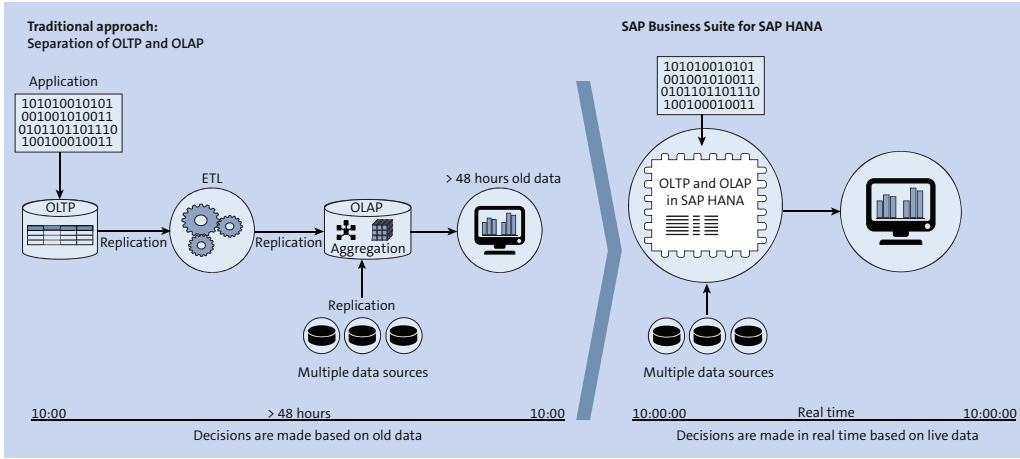


Figure 1.9 Integrating Real-Time Data Access for Improved Decision-Making

As shown in Figure 1.9, SAP S/4HANA provides all capabilities that are required from a digital platform. The redundant data limitation and the complex data models

overview are gone, which enables you to conduct ad hoc and real-time analysis without data extraction and data loading.

As a concrete example, let's take a closer look at the work of an accounts receivable manager. If the accounts receivable manager wants to get an overview of the 90 days' receivables he is expecting sorted by the top 10 customers outstanding, he can easily access this information via an SAP Fiori app that provides detailed information for his entire customer base (see Figure 1.10). The reports available via SAP Fiori allow different user groups to get a detailed understanding of the finance data (e.g., auditors can drill down into the details of the overdue receivables and sort them by customer, company code, accounting clerk, etc.).

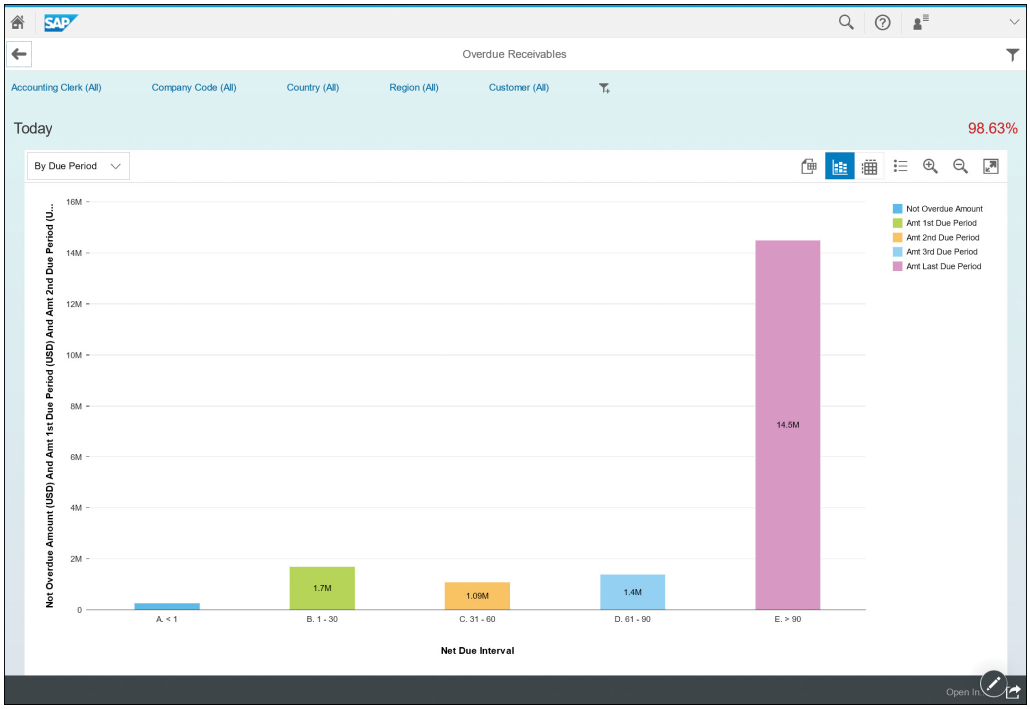


Figure 1.10 Overdue Accounts Receivables

Using this report, the accounts receivable manager can get a better overview of the top 10 customers and their behavior and then drill down into further details (see Figure 1.11). All this information provides transparency and helps companies improve their decision-making based on real-time financial data combined with on-the-fly reporting capabilities.

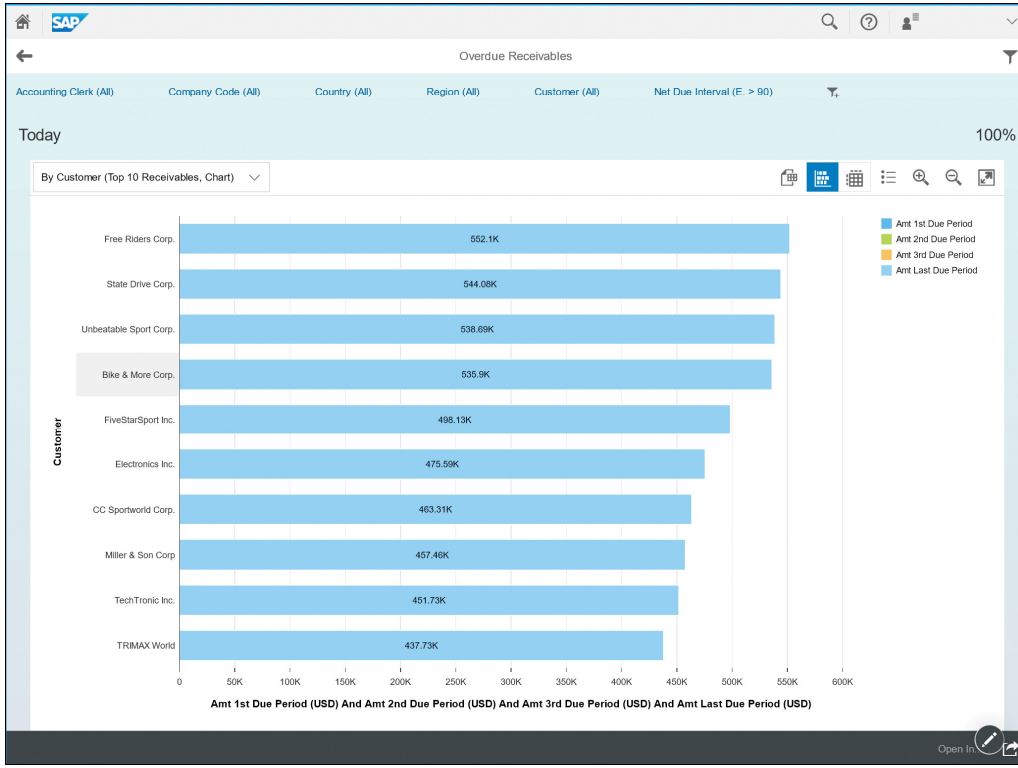


Figure 1.11 Overdue Receivables by Top 10 Customers

This example provides an overview of the key benefits of SAP S/4HANA based on the simplified data model, as listed here:

- **Real-time processing**
  Eliminate batch processing and data reconciliation through a single data pool.
- **Predictions**
  Discover and respond to future opportunities and challenges based on available/historical data.
- **Simulation**
  Simulate possible scenarios and explore the impact of business decisions on outcomes.
- **Responsive**
  Improve user satisfaction by reducing wait time through real-time access to data.

- **Drilldowns**
  Drill down into easy-to-use reports and analyze data at any level without exporting data.
- **Recommendations**
  Rule-based and instantaneous decision support guides the user and text mining, and the ability to embed structured and unstructured data in one business process ensures innovative business processes and business decisions.

1.2.3 Digitally Enabled Supply Chain

Section 1.2.1 showed how users are being empowered with people-centric UIs, and Section 1.2.2 showed how the simplification of a single data model with no redundant data is supported by SAP S/4HANA. Let's now look at the third piece of the puzzle: how logistics is changing due to the market trends that are driven through the digital transformation and how SAP S/4HANA addresses those topics. Although there are no changes to the processes themselves, there is a significant change in the way processes are executed more efficiently, as was shown earlier in Table 1.1. In logistics, the digital transformation has brought about significant changes; for example, consumers expect their orders to be fulfilled and shipped on the same day, so they can receive their product on the next day.

Another example is IoT and the collection of big data via sensors or other devices, which has huge implications for how companies monitor their supply chains. The rapid growth of collaborative networks is removing borders between suppliers and consumers, which has a big impact on how processes can be executed and improved.

The current SAP ERP system serves as a classical *system of record* storing your transactional data. The business user goes through different transactions for transparency into demand shortages, analyzes various reports, adds intelligence to the information, and then either prioritizes production or transfers goods from one plant to another to avoid shortages. With SAP S/4HANA, the business user gets away from the traditional system of record and leverages the core capabilities of the platform, such as IoT or business network connectivity, to obtain more detailed information and advanced analytical options that help him do his work more effectively.

To give a concrete example of the business value SAP S/4HANA provides in the logistics area, let's look at inventory management. The challenge of inventory management is to provide customers with the right products at the right time while reducing storage and saving costs at the same time. In the past, to achieve transparency, you had to execute the backflush process (the process of determining the number of parts that must be subtracted from the inventory) once a day, which led to inaccurate

inventory in the system. With customers now expecting individualized and on-demand products and services, it's not feasible to work with outdated data that gives limited transparency into the available inventory, as this will lead to supply shortages and unsatisfied customers.

Most businesses are requiring real-time data in the entire supply chain to minimize the stock in warehouses and thus reduce total costs. With older ERP solutions, separate data is loaded from several sources, which takes too much time. Therefore, a simplified data model is needed to avoid redundant data and enable on-the-fly analysis to provide a detailed look inside the inventory and minimize the risk of deviations between physical inventory and virtual inventory. This is where SAP S/4HANA comes in.

Figure 1.12 illustrates the classic inventory management process flow:

1. At 6:00 a.m., the stock is automatically entered via barcodes.
2. During the day, the inventory manager checks the virtual inventory available in his system. In this example, he checks the inventory at two-hour intervals, at 8:00 a.m., 10:00 a.m., and 12:00 p.m.
3. At 2:00 p.m., the stock is automatically entered via barcodes.
4. At the same time (2:00 p.m.), the inventory manager checks the virtual inventory again and gets a first view of the real values after the actualization of the information. This leads to a large deviation between the virtual and the real stock through, for example, production quality issues.

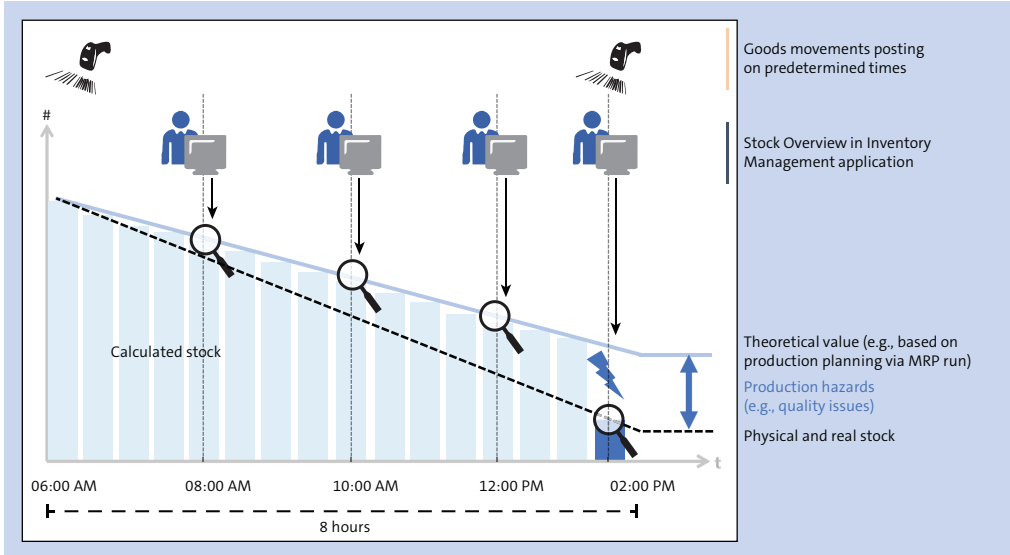


Figure 1.12 Classical Inventory Tracking

In this example, we have a high deviation between virtual and actual stock. To compensate for this difference and to prevent the production chain from stopping due to lack of parts, you must have safety stocks (see Figure 1.13). Safety stock is expensive because it requires additional costs (e.g., handling costs, space costs, etc.) on top of the stock itself. Therefore, it's essential to minimize safety stock.

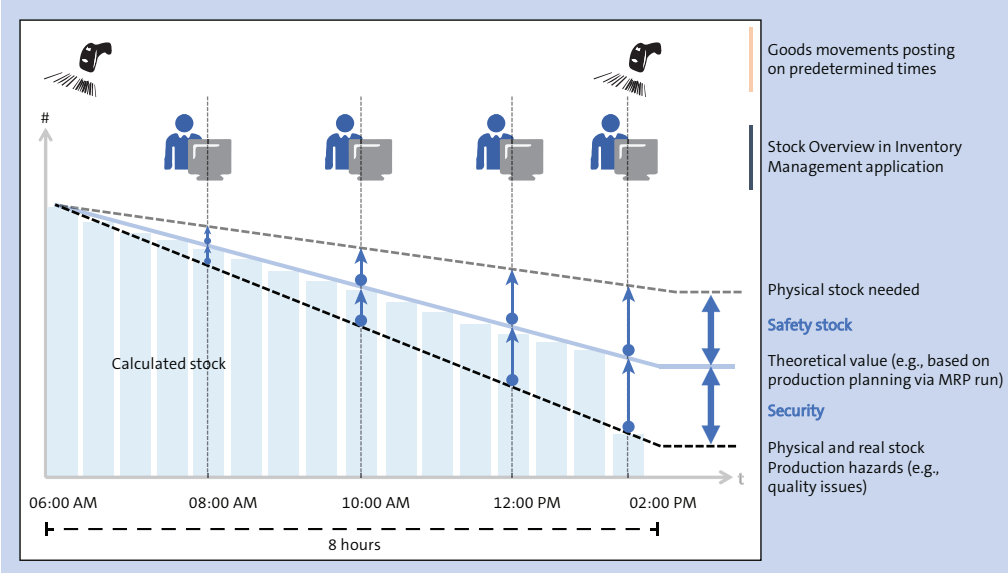


Figure 1.13 Inventory Tracking Including Cost-Intense Safety Stocks

To avoid these deviations and to reduce the amount of safety stock, SAP S/4HANA enables you to reduce the difference between the theoretical and the real stock value. As shown in Figure 1.14, real-time inventory tracking allows you to enter values of stock in real time, which allows you to anticipate actions to compensate for the risks of production and reduce your safety stock.

The foundation of this SAP S/4HANA simplification is the elimination of aggregates. In SAP ERP, the Materials Management (MM) inventory functionality is stored in table `MKPF` (header table) and table `MSEG` (line item table), with an additional 18 tables for quantities and values. Out of those tables, 11 aggregate tables have additional shadow tables for historical data (see Figure 1.15). All these tables are required to support reports such as Report MB5B or Report MMBE, among others. This all results in a great deal of redundant data, which was necessary before the possibilities of in-memory

technology. With SAP S/4HANA, a new data model has been built that leverages the advantages of the in-memory columnar storage.

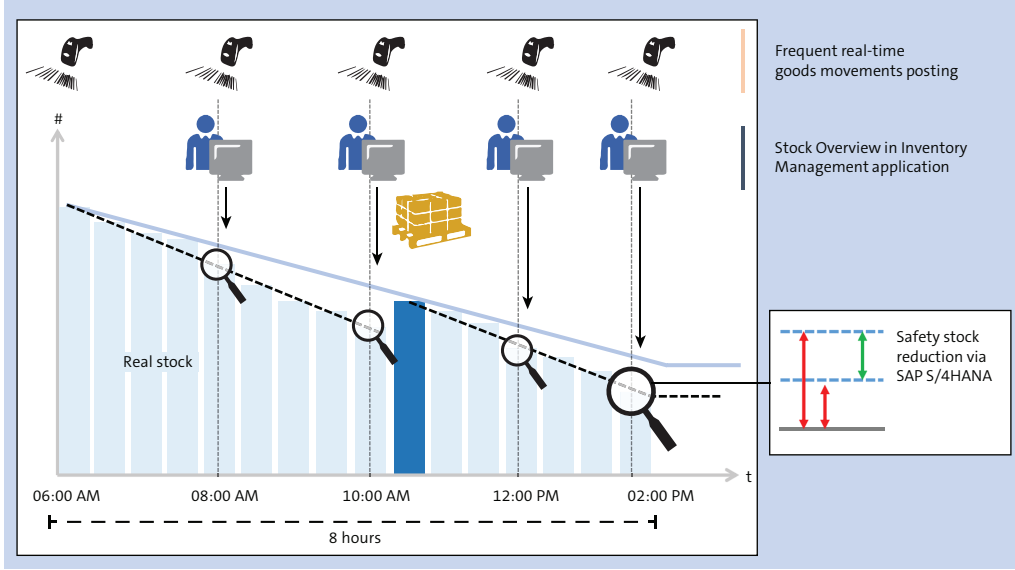


Figure 1.14 Real-Time Inventory Tracking

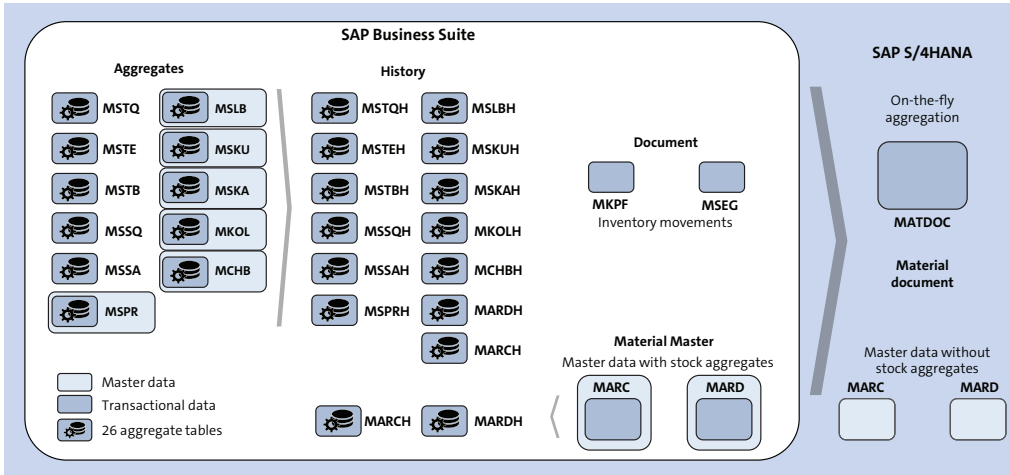


Figure 1.15 Inventory Management Changes from SAP ERP to SAP S/4HANA

With SAP S/4HANA, the single table MATDOC contains all the information formerly stored in all those various tables, which eliminates redundancy and provides you with better performance. Now that the aggregate tables have been replaced with Core Data Services (CDS) views, both on-the-fly calculations and compatibility with custom developments are supported. With these changes, SAP S/4HANA provides real-time processing of inventory postings and visibility of inventory values, so you can reduce your safety stock and manage smaller lot sizes moving through logistics operations. All of this leads to an overall cost reduction in your inventory.

Another example of optimization is found in the accelerated material requirements planning (MRP) available with SAP S/4HANA. As you can see in Figure 1.16, there is a huge simplification between the SAP ERP system and SAP S/4HANA. With SAP S/4HANA, you can now access your key performance indicators (KPIs) in real-time. Due to increased transparency, there is a significant decrease in the amount of inventory you must keep on hand, which in turn results in cost savings.

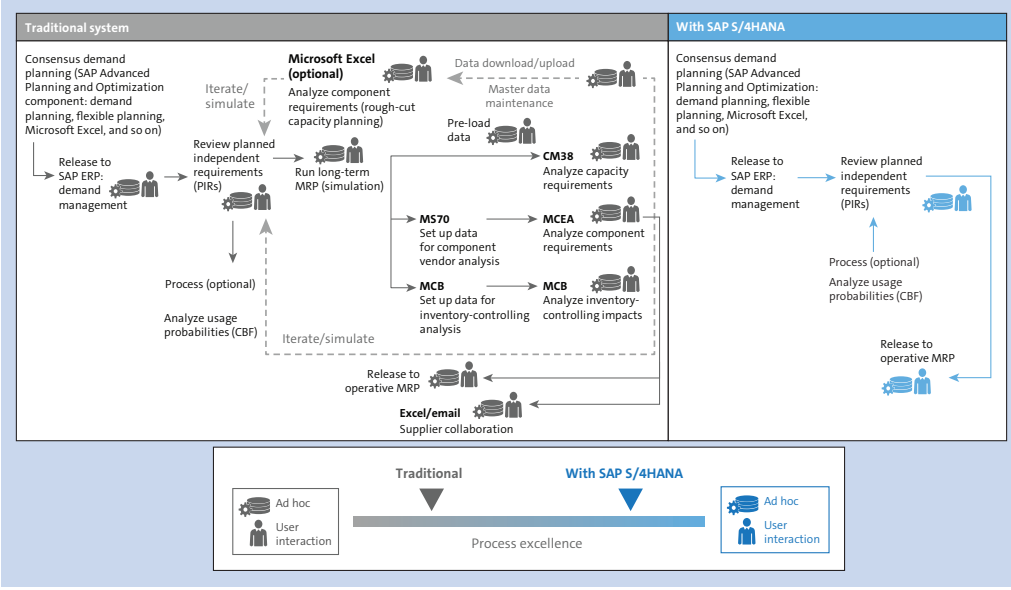


Figure 1.16 Accelerated Material Requirements Planning

Traditional SAP ERP	SAP S/4HANA
No real-time planning due to elapsed time	Real-time system with KPIs instantly refreshed
Decisions based on "old" data, resulting in lower quality	Segment of one that reduces lot sizes down to single items
Lower forecast accuracy and attainment of promise date; increase in inventory	■ Focus on exception handling rather than standard processes ■ Inventory decrease with reliable ATP check

Table 1.2 Accelerated Material Requirements Planning Comparison between SAP ERP and SAP S/4HANA

1.3 Architecture at a Glance

In this section, we'll provide a first glance at the architecture concept of SAP S/4HANA to build a basic understanding. As mentioned previously, the goal of SAP S/4HANA is the principle of one, which means the removal of redundant frameworks, technologies, data models, and application data. The guideline for a digital transformation platform is to focus on the essential and to reduce all overhead while leveraging the best technical possibilities to achieve a highly flexible solution for the digital era. To achieve this, we must take a closer look at the SAP architecture.

Within SAP, processes and features belong to a software component. All the relevant software components required for an SAP ERP 6.0, EHP 8 on-premise system are shown in Figure 1.17. As you can see, there are a lot of separate software components that reflect the functionality available in the current release. The idea of components is to have the smallest possible unit that can be maintained separately to reduce maintenance and increase the ability to update smaller pieces of the overall solution separately.

As you can imagine, there are interdependencies between the different components that need to be considered; this adds additional complexity to the overall solution and the development of the solution. One of the goals of SAP S/4HANA is to remove these dependencies to come to *one* component with *one* deployment option.

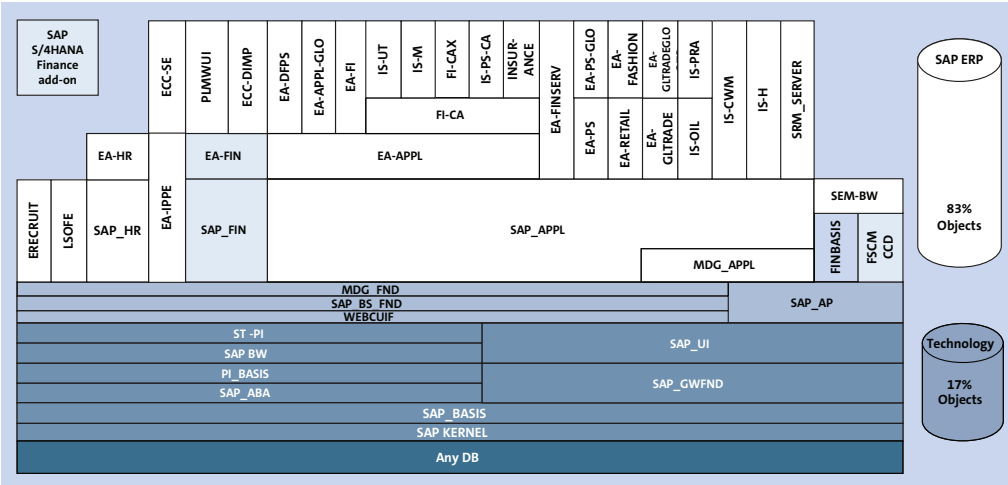


Figure 1.17 Overview of Software Components for SAP ERP 6.0, EHP 7 On-Premise

To follow the principle of simplification with SAP S/4HANA, the components that aren't essential need to be removed or be merged, as shown in Figure 1.18.

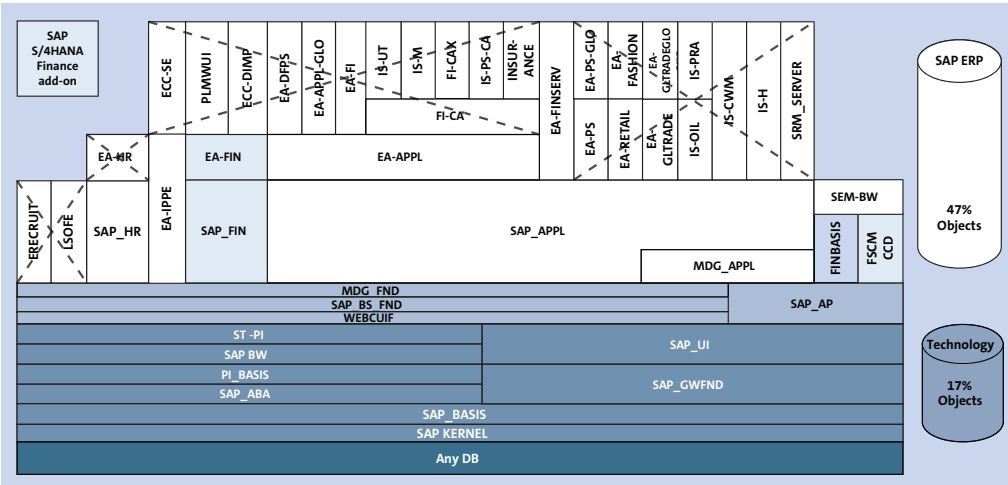


Figure 1.18 Reduced Objects Not Relevant for SAP S/4HANA Core Solution

SAP S/4HANA focuses on providing a baseline functionality around the areas of materials management, sales and distribution (SD), customer services, finance, and

controlling. This leads to the simplified SAP S/4HANA core, which includes the baseline functionality. All other software components are removed to streamline the solution, as shown in Figure 1.19.

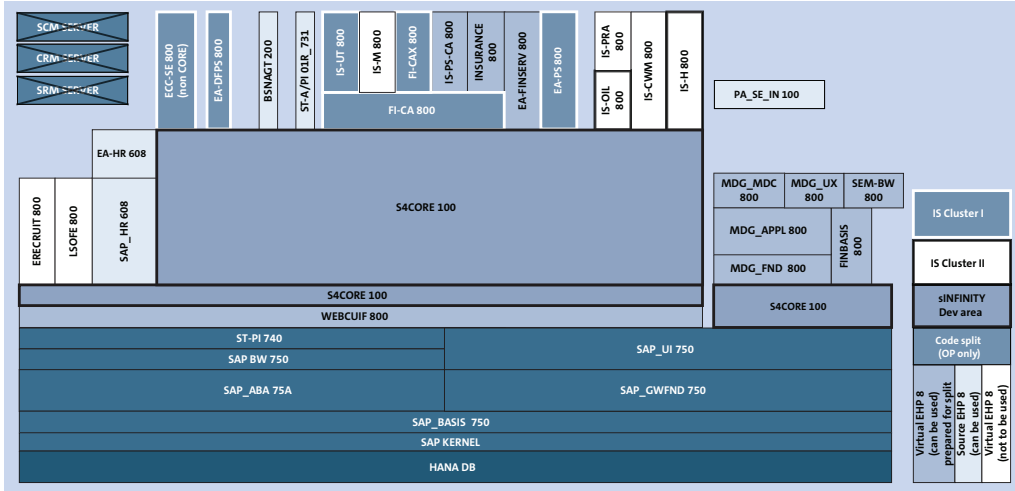


Figure 1.19 Software Components of SAP S/4HANA

As you can see, SAP S/4HANA is built similarly to SAP ERP 6.0 EHP 8, but is on a different code base. Both the original and the new code lines form the base for the different options illustrated later in Figure 1.21. This leads to some differences in the available functionality, as we will discuss later in the section.

Now, we'll illustrate the high-level runtime architecture of SAP S/4HANA in Figure 1.20. On the highest level, technology stacks are illustrated with the incorporated technologies. At the top, the SAP Fiori shell layer represents all available technologies for users to work with, ranging from the web GUI for SAP to SAP Fiori apps. Below that, you'll see SAP Gateway as an embedded component for the SAP S/4HANA ABAP stack for the cloud. For an on-premise SAP S/4HANA deployment, a separate UI frontend server is recommended.

In the second layer, the SAP S/4HANA layer, you'll see two different options to consume SAP S/4HANA tables:

- Direct consumption via business logic inside transactional logic
- ABAP CDS views

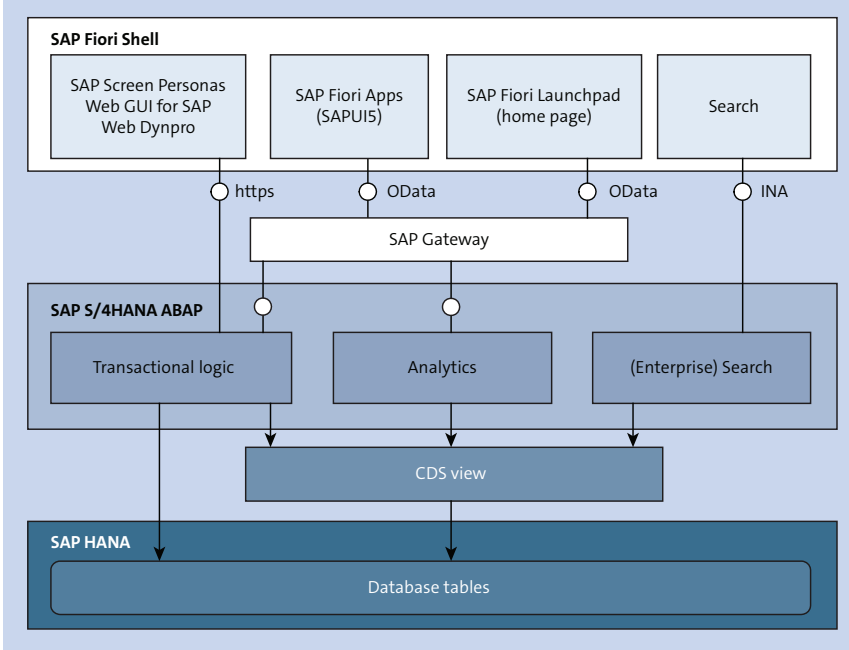


Figure 1.20 High-Level SAP S/4HANA Runtime Architecture

CDS views are used to reduce the application logic and push down the code from ABAP into SAP HANA.

Based on the principle of one, several simplifications have been achieved, as follows:

- Simplifications of the data models for finance and inventory management
- Unification with Discrete Industry Mill Products (DIMP) back to the SAP S/4HANA core application layer
- Simplification of long material number (LAMA) extending from 18 to 40 characters
- General deprecation process of around 70,000 main repository objects—for example:
  - Deprecation of Foreign Trade (SD-FT)
  - Remaining Beverage Solution (SD-SLS-PLL)
- One business partner via the customer vendor integration (CVI) as a single point of entry to create, edit, and display master data for business partners, customers, and vendors

- One single valuation via the Material Ledger (no moving average price on table MBEW)
- One analytics approach:
  - Avoid embedded SAP Business Warehouse (SAP BW) based on redundant data
  - Avoid Logistics Information System (LIS)

Note

Further information on the top simplifications can be found on the SAP Community Network (at *http://scn.sap.com/docs/DOC-70833*) and will be updated frequently.

As you can see in Figure 1.21, there are two different developments with separate code lines that supply the different product lines. Currently, classic SAP ERP can run on any database, including SAP HANA, and that supports the current functionality with some smaller functional enhancements and stabilization. As a second option, you can have classic SAP Business Suite on SAP HANA and activate the S/4HANA Finance add-on. However, this is no longer recommended by SAP as SAP S/4HANA Finance 1605 is on support pack release only. No additional functional enhancement will occur. SAP S/4HANA is a flagship product that includes both finance and logistics modules and is the recommend target architecture. As the last piece of the product line, you can see SAP S/4HANA Cloud, which is recommended for companies with about 1,500 employees. It can also be used as a two-tier ERP product for larger corporations for their subsidiaries.

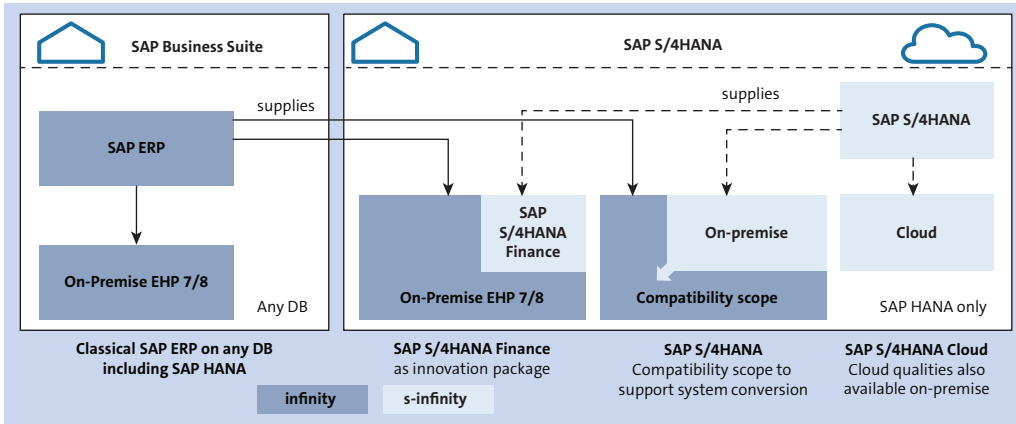


Figure 1.21 Overview of SAP Product Lines and Versions

SAP currently has a "cloud-first" strategy; because cloud solutions can be innovated and delivered faster, new functionality is usually available first in the cloud and then for the on-premise deployment options. For get a sneak peek at the next available functionality for your on-premise implementation, you can rely on the functionality provided with SAP S/4HANA Cloud. As shown in Figure 1.22, SAP S/4HANA is on a yearly cycle for new functionality, whereas SAP S/4HANA Cloud is on a quarterly cycle.

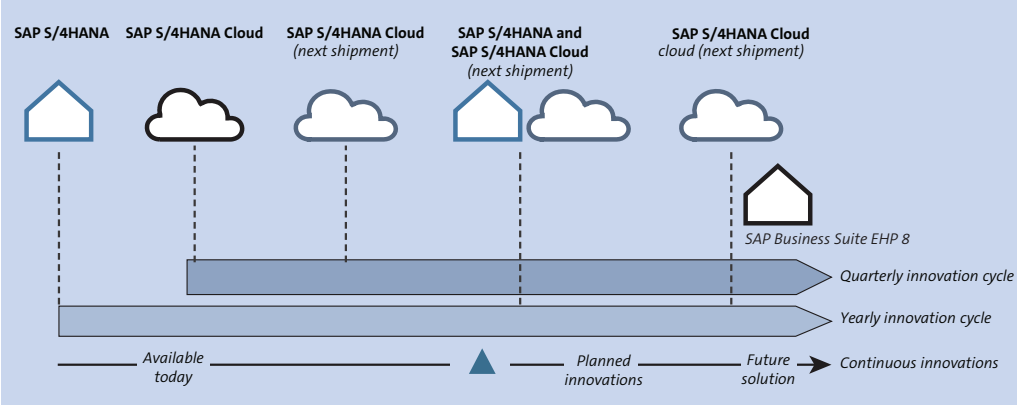


Figure 1.22 Release Cycle for SAP S/4HANA and SAP S/4HANA Cloud

1.4 Summary

In this chapter, we provided a brief overview of digital transformation and its implications. It's important to understand *where to act*, but it's also important to understand *how fast you need to act*, which is reflected within the pace layered model.

We also explained the key principles of customer centricity and experience, with SAP Fiori as the leading UX for SAP S/4HANA, as well as their possible benefits. We offered a brief overview of how SAP S/4HANA helps you achieve better customer insight and provides improved decision-making capabilities based on the SAP HANA platform. Along with the previous information, we discussed business value scenarios and the digitally enabled supply chain as part of SAP S/4HANA.

Finally, we illustrated a high-level overview of the SAP S/4HANA architecture and the principles behind SAP S/4HANA, as well as the simplifications that have been achieved from technical and functional perspectives, all to build a solid foundation for the following chapters.

Chapter 2
Finance

The key features of SAP S/4HANA Finance perfectly address pain points identified by the various IBM CFO surveys held over the years, which is helpful input to fuel the business case for SAP S/4HANA Finance.

SAP S/4HANA Finance follows SAP's simplification strategy. The introduction of the SAP HANA database which enabled real-time data made it possible to rethink how to run financial processes. SAP S/4HANA Finance was the first area in which SAP offered these new functionalities, which we'll describe in this chapter in more detail.

In the following sections, we'll provide insight into the seven key pain points chief financial officers (CFOs) are experiencing and will show how SAP S/4HANA Finance addresses these pain points; this should help build the business case for implementing SAP S/4HANA Finance.

Furthermore, we'll talk in more detail about SAP S/4HANA Finance functionalities such as Universal Journal, Material Ledger (ML), some improved functionalities in Asset Accounting (AA), Cash Management, SAP Business Planning and Consolidation (SAP BPC) for SAP S/4HANA Finance, Profitability Analysis (CO-PA), Central Finance, and the month-end close process. We conclude this chapter by assessing the maturity of SAP S/4HANA Finance, its business case, and its outlook.

2.1 Industry Pain Points and SAP S/4HANA Benefits

In this section, we'll look at seven key pain points identified for which SAP S/4HANA Finance can provide relief, contributing value to your organization:

1. Driving integration of information across the enterprise effectively
2. Driving enterprise cost reductions
3. Measuring/monitoring business performance
4. Optimizing planning, budgeting, and forecasting

5. Executing continuous finance process improvements
6. Providing inputs for an enterprise strategy
7. Developing talent in the finance organization

Let's now explore these seven areas in more detail.

2.1.1 Integration of Information

Driving integration of information across the enterprise means that you have the governance in place to ensure common business processes and data definitions in your enterprise. It means that you have all that information technically captured in one place—to use SAP's phrase, a *single source of truth*. This single place in your system environment can satisfy all your financial information needs and serves as the single source for all your interfaces as well. Many organizations are struggling with this; their finance departments can't reach their full potential because they can't provide required business insights.

Having only the technical ability for a single source of truth isn't sufficient, but from an organizational perspective, it's very important that the right governance structure is in place as well. To get to a single source of truth, an organization must have a clear idea of its financial reporting requirements. The organization must also have governance structures in place, such as business process ownership and business data ownership, to guarantee harmonized business processes and ensure that data is defined and captured in a common and consistent way across all business units. When the organization has all that governance in place, it then makes sense to have the technology as well to realize a single source of truth for finance via SAP's Universal Journal in the application landscape.

SAP ERP struggles in this area. Its financial capabilities contain multiple ledgers, such as the General Ledger (G/L), Cost Center ledger, Profit Center ledger, Material Ledger (ML), and the Profitability Analysis (CO-PA) "ledger" (see Figure 2.1). Due to all these different sources of financial information, reconciliation activities are required to make sure all the ledgers are synchronized.

With the introduction of SAP S/4HANA Finance, there is now just one ledger called the *Universal Journal* (captured in table `ACDOCA`), in which all details for actual postings can be found. Additional journals such as the Consolidation Journal (table `ACDOCC`) and Planning Journal (table `ACDOCP`) can be used to support, for example, consolidation and planning requirements.

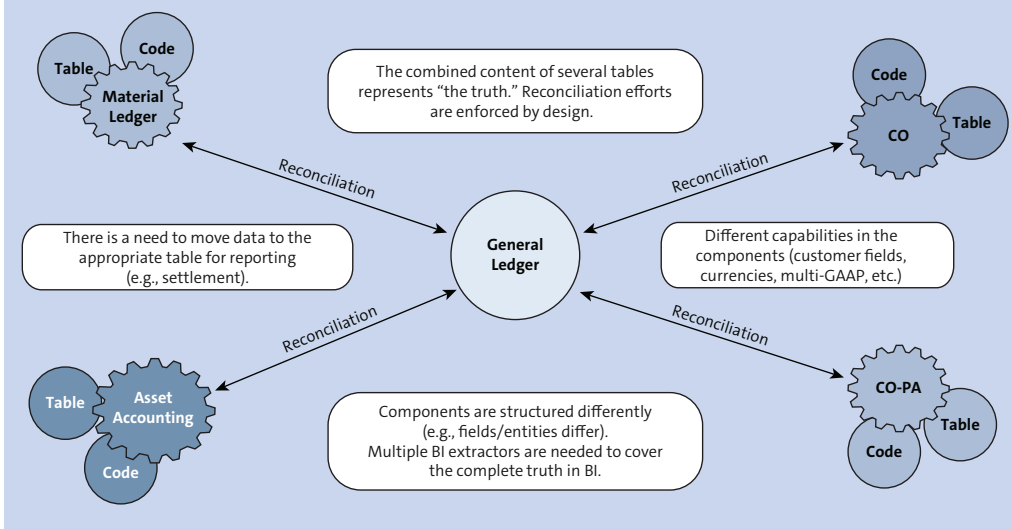


Figure 2.1 Challenge of SAP ERP Architecture: Various Ledgers

Consequently, you no longer have to consider where to report or interface your financial data from. The SAP S/4HANA Finance journals contain this disparate data, as shown in Figure 2.2.

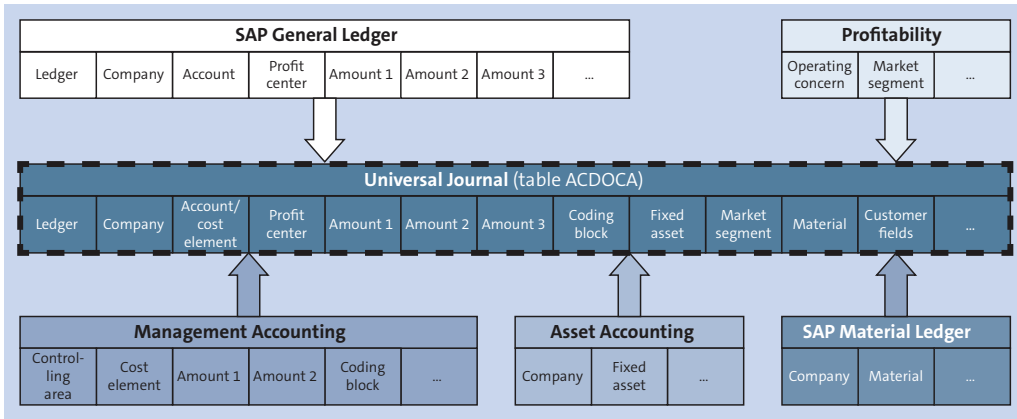


Figure 2.2 SAP S/4HANA Journals, Combining Information from Multiple Ledgers into Several Source Tables

2.1.2 Enterprise Cost Reductions

SAP S/4HANA's capability for in-memory processing using columnar databases shortens processing time significantly and eliminates the need for running processes in batches. Processes that you would normally run at period end due to long running times can now be run on a daily or weekly basis. Because it contains all the actual data, the Universal Journal removes the need to reconcile SAP ERP Financials (FI) and Controlling (CO) data and provides you with visibility into, for example, work in progress (WIP) in real time. These abilities enable a *soft close*, meaning that you no longer need to wait to analyze your data after month-end close activities; you can analyze the data daily to steer the business. No reconciliation efforts are required because you're reporting from one single source of truth.

Due to the speed of SAP S/4HANA processing and the shift toward soft closes, a lower headcount is required in the closing process. Capacity requirements are now more equally spread over the month rather than increasing dramatically at the end of the month. SAP S/4HANA Finance gives you access to very detailed data in real time, which helps you spot out-of-line situations immediately, minimizing costs of failure. Prompt remedial action is now possible, without waiting until the data is available after month end. Reporting is simplified, fast, and multidimensional, making drill-down reports almost redundant. You no longer need to run operational reporting in a separate SAP Business Warehouse (SAP BW) environment, which has a positive impact on the speed of turning data into information and thus on the operating costs.

2.1.3 Measuring Business Performance

SAP S/4HANA provides better insight during the posting period because you'll have easy access to real-time profitability on a granular level. Because the introduction of the Universal Journal simplifies data structures, you can perform end-to-end analysis and define new responsibilities in many areas, including the following:

- **Predicting the future**
  You can simulate the impact of different business models on your profitability. With a single source of truth in place and SAP S/4HANA's speed, you can connect your data with external sources to anticipate the future.
- **Managing receivables**
  Having access to real-time data allows the sales and accounts receivable departments to work more closely together. Collection tasks are moved from back-office teams to sales representatives.

A sales manager with access to real-time open item data any place, anytime on his mobile device via SAP Fiori apps can discuss out-of-line situations more efficiently with customers and can document agreed-upon actions immediately. In addition, this information is visible to the accounts receivable department. SAP Fiori delivers a role-based, consumer-grade user experience (UX) across all lines of business, tasks, and devices and is the new way of accessing SAP S/4HANA information and executing your SAP transactions.

For a good example of how SAP Fiori can be used, consider the Process Receivables transactional app (shown in Figure 2.3). Using this app, you can access a list of receivables payable by an individual customer. You can then create promises to pay and dispute cases. You start the app either by entering a customer number directly or by searching for a customer.

SAP S/4HANA Finance allows you to have real-time access to your cash position. There is no data latency, meaning cash managers can perform their tasks on the real cash situation. Cash Management provides you with the following in real time:

- Financial statements
- Actual cash flow analysis
- Liquidity forecast

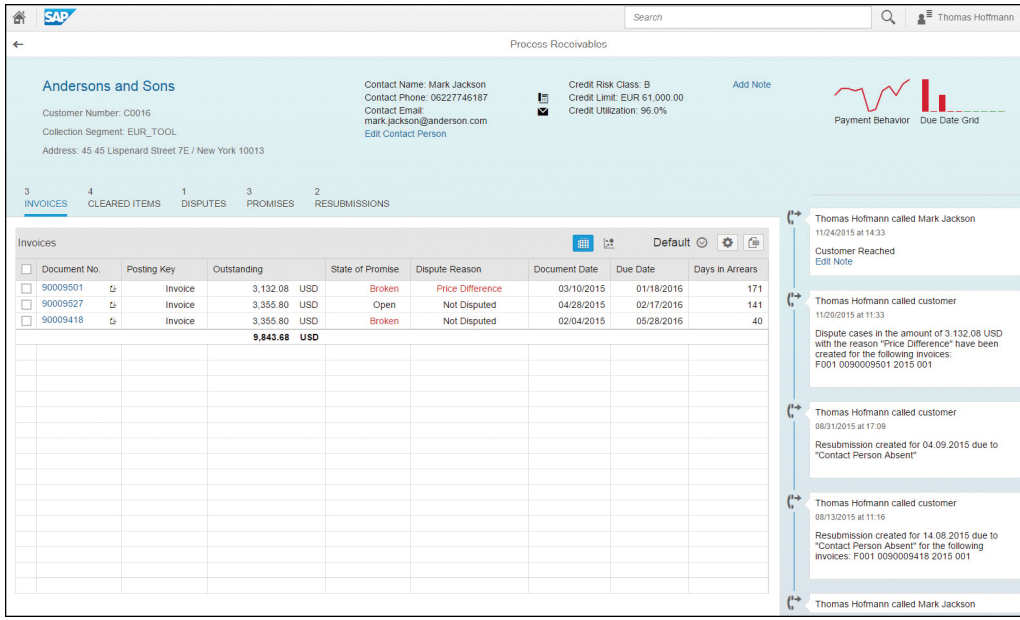


Figure 2.3 Cash Management with SAP Fiori Apps

2.1.4 Optimize Planning, Budgeting, and Forecasting

With the introduction of SAP BPC for SAP S/4HANA Finance, a new, more user-friendly planning process is supported. SAP ERP provided different planning solutions for Cost Center Accounting, Profit Center Accounting, Internal Orders, and CO-PA. Reconciliation of all these solutions could cause problems and delays. SAP BPC for SAP S/4HANA Finance provides a single tool to plan the following elements:

- Profit and loss
- Revenue
- Pricing
- Cost of sales
- Market segments
- Profit centers
- Cost centers
- Activity cost
- Internal orders
- Projects
- Liquidity

Because all this planning data will be stored in a single data structure, reconciliations are no longer needed. Another benefit is that you can apply the same validations to the planning data, and that reporting will have the same look and feel. In fact, SAP created a single source of truth for financial planning data in table ACDOCP (Plan Data Line Items). Plan data isn't part of the Universal Journal as it contains actual data only. You still need to read two different tables if you want to run a plan/actual comparison report.

2.1.5 Continuous Finance Process Improvements

SAP S/4HANA is about not only the speed of the database but also the value SAP S/4HANA technology will bring to finance activities in general. SAP S/4HANA Finance allows you to run your processes faster, which enables faster planning, reactions, reporting, and analysis.

As stated earlier, SAP S/4HANA enables continuous insight into your financial figures; it allows you to shift from month-end activities to weekly or daily activities. Because actual FI and CO data live in a single table (ACDOCA), you can run, for example,

your legal reporting and customer and market view reporting without needing to reconcile these reports. Using this single table also allows you to combine information from various areas into one report—for example, spend analysis by responsibility and profit and loss (P&L) by market segment, along with other dimensions, such as customer and material group or WIP analysis by relevant production order and cost center. SAP S/4HANA Finance extends the reporting and analysis capabilities that were previously only possible via SAP BW reporting.

SAP S/4HANA Finance provides new functionality as well, such as intercompany reconciliation, which is a great improvement in the financial close process. Intercompany reconciliation detects intercompany mismatches at an early stage, allowing you to have them corrected before the month-end close. It also performs the following tasks:

- Improves and accelerates automated matching
- Eliminates batch jobs; (real-time analysis supports continuous intraperiod process execution)
- Improves UX and enhances data drilldown to reduce the reconciliation effort
- Provides better process oversight via a new intercompany reconciliation dashboard

SAP also provides a very user-friendly goods receipt/invoice receipt (GR/IR) monitor that shows the goods receipt for which no invoice has been posted and vice versa.

SAP S/4HANA Finance also comes with the Financial Closing Cockpit, which allows you to centrally monitor and control closing tasks; enables automation of some manual steps, transactions, programs, jobs, workflows, and remote tasks; and allows owners to collaborate effectively during the closing process. It also offers best practices closing templates to streamline the closing process and supports audits by recording the output and history of all tasks performed and who performed them.

2.1.6 Provide Inputs to Enterprise Strategy

Today, companies are expected to produce more predictable financial results, eliminate surprises, and respond to market changes with more agility. To meet these expectations, finance functions must forecast with more precision, reduce cycle times associated with budgeting and investment, and shift from a retrospective statutory reporting view to one that is more forward-looking. Therefore, it's vital to be able to link your company's KPIs with your strategic objectives and to have a system in place that can show whether you're still on the right track and provide you the information to get on track again if necessary.

SAP S/4HANA Finance offers SAP BPC for SAP S/4HANA Finance, as well as the ability to integrate both operational/nonfinancial and financial information in a cohesive manner and to optimize the planning, budgeting, and forecasting processes. It also works with advanced analytics tools such as SAP HANA Live and SAP Crystal Reports, which are available to build real-time dashboards.

It's important to drive integration of information across the enterprise via a robust infrastructure with common standards, data definitions, finance processes, and planning platforms. In other words, you should strive to implement a single source of truth for the financials processes.

However, successful finance organizations go a step further by integrating their organizations' strategic, operational, and financial planning to impact the overall business performance. SAP S/4HANA Finance can play a crucial role here: the newly introduced Universal Journal is key to that goal.

Because you have easy and real-time access to your internal data via SAP S/4HANA Finance's Universal Journal, you can use this as a basis for simulating the impact on the business performance of potential new offerings by using SAP's advanced analytic tools, such as SAP Predictive Analytics. SAP Predictive Analytics also allows you to evaluate opportunities for stimulating your organic growth or the potential for mergers and acquisitions.

SAP Predictive Analytics can provide organizations with the ability to anticipate and shape their business, their customer relationships, competitive forces, and operational aspects. It enhances organizational performance by applying advanced mathematical modeling, deep computing, simulation, data analytics, and optimization techniques by using analytical engines, data mining, and statistical models that address specific business process areas. SAP S/4HANA Finance brings greater speed and agility to decision-making, with clear links to target performance outcomes, more reliable and accurate financial reporting, and greater visibility into the levers that drive performance. By combining your own internal data organized in SAP S/4HANA Finance's Universal Journal with external data sources such as industry trends and the nature of the competition, you can better determine the most promising opportunities.

2.1.7 Develop Talent in the Finance Organization

Considerable skills are required to benefit from SAP S/4HANA's real-time data provision and to operate sophisticated analytical tools such as SAP Predictive Analytics.

SAP S/4HANA Finance can help assess and improve business performance only with these sophisticated business analytics and the talent to interpret and use cross-functional information. However, acquiring the right technological and business know-how is only one of the issues CFOs must handle; many CFOs are preoccupied with more immediate challenges, such as whether their own finance teams are ready to weather the storm. Table 2.1 lists some finance workforce challenges and the opportunities available to address them.

Workforce Challenge	Workforce Opportunity
Finance skills are focused on transaction processing.	Transform competencies into more value-added activities to support the evolving role of finance.
Qualified professionals are wasting effort on activities that add less value.	Refine the skill mix to focus professionals on driving business value and innovation.
Data analysis is performed by management.	Develop junior employees in decision support.
The finance team is globally distributed.	Enable global collaboration.
Shared services expansion or relocation eliminates local roles.	Educate and redeploy top talent into retained organization roles.
The implementation of SAP ERP systems eliminates roles.	Expand transformation to train and educate top talent to develop value-adding capabilities.
Employee turnover is high.	Grow organically by defining new career paths.
Linear traditional career paths are eroding.	Chart multidimensional career paths to develop the leaders of tomorrow.
Employee development is informal.	Align learning and development programs to support the CFO agenda and future job roles.

Table 2.1 Finance Workforce Challenges and Opportunities

With new technology and new processes in place when using SAP S/4HANA Finance, training is typically restricted to how to use the tool to continue to perform jobs as before the SAP ERP implementation—essentially focusing on efficiency versus effectiveness. You should go beyond how to use the tool or module; for example, help develop critical thinking skills so that employees can leverage the tools to perform value-added analysis.

2.2 Key Functionalities

In this section, we'll introduce you to the most important functionalities of SAP S/4HANA Finance. Some of these, such as SAP BPC for SAP S/4HANA Finance and the Universal Journal, have already been part of our discussion but will be fleshed out in detail. We'll also discuss the ML, the new Asset Accouting, Cash Management, CO-PA, Central Finance, and the soft-close process enabled by SAP S/4HANA Finance.

2.2.1 Universal Journal

As stated in earlier sections, one of the key features of SAP S/4HANA Finance is the availability of a single source of truth for finance via the Universal Journal, captured in table ACDOCA. This table provides the following:

- One common view of financial and operational data is provided to help ensure enterprise-wide consistency and reduce reconciliation time and errors.
- Real-time data is available across all financial dimensions.
- A single line-item table contains full details for all applications for instant insight and extensibility.
- Data is stored only once, with no reconciliation needed by design.
- Fast multidimensional reporting is available without replicating data to SAP BW.
- If SAP BW is already in place, only one extractor is needed instead of many for financial data.
- From the ABAP program perspective, read access remains the same.
- SAP-provided compatibility views redirect the program to the new format in SAP HANA.

The power of the Universal Journal is that financial data that was spread over multiple tables in previous versions of SAP is now stored in a single table. Information from FI, CO, AA, ML, and account-based CO-PA is combined in a single entry in table ACDOCA to provide the benefits outlined in the preceding list. Keep in mind that costing-based CO-PA and special-purpose ledger tables aren't part of the Universal Journal table. It makes a lot of sense to explore the possibilities of account-based CO-PA before activating costing-based CO-PA and to prevent the use of special-purpose ledgers because both will jeopardize the single source of truth concept.

Furthermore, as discussed in Section 2.1.1, you can only benefit from a Universal Journal when your organization has a clear idea of its financial reporting requirements. You must also have the governance in place to guarantee harmonized business

processes and to guarantee that data are defined and captured in a common and consistent way across all business units. You can only take full advantage of SAP S/4HANA Finance when you have a single source of truth for finance, a single place in your system environment in which all data elements required for any financial reporting are defined in a consistent way.

A concept that can help determine what information needs to be managed is what we call the *coding block*. A coding block is what you use to document all reporting requirements for an organization. It serves as the basis for setting up the design of the Universal Journal in SAP S/4HANA Finance. A coding block consists of business measures, represented by rows, and business dimensions, represented by columns, as shown in Figure 2.4. Measures are normally represented by the chart of accounts in your SAP system, and the dimensions are represented by posting details such as material, customer, channel, and so on. It's essential to understand that not all measures need to be recorded; for example, gross profit is a measure that is calculated based on the revenue and cost of goods sold (COGS) elements. The same applies for the measures as well. Not all dimensionality is required in the initial recording. Some dimensions can be derived based on the recorded elements later (e.g., by an allocation).

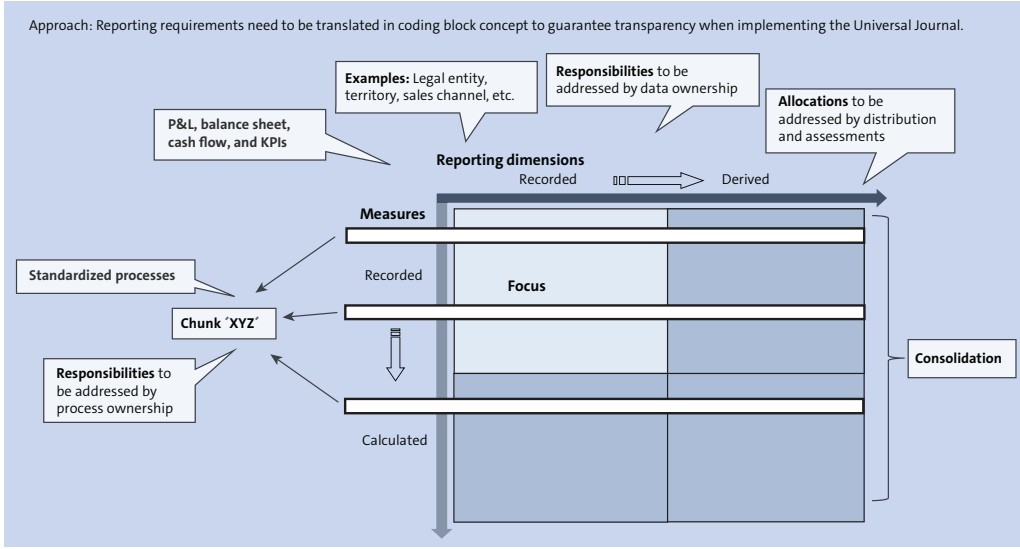


Figure 2.4 Coding Block Approach

All reporting requirements need to be broken down to fit this concept. All definitions should be in business terminology and not be linked to any system. For an example of a coding block, see Figure 2.5.

In Figure 2.5, the business measures and the related business dimensions are depicted clearly. For example, the Land and Buildings account requires the following four business dimensions: **Legal Entity**, **OpCO** (operating company), **RepCO** (reporting company), and **General Ledger Account**.

Account	Description	Movement specifications	Chunk ID	Chunk	Glossary ID	Legal entity	OpCO	RepCO	General Ledger account	Material (master)	Material group (e.g., brand, COGS type)
									DD	DD	DD
A10100	Land and buildings	M_PPE	130	ASSETS		x	x	x	x		
A10200	Plant and equipment	M_PPE	171	ASSETS		x	x	x	x		
A10700	Other operating assets	M_PPE	163	ASSETS		x	x	x	x		
A10800	Not employed in business operations	M_PPE	151	ASSETS		x	x	x	x		
A10000	**Property plant and equipment**		**176**								
A20910	Trademarks, patents, and licenses	M_INT	211	ASSETS		x	x	x	x		
A20920	Software	M_INT	189	ASSETS		x	x	x	x		
A20930	Internal developed intangible assets	M_INT	122	ASSETS		x	x	x	x		
A20980	Intangible intercompany assets	M_IGW	119	ASSETS		x	x	x	x		
A20990	Miscellaneous intangible assets	M_INT	144	ASSETS		x	x	x	x		
A20900	**Other intangible assets**	**M_INT**	**158**								
A20100	Goodwill	M_INT	112	ASSETS		x	x	x	x		
A20000	**Intangible assets**	**M_INT**	**118**								
A30910	Non-current derivative assets		146	OTHER ASSETS		x	x	x	x		
A30920	Securities		185	OTHER ASSETS		x	x	x	x		
A30990	Miscellaneous financial assets		143	OTHER ASSETS		x	x	x	x		
A30900	**Other non-current financial assets**		**162**								
A30200	Pension assets		168	OTHER ASSETS		x	x	x	x		
A30300	Deferred tax assets	M_TAX	95	OTHER ASSETS		x	x	x	x		
A30400	Investments in subsidiaries	M_INV	126	OTHER ASSETS		x	x	x	x		
A30600	Investments in associates	M_INV / ASS	125	OTHER ASSETS		x	x	x	x		
A30700	Loans to group companies	M_NON	134	OTHER ASSETS		x	x	x	x		
A30800	Non-current receivables		150	OTHER ASSETS		x	x	x	x		

Figure 2.5 Coding Block Example

Once you have a coding block, you can use it to design how to depict your data in SAP. As stated earlier, a coding block consists of business measures (rows) and business dimensions (columns).

Measures are split into measures to be recorded and measures to be calculated. Measures to be recorded are normally represented by the chart of accounts in SAP. Measures to be calculated are a computation of the measures that are recorded (e.g., gross profit).

Dimensions are split as well into dimensions to be recorded and dimensions to be derived. Dimensions to be recorded need to be supplied by the business transaction at recording time. For example, if we state that the revenue measure should contain customer and material as dimensions, a business transaction that triggers a revenue line should support it. If we also state that revenue should have channel as a dimension as well, and it can't be recorded at inception time, then we need an allocation to get revenue at the required level of reporting via an allocation.

Dimensions can be represented by SAP's organizational structural elements (e.g., company codes, profit centers, and functional area segments) or by master data elements—in many cases, as CO-PA dimensions. By plotting SAP solutions in the coding block, you can see exactly which SAP elements will be used for representing each part of the coding block, which should clearly indicate the requirements for any business transaction feeding the coding block.

In summary, the coding block will do the following:

- Provide a roadmap for how to depict real-life organizational structures as SAP ERP organizational structural elements
- Determine what can be reported where (in which SAP module)
- Ensure consistency in mapping business requirements that relate to organizational structure elements

If you have all that preparatory work in place, then it makes sense to use technology such as the Universal Journal in SAP S/4HANA to realize a single source of truth for finance in your application landscape.

Keep in mind that the introduction of the Universal Journal doesn't necessarily mean that the SAP modules needed for depicting your financial organization will change. You'll still set up AA, cost centers, profit centers, ML, and CO-PA—but you'll probably switch to account-based CO-PA, which under SAP S/4HANA is similar to costing-based CO-PA and is incorporated into the Universal Journal. The benefit of the Universal Journal is that it combines all the information stored in those various ledgers in the past into a single ledger entry. In addition, by combining FI and CO information in one table, there's no longer a need for cost elements. In SAP S/4HANA Finance, primary cost elements are replaced by G/L accounts. To support secondary cost elements as well, the G/L master record is extended by a special attribute indicating a secondary cost element.

In some SAP S/4HANA releases, the Universal Journal had some release restrictions regarding currencies and transfer pricing. As of SAP S/4HANA Finance 1605 and SAP S/4HANA 1610, in addition to the local and global currency, the Universal Journal supports eight freely definable currencies per ledger.

As of SAP S/4HANA 1709, full support for up to three parallel currencies is available in Controlling. This enables the ability to implement parallel currencies and valuations in Controlling and takes away the existing release restrictions for on-premise deployments of SAP S/4HANA Finance.

Furthermore, there are two options available for storing multiple valuations in FI. One is an approach in which every valuation is stored in a separate ledger—a parallel single-valuation ledger—so that there is a clear separation of postings and reportings on a specific valuation (see Figure 2.6).

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	
0L	1000	10	30			Legal view
GR	1000	11	31			Group view
PC	1000	12	32			Profit center view

Figure 2.6 Currency Support in SAP S/4HANA Enterprise Management (Parallel Single Valuation)

In the other, multiple valuations are stored in a single ledger—the multivaluation ledger—as shown in Figure 2.7.

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	CURTP3	CURTP4
GL	1000	10	30	11	31	12	32
		Legal view		Group view		Profit center view	

Figure 2.7 Currency Support in SAP S/4HANA Enterprise Management (Multivaluation)

These currency and ledger functionalities are part of SAP S/4HANA as of release 1503.

2.2.2 Material Ledger and Transfer Pricing

ML functionality has been present in SAP ERP for a long time as part of Product Costing (CO-PC). ML allows you to perform the following tasks in the system:

- **Parallel currencies**
  Without ML, stock values are stored in the system only in one currency. If you need to get stock reports in another currency, conversion is performed using the reporting date exchange rate. ML lets you valuate goods movements using the historical exchange rates. In SAP ERP, up to three parallel currencies can be defined in ML. Parallel currencies is a required feature for stock valuation in countries with highly fluctuated local currency or in industries with standard currency stock units.

- **Parallel valuations**
  In addition to parallel currencies, the ML can maintain several valuations. These valuations can depict stock values from different views (legal, group, profit center), and values in each valuation can differ by addition or exclusion of certain values. This feature allows you to analyze stock values simultaneously from different perspectives. It's used by global companies to have visibility into stocks from the following different perspectives:
  - Legal valuation (statutory and/or tax)
  - Corporate group valuation
  - Valuation for individual company segments/organizational units (profit centers)

  In total, only three combinations of parallel currencies/parallel valuations can be defined in SAP ERP.
- **Periodic actual cost**
  During period end, valuation of all goods movements is performed with the preliminary valuation price, which is normally the standard price for produced goods and the standard or moving average price for purchased materials. ML adds a feature to calculate periodic actual cost. In this case, all variances from the preliminary valuation of materials are collected in the ML. At period end, revaluation of ending inventory and consumption can be performed with the determined actual price. Revaluation is possible using different rules for different valuations.

ML functionality used to be an optional feature in SAP ERP and was activated in the system only if one or several of the previously mentioned features were required. In this case, one or several ML features were activated with the respective configuration and process adjustments. This led to a vast number of different approaches to ML usage.

Because ML was an optional component in SAP ERP, it used a fully separate set of tables to store data. This led to two historical disadvantages of the ML:

- A need to reconcile values between ML and other functional components (most notably Financial Accounting [FI] and Materials Management [MM])
- The absence of a comprehensive reporting tool for different material valuations because data was distributed among FI tables, MM tables, and ML tables

In SAP S/4HANA Finance, on the other hand, the goal is to have a single source of truth for the data with the ability to drill down to the required level of detail when needed. To achieve this goal, the table setup must be clear and simple, without data duplication and distribution. The historical ML setup didn't match the new concept

because it was a rather complex separate module with its own tables. Therefore, SAP S/4HANA Finance introduced a single common solution for material valuation. This solution consists of mandatory ML functional components combined with architectural changes.

With mandatory usage of ML, it's no longer necessary to store values in inventory-valuation tables (e.g., EBEW, EBEWH, MBEW, MBEWH, OBEW, OBEWH, QBEW, QBEWH) in the xBEW(H) namespace. Therefore, in SAP S/4HANA Finance, these tables are no longer updated to store transactional figures and only contain material master data attributes. This leads to higher data integrity and higher throughput.

Contents of ML tables MLIT, MLPP, MLPPF, MLCR, MLCRF, MLCD, CKMI1, and BSIM are now stored in table ACDOCA. For materials that aren't relevant for actual costing, ML tables MLHD, MLIT, MLPP, MLCR, and MLCD are no longer updated; instead, values are updated in table ACDOCA. For materials that are relevant for actual costing, tables MLHD, MLIT, MLPP, MLCR, and MLCD are updated (see Figure 2.8). To get the full picture of material valuation for both types of materials, compatibility views are used, which read from both tables.

The main ML features are updated and work in the following way in SAP S/4HANA Finance:

- **Parallel currencies**
  In SAP S/4HANA Finance, a single-currency setup must be used across all finance components: FI, CO, and ML. This single-currency setup is defined once and used in the Universal Journal for all financial transactions. This provides a single view into material valuation and uses common reporting tools that are linked to the same table structures.

  As of release 1610 SP 01, previous limitations of parallel currencies in ML are excluded totally. Similar business functionality for up to three parallel currencies can be set up in ML and always reconciled with financial accounting.
- **Parallel valuations**
  Due to changes in finance table architecture, the parallel valuation approach was redesigned in SAP S/4HANA Finance. The first solution to cover parallel valuation was delivered as part of release 1605 together with a solution to store additional currencies. A more stable solution that covered the full functionality available in standard SAP ERP was delivered as part of release 1610 SP01. From this release, both transfer prices functionality and multiple valuation of cost of goods manufactured can be supported in the ML. This allows you to calculate actual product cost based on different accounting principles and internal requirements.

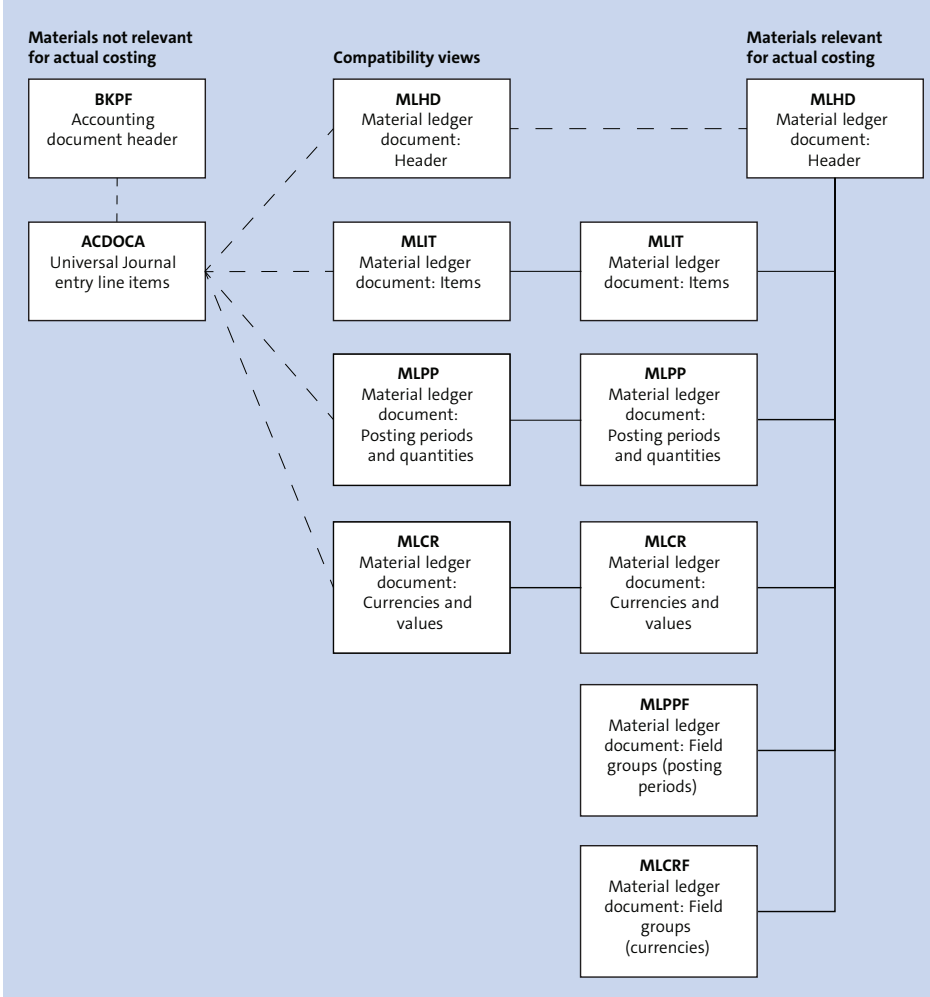


Figure 2.8 SAP Material Ledger Tables

- **Periodic actual cost**

  Periodic actual cost is an optional feature of the ML in SAP S/4HANA Finance that can be used if the requirement to calculate periodic actual cost is in place.

  The main concern many have about using the ML is that the closing schedule will be complicated due to actual cost calculation steps. If actual costing isn't used, then the ML has no impact on closing or operational processes. Therefore, companies not using the ML currently and that have no requirement to calculate periodic

actual cost won't need to update their closing schedules and modify accounting policies.

SAP also simplified ML actual costing functionality in SAP S/4HANA Finance:

- The number of ML closing steps was reduced as several sequential steps were combined into one.
- A new Material Ledger Cockpit was introduced to simplify ML closing processing.

2.2.3 New Asset Accounting

SAP released the new Asset Accounting (new AA) for the first time in SAP ERP 6.0, EHP 7. However, to use the new AA, you had to activate business function `FI_AA_PARALLEL_VAL` and then activate new AA.

In SAP S/4HANA Finance, new AA is mandatory. There is no option to use the classic FI-AA functionality, and migration steps are incorporated into the SAP S/4HANA Finance migration. Data from classic AA tables `ANEK`, `ANEP`, `ANEA`, `ANLP`, and `ANLC` is now stored in table `ACDOCA` and can be retrieved online. There are also other technical adjustments to reduce the number of sources of data storage and simplify reporting for AA.

The main shift in SAP S/4HANA Finance is to move from batch processing to online processing. The goal is to perform as many process steps as possible not during the closing but during the period end (this is a *soft close* process, which is discussed in more detail in Section 2.2.8). In the new AA, this is achieved to some extent with a new configuration setup for depreciation areas. In SAP S/4HANA Finance, it's not only the leading depreciation area that posts its values to the G/L online but also other depreciation areas. This feature eliminates reconciliation issues between fixed assets and the G/L and increases transparency between depreciation areas and accounting principles. Several changes to the posting logic have been made that also improve transparency.

The depreciation posting logic has undergone changes as well. There are multiple changes on the selection screen of the program, as follows:

- Multiple company codes can now be executed at the same time.
- Depreciation postings are allowed even if some assets aren't complete.
- Depreciation postings are now at the asset level.

The last bullet point should reduce the reconciliation effort significantly and provide seamless reporting capabilities for all accounting principles. At the same time, the number of line items increases proportionally to the number of parallel accounting principles.

There are also other minor improvements and restrictions in the new AA compared to the classic FI-AA. These influence both the technical implementation and process change in SAP S/4HANA Finance and need to be analyzed prior to migration.

2.2.4 Cash Management

Cash management processes were supported by SAP ERP prior to SAP S/4HANA Finance. Functionality was distributed between SAP ERP functional components such as Bank Accounting (FI-BL) and SAP Financial Supply Chain Management (SAP FSCM) and wasn't focused on supporting central cash management and distributed processes.

With a strong business direction to move to central cash management, there was a need for an integrated product that would support integrated group and subsidiary cash management processes. SAP introduced Cash Management in SAP S/4HANA to address this requirement. This functionality changes the way companies can manage cash using SAP functionality and provides a set of functional innovations to support that.

Cash Management works only using the SAP Fiori user interface (UI). There is no option to use new functions via SAP GUI. Cash Management consists of several functional components—Bank Account Management, Cash Operations, and Liquidity Management—that support business requirements.

Bank Account Management

Cash Management offers a new approach to manage bank accounts centrally. This functionality is called Bank Account Management and offers the following main features:

- **Management of bank accounts hierarchy**
  Bank accounts are presented in a hierarchical way in Bank Account Management and are easily accessible by the central cash manager. Bank and bank account masters are master data and no longer Customizing data. Bank accounts can be grouped easily for cash pooling and reporting purposes.

- **Approval process for creating, changing, and closing bank accounts**
  The bank account managing process is now more business-oriented rather than IT-based. Approval flows are seamless and easy to maintain and execute, with no need to perform configuration steps. This includes setting defined fields, which can be maintained only after specific approval is obtained.
- **Cash position analysis on bank accounts instead of G/L accounts**
  There is no longer a need to check the balance of your G/L accounts representing your bank accounts; you can refer to the bank account itself.
- **Additional account attributes linked to bank account master data**
  Account attributes are now part of bank master data and bank account master data.
- **Integrated cash pooling and cash concentration functionality**
  This functionality is simplified and integrated into the bank account hierarchy.

For customers who don't want to use the full scope of the new features offered by Cash Management in SAP S/4HANA, it's possible to use Bank Account Management Lite. This option doesn't include workflow-based governance for opening, closing, and changing accounts; payment signatory; overdraft limit; review process; remote bank account support; bank hierarchy view and bank account group view; or bank contact person functions.

Cash Operations

Cash Management in SAP S/4HANA offers a new set of features to support daily cash operations. The following features are accessible via the new SAP Fiori UX and are designed to support the overall concept of central cash management:

- **Overall monitoring of bank statements**
  Monitors whether bank statements imported successfully
- **Daily cash forecasts**
  Provides a forecast of today's closing balance
- **Bank risk analysis**
  Analyzes deposit distribution in terms of bank ratings and identifies deposits in high-risk bank accounts
- **Bank transfers and payments initiation**
  Makes bank transfers
- **Approving and monitoring payments**
  Approves payments or bank transfers

In the past, these features were part of the FI-BL and SAP FSCM modules. Now, they're combined under a similar UI and share a similar governance concept. In addition, a set of predefined analytical apps from the initial SAP Fiori launchpad provides an instant outlook over the company cash status and trends. From the top-level analysis, it's possible to drill down to the account and line-item levels. The SAP Fiori UX offers more analytical possibilities than SAP GUI.

Liquidity Management

Reliable cash forecasts play a critical role in business operations. Sufficient cash must be available to support daily operations and, at the same time, there must be no excess cash lying in bank accounts uninvested.

SAP addresses the liquidity planning and management topic with the new Liquidity Management functionality that is part of Cash Management. It provides features to create and manage the liquidity plan of a company and compare actual figures against the plan.

As with all new Cash Management functionalities, Liquidity Management is designed to support a centralized cash management process. The entire process is controlled by the embedded SAP BPC engine and can be enhanced using its features. By default, it supports standard planning techniques such as the following:

- Creating the plan based on reference data
- Autofilling with reference or plan data
- Adjusting currency and hedging
- Tracking plan data entered by subsidiaries

Cash management processes within SAP S/4HANA can be integrated with the corporate workflow so that notifications to update or review the plan are sent via email. The group cash manager can control the status of the cash forecast entered by subsidiaries. Entered forecasted data can be seen in planning reports to analyze cash-sufficiency levels and adjust cash forecasts if needed. The system issues alerts if there are significant differences between the current plan and the previous plan.

Based on the actual posted data, you can see an overview of daily cash inflows and outflows and analyze them for past weeks and months. Data is provided via the common SAP Fiori app, with the ability to drill down to a detailed level.

Some enhanced functionalities you should be aware of can be found in the following areas:

- **Cash position details**
  - Multiple-day view on one page
  - More dimensions (planning level, G/L account, summarization term, planning group)
  - Ability to personalize the layout for analysis
  - Simplified backend for better performance
- **Bank Account Management**
  - Improved usability for countries only using International Bank Account Numbers (IBANs)
  - Easier configuration of field status groups
- **Liquidity Management**
  - Preconfigured Liquidity Forecast Details app
- **One Exposure from Operations**
  - Integration with SAP ERP Materials Management (MM) and Sales and Distribution (SD)

2.2.5 SAP BPC for SAP S/4HANA Finance

SAP BPC for SAP S/4HANA offers the following functionalities:

- An enhanced consolidation monitor
- Intercompany elimination and adjustments
- Currency conversion
- Balance carry forward
- Intercompany matching
- Account transformation
- Equity pickup (future release)

SAP BPC for SAP S/4HANA offers consolidation logic that is identical to the SAP BPC standard model except for some features, such as equity pickup. Furthermore, it supports SAP BusinessObjects Analysis for Microsoft Office, SAP Fiori, and SAP Lumira Designer as frontends. The main advantages are as follows:

- Merge of SAP BPC consolidation and SAP S/4HANA
- Read access to Universal Journal
- Read access to SAP S/4HANA master data

- Flexible data model

SAP BPC optimized for SAP S/4HANA will contain predelivered SAP BPC content with real-time interaction with SAP S/4HANA transactional and master data, as depicted in Figure 2.9.

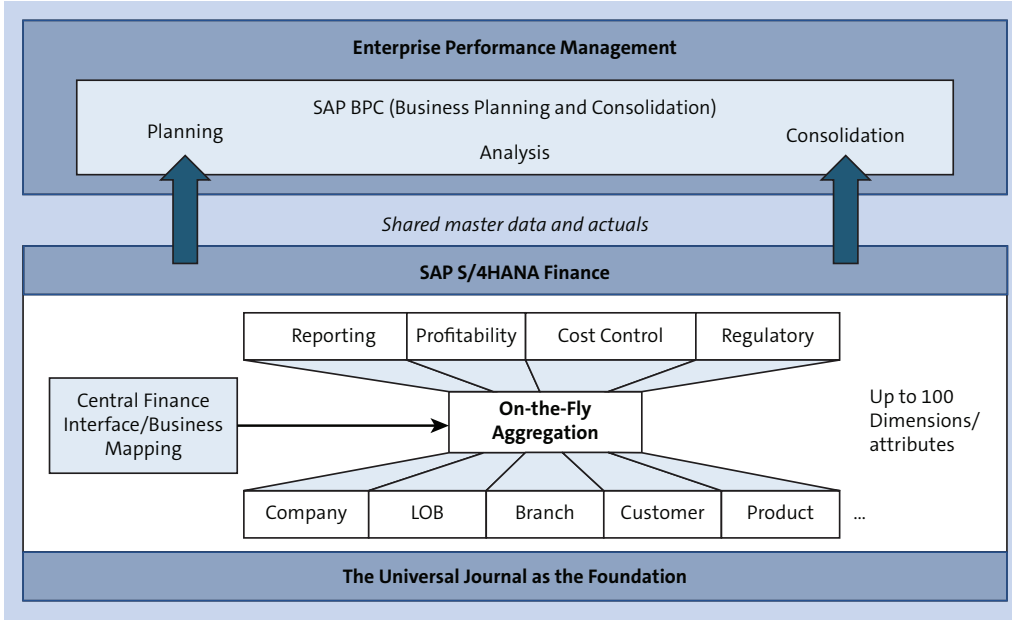


Figure 2.9 SAP Business Planning and Consolidation Based on SAP S/4HANA Technology

Using the Universal Journal in an SAP BPC context will provide the following benefits:

- The speed of the SAP HANA database will improve the performance of planning and consolidation processes such as intercompany eliminations and currency conversion.
- Access to master and transactional data via the Universal Journal will occur in real-time without replication of the data to a special InfoCube first.
- Aggregation, planning, and consolidation can be performed on the fly.

In the past, the planning process was performed mainly outside of the SAP ERP system, and ready-to-use data was uploaded to SAP ERP using the data structure of the respective functional component. Because there are very different planning areas and their respective data structures, this usually happened outside the system.

SAP BPC is one of the products used to support planning. Along with common integration direction, the planning function moved to a new integrated concept in SAP S/4HANA Finance, which is called SAP BPC for SAP S/4HANA Finance. This offers an alternative to classic planning capabilities within the FI and CO modules. Along with UI improvements, this solution enables you to access actuals data and master data directly in SAP ERP without data replication. This integration eliminates some reconciliation issues and integrates finance processes within the company.

All planning activities can be accessed via a Microsoft Excel frontend to provide a common way of working with and viewing planning data. There are no longer silos for the planning data, such as planning in CO-PA and planning for cost centers or profit centers; all planning data are contained in a real-time InfoCube in the local SAP BW installation, which is optimized for SAP HANA. Actual data and master data are accessed directly in real time without the replication that would be necessary in a standalone SAP BW system.

SAP BPC is still limited to financial planning, as depicted in Figure 2.10, and does not involve logistics planning yet, although integrating the two is on SAP's future roadmap.

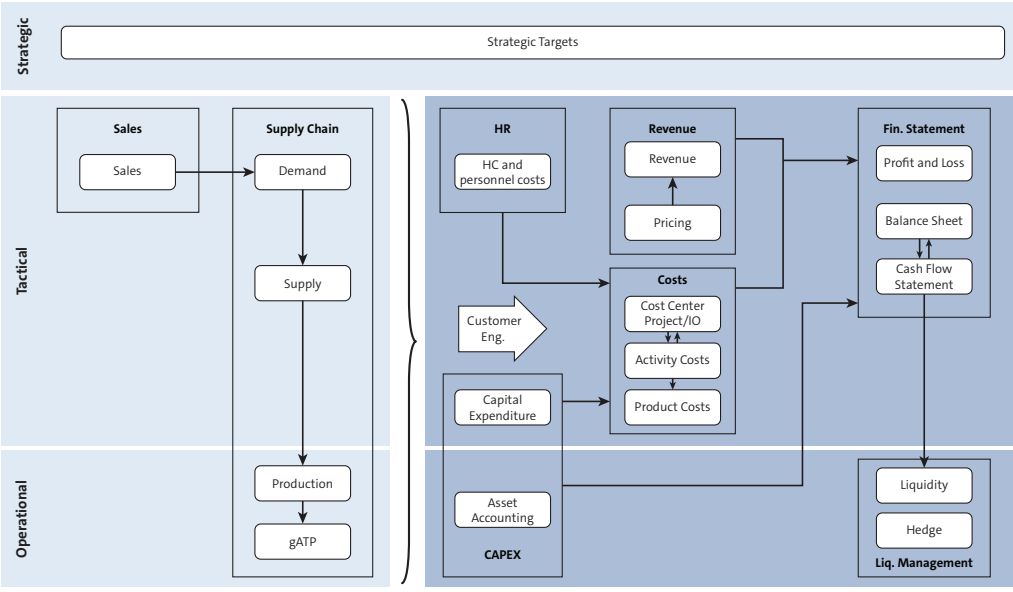


Figure 2.10 SAP Business Planning and Consolidation Scope

SAP BPC includes process such as the following:

- Cost center planning
- Project/internal order planning
- Profit and loss planning
- Liquidity planning

SAP S/4HANA Finance delivers a set of predefined sample XLS workbooks for planning in Excel format. You can use these as a reference when creating your own set of workbooks. It also includes the following standard content for each planning area:

- Monthly planning
- Yearly planning
- Standard functions for copy, lock, distribute, and so on
- Retraction to SAP ERP where relevant
- Plan versus actual comparison reports

New functions provided by SAP S/4HANA 1610 are described in Table 2.2.

Function	Description
Planning content	■ Sales planning on periods (basic) ■ New workbook to plan revenues: Material quantity x price = revenue ■ Activity price planning ■ New workbook to record the plan rate for an internal activity ■ Activity consumption planning ■ New workbook to record the expected quantity of a specific activity provided by a partner cost center ■ Fixed amount transfer planning ■ New workbook to plan for fixed amount transfers between cost centers
Predictive	*Cost simulation (enhanced)*: Now possible to specify sender accounts and sender cost centers
Extensibility	*Model extension tool*: Shortens SAP BPC implementation by generating info objects and so on for customer-specific planning dimensions

Table 2.2 SAP Business Planning and Consolidation Scope

Function	Description
Architecture	*Planning persistency AcDocP*: Alternative plan data persistency designed for specific use cases
UI for SAP Analysis for Microsoft Office	*Workbooks redesigned for SAP Fiori*: The design of all planning workbooks adapted to meet SAP Fiori style guidelines

Table 2.2 SAP Business Planning and Consolidation Scope (Cont.)

In the future, we expect that logistics planning functionality will be integrated with SAP BPC, which will make an integrated, enterprise-wide planning cycle possible. In addition to planning, SAP BPC supports real-time consolidation as well, as depicted in Figure 2.11. Real time in this context means that it has the ability to consume SAP S/4HANA data without data replication (both transaction data and master data).

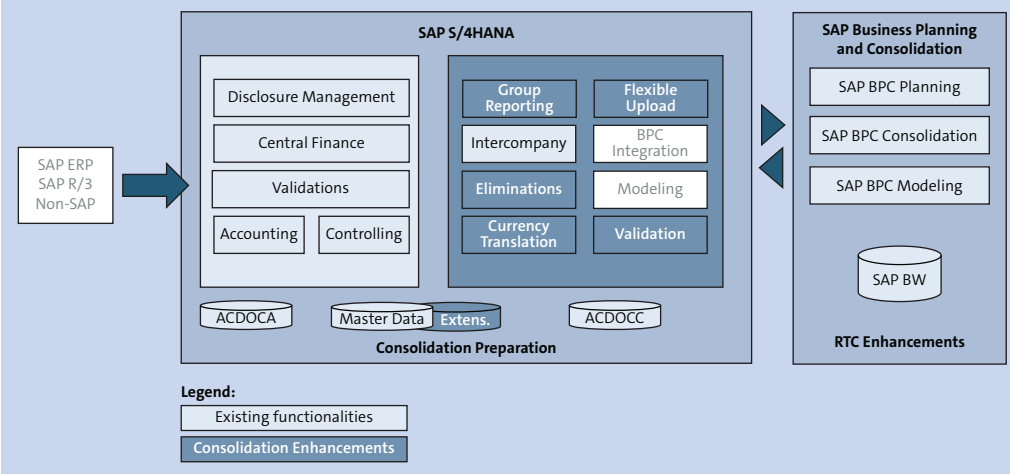


Figure 2.11 SAP BPC and Real-Time Consolidation

2.2.6 Profitability Analysis

SAP has made a clear statement with SAP S/4HANA Finance: the future direction of CO-PA is account-based. This follows SAP's plan for simplification and integration of SAP S/4HANA and the overall SAP solution portfolio. Functional gaps, which differentiated costing-based CO-PA in the past, are now incorporated into account-based

CO-PA. Additional developments for account-based CO-PA soon will shorten the functional gaps of costing-based CO-PA that are still in place today.

The main decision factor regarding which functionality to select must be whether you need a common and integrated profitability model or a separate tool to calculate and analyze profitability. Although account-based CO-PA is tightly integrated with FI and is always reconciled, this could be undesirable in some business environments. In such environments, costing-based CO-PA is still a valid option.

In this section, we'll look at the two types of CO-PA before jumping in to how SAP S/4HANA has affected a number of CO-PA processes: COGS postings, valuations, top-down distributions, and production variances. We'll end with a brief look at some of the new quantity fields.

Costing-Based and Account-Based Profitability Analysis

As stated previously, there are two types of CO-PA possible in SAP:

1. **Costing-based CO-PA**
   This type groups costs and revenues according to value fields and costing-based valuation approaches, both of which you can define yourself.
2. **Account-based CO-PA**
   This type is organized into accounts and uses an account-based valuation approach.

You select CO-PA types during the Customizing of the operating concern in SAP. You can even select both types to be run in parallel, but fully parallel implementation is hard to achieve because all assignments, allocations, and reports are defined individually per CO-PA type. Parallel implementation places a heavy burden on system maintenance and creates big reconciliation problems without adding much business value.

As a result, in the past, SAP's recommendation was to use costing-based CO-PA as a main tool, with account-based CO-PA activated for reconciliation purposes with FI. In addition, there were functional gaps that made it preferable to use costing-based CO-PA over account-based CO-PA.

In SAP S/4HANA, additional functions are available in account-based CO-PA that were previously only possible in costing-based CO-PA. Of course, new functionality isn't a copy and paste of that in costing-based CO-PA because CO-PA must still be reconciled with FI.

In addition to new functional features, there are also architectural changes in SAP S/4HANA Finance. To keep constant reconciliation between FI and CO-PA, fields from CO-PA are now part of table ACDOCA. Account-based CO-PA and FI are now updated at the same time during the postings, which eliminates the need for reconciliation between these functional components.

With the addition of CO-PA fields to table ACDOCA, now it's possible to derive them during any P&L posting, not only during posting to CO-PA. There is an enhanced derivation in SAP S/4HANA Finance to derive characteristic values and post them to table ACDOCA during initial posting in real time, instead of waiting for period-end closing. For example, for cost posting to a customer project, the system will search for the settlement configuration to CO-PA contained in a WBS element. If no settlement rule is found, the system will look for an assigned sales order to derive required characteristic values. If there is no settlement rule to CO-PA defined in Customizing, the system will look for derivation rules defined in Transaction KEDR, which now works for table ACDOCA postings.

Cost of Goods Sold Postings

There is a timing difference between COGS postings to FI and costing-based CO-PA. Posting to FI happens the moment a finished good is issued from stock, whereas posting to costing-based CO-PA happens at the moment of billing. COGS in CO-PA is derived from the VPRS condition (representing the COGS item) in the billing document or from a standard cost estimation using a CO-PA valuation. In the second case, you can split COGS based on standard cost estimate components and put them into different value fields. In FI, COGS is derived on the other side, from the material valuation view of the sold good.

The main disadvantages of this timing difference center on the following reconciliation problems:

- What if the good has been issued from stock, but the invoice isn't issued yet?
- What if the VPRS condition isn't correctly maintained in the SD pricing?
- What if the return of sold goods is performed in a different period?

All costing-based CO-PA business and technical issues pile up until the end of the month, and then the results can hardly be reconciled. This results in companies writing large manuals on how to track and handle different types of differences and introducing complex business controls.

Since SAP ERP 6.0, EHP 4, the system can post values to costing-based CO-PA at the moment of goods issue. However, few companies use this function because of the following restrictions:

- There is no option to split COGS into cost components.
- Not all characteristics available during goods issue are compared to billing; therefore, the profitability segment for COGS isn't posted to the same level as revenue.

In SAP S/4HANA Finance, SAP introduced a new function for account-based CO-PA, which is intended to solve the first problem in the preceding list. Now it's possible to split COGS based on the cost components of the standard cost estimate and post this split to different G/L accounts. Posting occurs at the moment of goods issue, so values are always reconciled between FI and CO-PA.

This is like CO-PA valuation based on the standard cost estimate in costing-based CO-PA. The difference here is that values are posted to accounts (because there are no value fields in account-based CO-PA).

However, the following restrictions remain, compared to costing-based CO-PA:

- Only one cost component structure assignment is possible; otherwise, double postings would result.
- There's no option to perform revaluation of cost components based on the actual price from the ML. Posting occurs for one COGS account in this case. SAP promises to deliver this function later.

As of SAP S/4HANA release 1709, an enhanced splitting procedure is available that allows users to perform splits of COGS accounts by cost component, not only for sales order–related transactions, but for the following types of transactions as well:

- Stock transfers
- Intercompany sales
- Third-party sales
- Point-of-sale transactions
- Sales processes posted to internal orders
- Sales processes posted to projects

Because posting is performed at the moment of goods issue in account-based CO-PA, it's not posted with the same analytical details as a document from billing because CO-PA characteristics are derived from the sales order.

In addition, when you avoid differences between COGS values in FI and CO-PA, you receive differences between the billed quantity (revenue) and sold quantity (COGS) at the same time. In costing-based CO-PA, these were the same figures by definition. In account-based CO-PA, they can be different because they come from different sources.

Valuation

The valuation function is utilized to some extent by most companies that use costing-based CO-PA. In simple cases, this function allows you to split COGS according to cost components of standard or actual cost estimates. We touched upon this in the previous section and showed that in SAP S/4HANA Finance, this function is realized for account-based CO-PA.

A more complex valuation solution in costing-based CO-PA can be realized using the conditions and costing sheets. This functionality allows you to build dependencies among values posted to CO-PA and generate additional postings based on user logic. This is sometimes used for value field corrections, transfer prices treatment, and intercompany cases. The problem is that these additional CO-PA postings aren't depicted in FI and therefore pose reconciliation issues.

In SAP S/4HANA Finance, valuation functionality isn't available for account-based CO-PA. If there is a requirement to generate additional postings, the postings must be configured and created in SD and/or FI and only from there moved to CO-PA. This is possible because the SD pricing procedure uses similar functions to CO-PA costing sheets. Of course, this method requires more complex SD Customizing and additional G/L accounts, but, in the end, you'll receive more reconciled results.

For postings in FI, there is no such functionality as costing sheets, and additional postings must be generated using different methods. However, the underlying concept remains: there must not be postings in CO-PA that aren't reconciled with FI.

Top-Down Distribution

There has been a long-lived misunderstanding that top-down distribution wasn't allowed in account-based CO-PA. In fact, top-down distribution is available in account-based CO-PA, but the processing instructions differ compared to costing-based CO-PA because there are no value fields in account-based CO-PA. When you select the **Value Fields** tab in Transaction KE28 for account-based CO-PA, you won't find the expected value fields and accounts (see Figure 2.12). You must select the value in the object currency and then combine it with the cost elements that store your revenues, for example, to make your distribution. That's a little bit more difficult than

directly accessing one of the 200 value fields, but you definitely can set up selection logic to pick up the reference data you need to make the distribution.

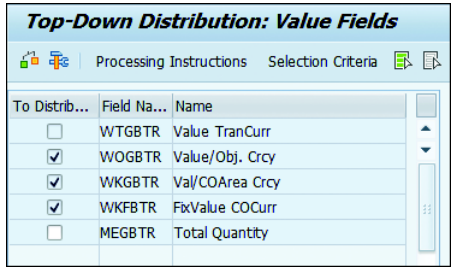


Figure 2.12 Top-Down Distribution Value Fields

Therefore, top-down distribution isn't really a differentiator of costing-based CO-PA; it can be used in account-based CO-PA as well.

Production Variance Allocation to Profitability Analysis

In costing-based CO-PA, it's possible to transfer production variances from variance calculations to CO-PA and segregate different variance types by different value fields. This functionality wasn't available previously in account-based CO-PA.

In SAP S/4HANA Finance, you can now post production variances to different accounts based on the different variance categories. These accounts are then taken up to account-based CO-PA. Customizing is like the FI transfer structure, which is used for the same function in costing-based CO-PA (see Figure 2.13).

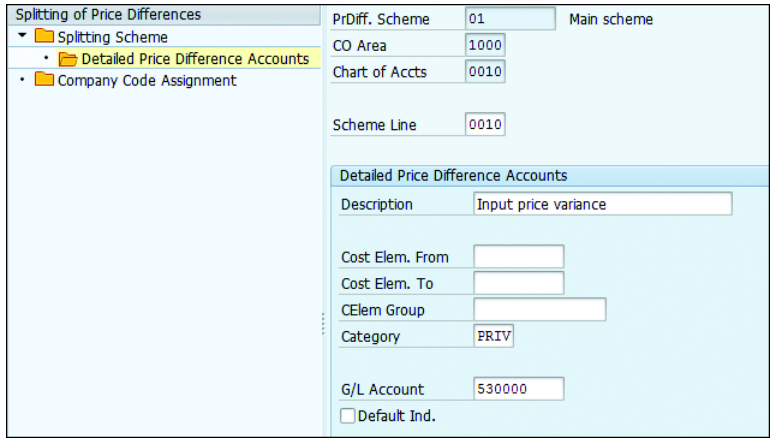


Figure 2.13 Detailed Price Difference Accounts

Additional Quantity Fields

It's a common business requirement to not only store the sales order quantity for financial analysis but also convert the quantity into the unit of measure (UoM) common across the product lines. Historically, in financial reporting, only quantities such as invoice quantity and delivered quantity are stored. This applies to account-based CO-PA also, for which quantities from FI are used.

In costing-based CO-PA, you can define additional value fields to store additional quantities and define rules for how to derive such quantities.

In SAP S/4HANA Finance, it's possible to define up to three additional quantity fields in the Universal Journal. The result is like what you could achieve with additional quantity value fields in costing-based CO-PA (see Figure 2.14).

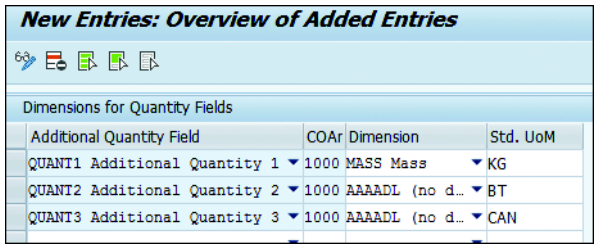


Figure 2.14 Customizing Additional Quantity Fields in Table ACDOCA

In addition, a BAdI is available in SAP S/4HANA Finance that allows you to influence UoM conversion as in costing-based CO-PA.

2.2.7 Central Finance

One of the implementation scenarios for SAP S/4HANA Finance is the Central Finance scenario. For customers that see the benefit of the new functionalities of SAP S/4HANA Finance but can't yet upgrade their legacy systems to SAP S/4HANA because they have a hybrid multi-ERP system landscape or because such an upgrade would be too complex, costly, or time-consuming, SAP offers Central Finance as a deployment option.

This section explains the concept of Central Finance and how organizations can benefit from SAP S/4HANA Finance features such as real-time central reporting based on the Universal Journal, the new UX available via SAP Fiori, and the improved functionalities of SAP S/4HANA Finance without disrupting their existing application landscapes.

Central Finance Process

In the Central Journal concept (see Figure 2.15), legacy ERP systems (SAP and non-SAP) are connected via an SAP Landscape Transformation Replication Server (SAP LT Replication Server) to an SAP S/4HANA Finance system that acts as the central repository for financial data. The SAP LT Replication Server handles parts of the initial load and the new financial transaction updates.

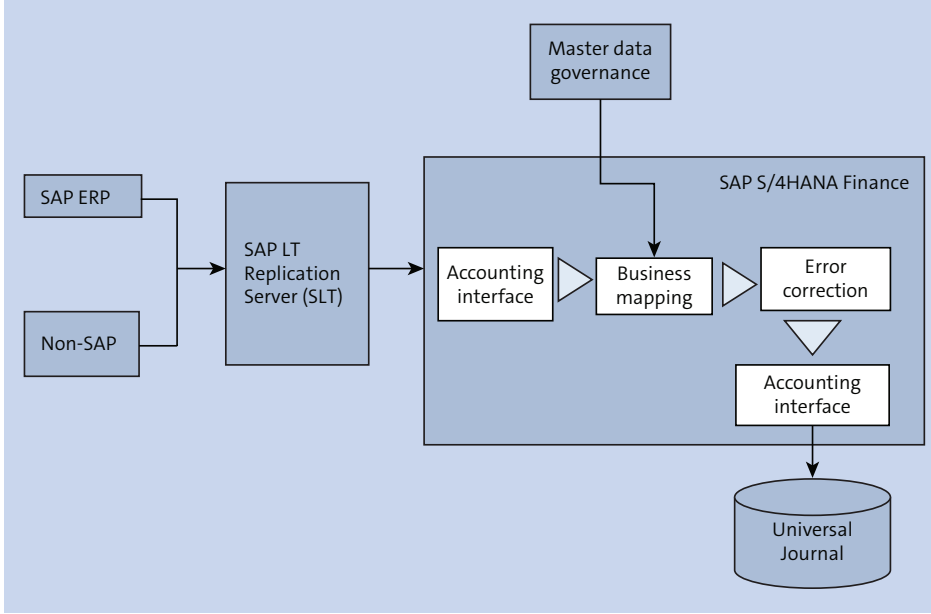


Figure 2.15 Central Journal Concept

Data (master data and transaction data) is replicated in real time from legacy systems to a central system via a Central Finance accounting interface using the SAP LT Replication Server, as depicted in Figure 2.16.

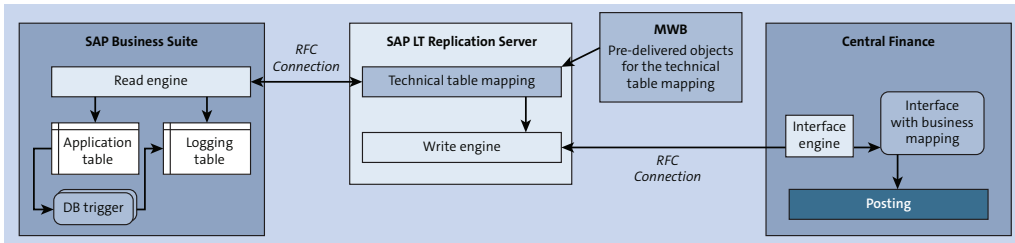


Figure 2.16 SAP LT Replication Server in SAP S/4HANA Central Finance Context

SAP LT Replication Server collects data written to databases in the source systems and feeds this data into the corresponding Central Finance accounting interface. SAP LT Replication Server is used for the ongoing replication of data to Central Finance for both FI and CO postings. For the initial load of data, SAP LT Replication Server is used to transfer CO postings. The initial load of FI data is managed via Customizing activities in the Central Finance system. The Central Finance process is as follows:

1. Central Finance offers integration with SAP Master Data Governance (SAP MDG) to access available mapping information there. Even if SAP MDG isn't in use, in the background Central Finance uses the SAP MDG mapping tables that are available without installing SAP MDG. This doesn't require an SAP MDG license. The SAP MDG license is only required if the SAP MDG application is used. If you use SAP MDG to distribute master data throughout your system landscape, it's likely that SAP MDG will already contain a lot of information about how master data elements map to each other in the different systems. This information can be accessed and doesn't have to be maintained again manually. Different types of master data are mapped in different ways:
   - Master data such as company codes and company IDs must be either mapped manually as part of Customizing or mapped using SAP MDG.
   - Master data relating to cost objects, such as production orders and internal orders, is mapped using the cost object mapping framework.
2. Business rules and mappings are set up in the central system to convert and harmonize incoming data from legacy systems. An overview of where to perform the different types of mappings is shown in Figure 2.17.

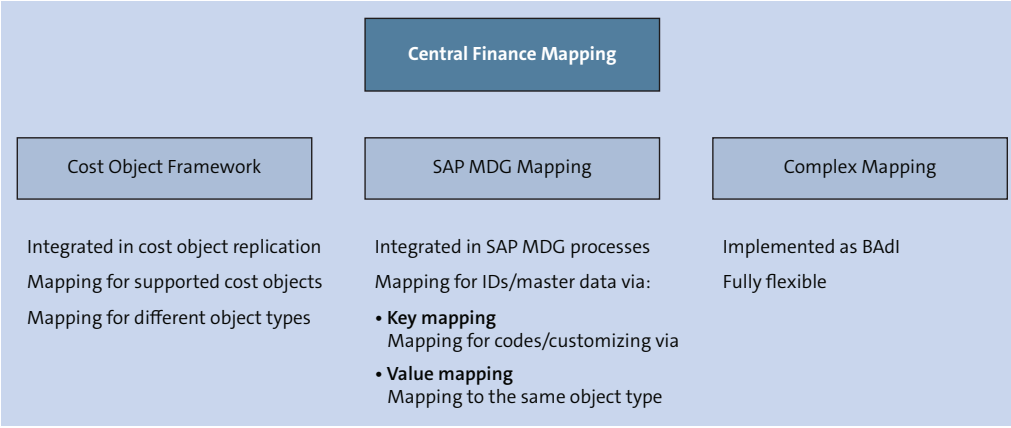


Figure 2.17 Business Rules and Mappings

3. In case of errors, the SAP Application Interface Framework can be used for corrections. This is a framework for interface implementation and error correction focused on business users. It provides user-friendly selection screens and is used to define three main interfaces:
   - FI posting replication
   - CO posting replication
   - Cost object replication
4. The SAP S/4HANA Finance internal accounting interface transfers harmonized data to the format of the Universal Journal entry in the SAP HANA database.
5. The Universal Journal entry database in SAP HANA is then the underlying data platform on which SAP S/4HANA Finance operates.

By applying Central Finance as an implementation scenario, source systems are untouched and continue to work as before. You can then use the following functionalities to leverage SAP S/4HANA Finance capabilities:

- Real-time replication of FI and secondary CO postings from several source systems into a central SAP S/4HANA Finance system.
- With document drilldown to the original FI document in the source system using the Document Relationship Browser, you can see the document flow of an FI document. For example, you can navigate back from an FI document to the original sales order.

  You can also search for the reposted FI document using the company code, original document number, or fiscal year from the source system.
- Replication of cost objects (production orders, product cost collectors, and internal orders) from source systems to the central system.
- Mapping functionality for harmonization of master data before posting into Central Finance.
- Access to existing master data mapping from SAP MDG (optional).
- Centralized error handling with the error correction and suspense tool.

The real-time data flow is depicted in Figure 2.18.

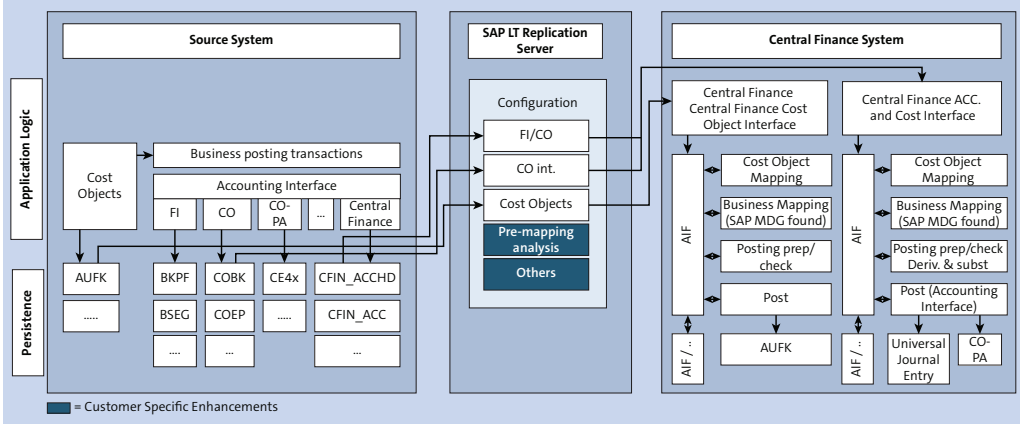


Figure 2.18 Central Finance Data Flow via SAP LT Replication Server

Central Finance offers some reconciliation reports as well, described in Table 2.3.

Level of Analysis	Report Name	Purpose
Level 1	FINS_CFIN_DFV_FI_DOC_COUNT Transaction FINS_CFIN_DFV_FI_NUM	*FI Documents Count:* Checks whether all FI docs have been replicated as expected
Level 2	FINS_CFIN_DFV_FI_BAL_COMPARE Transaction FINS_CFIN_DFV_FI_BAL	*FI Balance Comparison:* Checks whether debit or credit amount per G/L account is the same in a source system and CFIN system
Level 3	FINS_CFIN_DFV_FI_DOC_COMPARE Transaction FINS_CFIN_DFV_FI_DOC	*FI Documents Comparison*: Checks whether all FI document line items for selected G/L accounts in a source system and CFIN system sum to the same amount
Level 1	FINS_CFIN_DFV_CO_DOC_COUNT Transaction FINS_CFIN_DFV_CO_NUM	*CO Documents Count:* Checks whether all CO (secondary posting) docs have been replicated as expected

Table 2.3 Central Finance Standard Reconcilaition Reports

Level of Analysis	Report Name	Purpose
Level 2	FINS_CFIN_DFV_CO_BAL_COMPARE Transaction FINS_CFIN_DFV_CO_BAL	*CO Balance Comparison:* Checks whether debit or credit amount per cost element used in secondary postings is the same in a source system and CFIN system
Level 3	FINS_CFIN_DFV_CO_DOC_COMPARE Transaction FINS_CFIN_DFV_CO_DOC	*CO Documents Comparison:* Checks whether all CO document line items (secondary postings) for selected G/L accounts in a source system and CFIN system sum to the same amount

Table 2.3 Central Finance Standard Reconcilaition Reports (Cont.)

Characteristics and Benefits

The key element in this Central Finance scenario is the Universal Journal. As stated before, to realize the single source of truth for finance, it's very important for an organization to have a clear idea of its financial reporting requirements. Next, the organization must have the governance in place to guarantee that business processes are harmonized and that data is defined and captured in a common and consistent way across all business units. Central Finance offers you an implementation scenario with the following characteristics:

- Headquarters can establish a single source of truth for more financial insight into what's happening in the company and with higher data quality due to built-in SAP ERP validations.
- You can harmonize your master data on the fly in the central system without having to undertake a large harmonization project throughout your entire system landscape (e.g., common central chart of accounts, single central controlling area, single central operating concern).
- You can establish a financial data warehouse that is updated in real time and fully reconcilable because it shares the same transactional data model as the source system (in contrast to SAP BW).

The Central Finance scenario can also offer you the following advantages:

- The benefit from the flexibility and speed of reporting of SAP Accounting powered by SAP HANA (G/L, P&L, CO-PA).
- The ability to report your P&L on any dimension (e.g., down to the product level).
- The advantage of new reporting capabilities of SAP S/4HANA Finance (SAP Analysis for Microsoft Office and SAP Lumira Designer).
- A central place to prepare your consolidation and perform adjustment postings and allocations.

Some people might wonder what the benefit is of Central Finance for central reporting compared to traditional SAP BW reporting. Table 2.4 describes the differences between the two options.

Topic	Description	SAP BW System	Central Finance
System consolidation	■ SAP ERP instances ■ Non-SAP ERP instance	Yes	Yes
Centralized reporting	■ Finance reporting ■ Management reporting	Yes	Yes
Real-time BI	■ Real-time reporting ■ Role/business user interaction	No	Yes
Central process execution	■ Closing-oriented (non-operational) ■ Cross-client processes ■ Corporate/group processes	No	Yes
Big data	■ Exposed SAP-wide data attributes ■ Enclosure of external statistics	No	Yes
Predictive finance	■ Trends and forecasting ■ Correlation analysis ■ Classifications and decision trees	No	Yes
Integrated business planning	■ Embedded planning ■ Integrated business planning	No	Yes
Code innovation	■ Cash Management ■ FI-CO code pushdown ■ One logistical FI-CO document	No	Yes

Table 2.4 Central Finance Scope

Increasingly, the Central Finance scenario is used not only for central financial reporting alone but also for central finance processing and central real-time consolidation as well, as depicted in Figure 2.19.

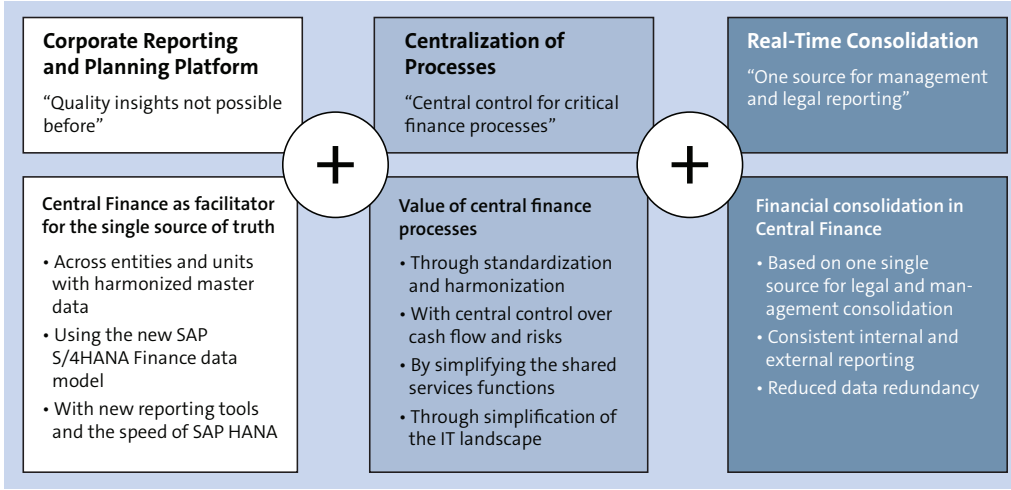


Figure 2.19 Central Finance Scope

Unified Central Finance System

Reporting is the first step on your path to a fully unified Central Finance system in a single SAP S/4HANA box, as depicted in Figure 2.20.

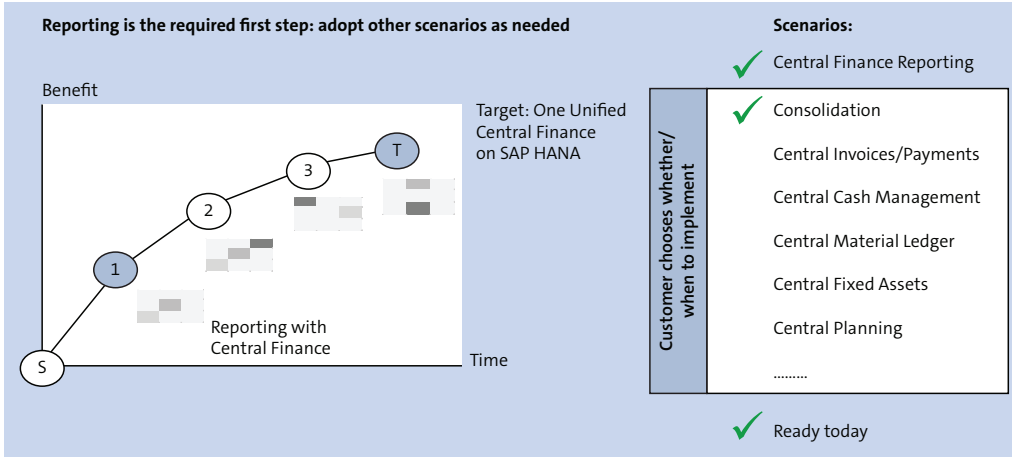


Figure 2.20 Reporting on Unified Central Finance System

Central Finance is considered a stepping stone to a full-blown SAP S/4HANA Enterprise Management system. We call this a "lift and shift" scenario. Keep in mind that Central Finance is a normal SAP S/4HANA system with the business function CFIN activated. This business function will allow you to use SAP LT Replication Server, SAP Application Interface Framework, and a light version of SAP MDG to map master data. It also will provide some additional configuration features for the Central Finance scenario.

In this lift and shift scenario, a customer starts by connecting legacy systems to the Central Finance system to allow for central financial reporting. Later, he might start using real-time consolidation as well and some financial transactions, like central accounts receivable, central accounts payable, and central payments. After that, the customer will *lift* nonfinancial functionalities from the legacy systems and *shift* them to the Central Finance systems. By doing so, at the end of the lift and shift activities, the legacy system will no longer generate any financial transactions and will dry out. The reasons to use this scenario are as follows:

- Gaining SAP S/4HANA experience before a full migration
- Reduction of uncertainty around SAP S/4HANA functionalities thanks to learning about them in small steps
- Risk mitigation achieved by making the migration steps a lot smaller

For the outlook of functionalities provided by Central Finance, see Section 2.3.

2.2.8 Real-Time Data and Soft Close

As stated previously, SAP S/4HANA Finance enables continuous insight into your financial figures in real time via the Universal Journal, which will have a huge impact on the financial closing process. One key feature of the Universal Journal is that it brings together FI and CO data in a single table. In SAP ERP, there was a strict border between the FI tables and CO tables that caused reconciliation issues between these tables and caused CO-related data (e.g., WIP) not to be visible in FI until, for example, a production order was settled at month end.

Now, because all data for FI and CO is stored in table ACDOCA, WIP is visible immediately, which means financial reporting on WIP can be done anytime, anyplace, and anywhere. The settlement still must be run at month end, but this will only be a kind of technical step now; all reporting on WIP will no longer be dependent on the settlement.

The same applies for profitability-related data. In SAP ERP, a derivation rule had to be applied to get profitability data on the required level of detail, and this data was only

available in CO. Now, derivations are performed on the spot and will make daily reporting on profitability possible. In addition, because all CO data is stored in one table, integrated reporting for these modules is possible.

Table ACDOCA combines ledger and subledger data in one table as well. The impact on fixed assets accounting is that, for example, all information for planned depreciations is visible in real time as well, so you don't have to run the monthly depreciation to have the accumulated depreciation values available for financial reporting. This information will have the correct cost center assigned to it as well, so the information needed for cost center reporting is also available immediately.

The consequence of this is that many activities that were traditionally performed as part of the month-end close process are no longer needed or can shift to a process run during the month, which enables soft closes. Financial reporting is heavily impacted by this because most of month-end reports now can be run daily. This will effect on your financial workforce as well. A lot of activities in the past were based on transactional activities—that is, preparing the data to run a financial report at month end. Because the data is already available in real time now, you no longer need people who can transact the data but need people who can use this data to perform predictive analysis. In the example of a traditional close shown in Figure 2.21, note the following challenges:

- Multiple batch run dependencies
- Batch-processing bottlenecks delaying downstream activities
- High effort needed to correct errors
- Solving complex issues delayed until after close
- Solutions made under extreme time pressure
- Delayed visibility on reporting

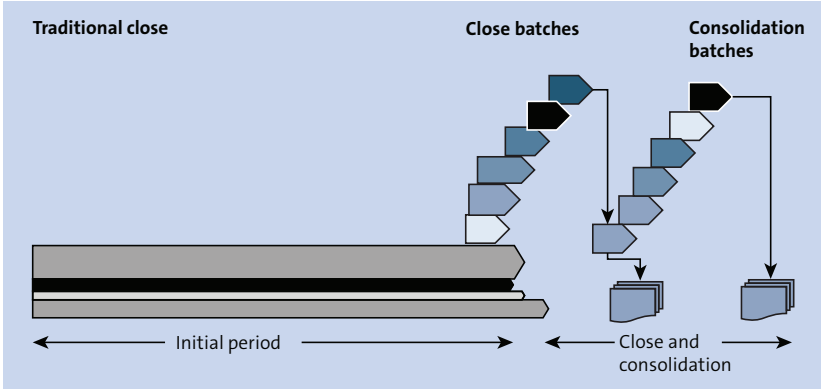


Figure 2.21 Traditional Financial Close

SAP S/4HANA Finance improves this in the following ways, as depicted in Figure 2.22:

- Elimination of batch job bottlenecks
- Continuous intercompany reconciliations
- Continuous financial reporting visibility
- Automation of routine tasks
- Full management visibility into the closing task via an SAP Fiori Financial Closing app

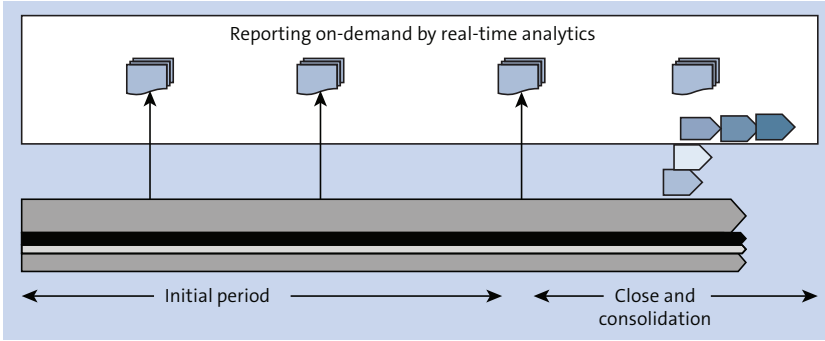


Figure 2.22 Financial Close with SAP S/4HANA Finance

2.3 Outlook

Especially for the Central Finance scenario, we expect many functionalities to be added in the future. In the first release of SAP S/4HANA Central Finance in April 2015, only G/L-level data was replicated to the Central Finance system. As a result, Central Finance could only be used for reporting balance sheets and P&L statements and as a single source for feeding SAP BW and financial consolidation systems. In SAP S/4HANA Finance 1605, functions were delivered that allow the replication of clearing data for accounts receivable and accounts payable items as well. In SAP S/4HANA Finance 1709, an additional replication scenario was added for open item management in Central Finance. Soon, we expect that Central Finance will be able to replicate all subledger-level data as well, such as AP, AR, and assets, so it will be possible to position financial shared services on top of the Central Finance instance. In this case, financial shared service employees wouldn't have to log on to the various SAP ERP systems anymore but could perform their tasks based on the information stored in the Central Finance instance. In addition, Central Finance will make it possible to have the following capabilities available in real time:

- Central Cash Management and liquidity forecast position
- Central AR and AP processing, such as SAP Collections Management, SAP Dispute Management, and SAP Credit Management
- Central payments and reconciliation functions
- Central fixed assets accounting
- Central closing based on soft-close principles
- Central intercompany reconciliation
- Central consolidation functionalities using the Universal Journal as a basis

In the longer term, we expect that Central Finance will develop as the single source for all financial transactions, financial planning and consolidation, and reporting (see Figure 2.23).

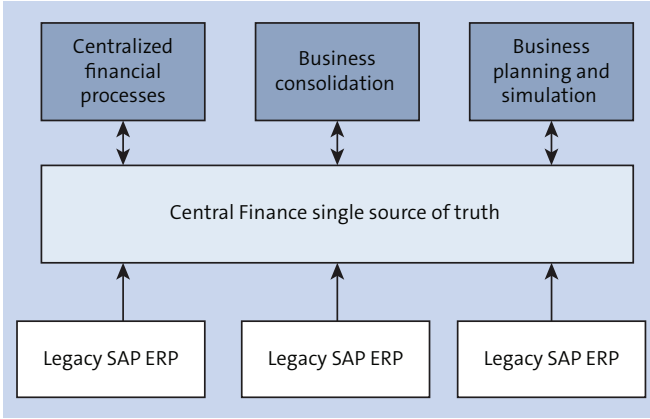


Figure 2.23 Expected Future Architecture of Central Finance

All of this will make the Central Finance implementation scenario interesting for companies that lack a strong centralization culture but are looking for more centralized and transparent finance operations. Therefore, Central Finance may be the right choice under the following conditions:

- If the short-term goal is limited to centralizing finance functions only
- If standardization of nonfinancial functions isn't required in the short term or isn't achievable due to lack of global governance
- If you can agree on a global coding block structure for FI
- If having G/L-level data only is acceptable in the short term

- If you want to use it as the single source for interfacing with your consolidation system
- If you accept the uncertainty of the SAP roadmap for supported functionalities

In addition, we expect some further improvements in the SAP S/4HANA core. In general, more SAP Fiori apps will be delivered to support the various FI job roles. We also expect SAP to provide more enhanced financial planning functionalities and to build extensions for SAP BPC for SAP S/4HANA Finance, to allow for real-time consolidation and to enhance the predictive and simulation capabilities in the FI domain.

We also expect SAP to offer more functions to support the soft-close process, SAP Treasury and Risk Management (SAP TRM), and the area of collaborative finance operations. An example of the latter item is found in the innovations delivered via SAP Cloud Platform for the centralization of AR, which will support the following:

- Automated credit integration of credit bureau rating information in SAP Credit Management
- Customer fact sheet that provides access anywhere to AR data for the sales team or executives
- Customer payments that will improve the collaboration with customers on open item clearing and allow customers to pay bills with bank transfers

2.4 Summary

In this chapter, we discussed the benefits of SAP S/4HANA Finance and the functionalities that address financials pain points. These functionalities have been updated for 1709. Next, we talked about key functionalities in SAP S/4HANA Finance, its maturity, and its outlook. In the next chapter, we'll discuss SAP S/4HANA logistics functionalities in more detail.

Chapter 3
Manufacturing

In this chapter, we'll describe the key challenges for manufacturing. We'll then walk through SAP S/4HANA innovations for manufacturing and see how SAP S/4HANA can address existing pain points.

The focus of this chapter is manufacturing, and we'll start with the key challenges that a chief supply chain officer (CSCO) and chief operations officer (COO) are facing within manufacturing. We'll discuss the SAP S/4HANA innovations within the manufacturing LOB and describe the key benefits of SAP S/4HANA compared to the traditional SAP ERP system. We'll discuss the detailed SAP S/4HANA functionalities and outlook of SAP S/4HANA with regards to manufacturing.

3.1 Industry Pain Points and SAP S/4HANA Benefits

The role of the chief supply chain officer (CSCO) and chief operations officer (COO) today is broader and more complex than ever. His or her role is no longer restricted to optimizing operations such as planning, manufacturing, quality, sales, and delivery. Today's digital economy and its continuous connectivity and information exchange (through the Internet of Things [IoT], social networks, etc.) are transforming business processes, business decisions, and business outcomes. Expectations from customers and partners have changed, too; they're becoming more demanding than ever.

What do these challenges mean for manufacturing? A material planner is responsible for hundreds of materials and is challenged with dozens of exceptions in a day. He/she must make sure there's enough supply to meet demand and identify and act on material shortages and other critical situations quickly.

The following are some of the key challenges in manufacturing today:

- Production planning and evaluation in traditional systems is time-consuming and labor-intensive. Due to the high volume of data, execution time for material

requirements planning (MRP) runs long and needs to be scheduled in batch processes, either once a week or a few times a week. The material planner can't detect critical situations easily, and his day-to-day work often requires intensive manual analysis of the stock requirements list and data from multiple sources.

- Lack of real-time information causes inaccurate data for reporting and analysis, which results in the following:
  - Inaccurate production planning, causing incorrect inventory levels
  - Inaccurate capacity planning and leveling of resources
  - Insufficient information to detect and focus on critical situations only
  - Poor decision-making processes due to the lack of a real-time single view of materials and inefficient processes to evaluate solutions (need to navigate to multiple transactions)
  - Inability to minimize production risks across the networks (due to lack of complete and accurate manufacturing data)
- Many applications and disparate systems for different processes, creating different versions of truth and duplicated and scattered information

Due to these challenges, the traditional system doesn't provide sufficient capabilities for companies to improve service levels and inventory accuracy, to avoid critical situations, and to drive revenue growth.

SAP S/4HANA is a digital ERP core built on SAP HANA, and it's the next-generation business suite that enables companies to reinvent business models and drive new revenues and profits. The digital ERP core is the key foundation and enabler for business innovation and optimization, and it helps enterprises drive digitization of their critical business processes across all operations.

Enterprises can run their advanced analytics at any point in time, at all levels of granularity in real time and from a single system source, increasing supply chain visibility and transparency. They can now easily connect to people, devices, and business networks in real time and deliver new value in the digital economy. In addition, SAP S/4HANA offers capabilities to predict and simulate business outcomes that will allow them to quickly respond and make better decisions.

With these core capabilities, CSCOs can now expand their digital transformations across the entire value chain to do the following:

- Improve collaboration with suppliers and customers.
- Deliver new and more personalized experiences to their customers, along with better services, due to a better understanding of customer demands and better integration between business processes.
- Manage their assets more effectively and drive new business insight through real-time information on big data. They now can leverage an open innovation platform to quickly integrate, extend, and build innovative SAP Fiori apps and embed device data across the value chain to create new business models.

With SAP S/4HANA, the innovations can be split into three different categories:

1. **Rearchitecting the functional core**
   In this category, innovations have been made within the SAP S/4HANA core. The technology footprint has been optimized and modernized and OLTP and OLAP have been enabled, which allows the processing of on-the-fly reporting and analytics.
2. **Responsive UX**
   This category focuses on SAP Fiori, a role-based UX with a new responsive design. SAP Fiori apps can be run on any device and have been designed for exception-based issue handling.
3. **Unifying the functional core**
   The focus for the third category is the elimination of redundancies, which have been built in to SAP Business Suite over the years, resulting in a simplified suite.

SAP S/4HANA resolves some of today's challenges and provides a single source of truth, as well as advanced analytics and insights via real-time data. With SAP S/4HANA, enterprises can truly become analysis-led and technology-enabled digital enterprises. You can make your supply chain more transparent and create a more agile environment in which you can predict and respond more rapidly.

Now, we'll provide a summary of the key challenges and pain points related to the area of manufacturing and see how SAP S/4HANA can resolve them.

Table 3.1 shows the key challenges for the CSCO in the manufacturing area and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Can Help
Lack of visibility: ■ Lack of real-time availability of granular data to identify and analyze bottlenecks and improve planning and execution decisions. ■ Lack of tightly integrated supply chain capability to respond to variable market conditions. ■ Lack of a centralized demand and supply planning capability to create a forward vision. Use real-time market and customer-related data to predict and manage shifts in demand. ■ Lack of analytical insight to drive optimal performance of assets, facilities, and energy.	MRP Cockpit improves the following: ■ Transparency of internal and external shortages across the entire enterprise. ■ Visibility of accurate inventory position across multiple plants. ■ Ability to track overall material flow and visibility over fast and slow runner inventories. ■ Increased visibility into capacities and bottlenecks. ■ Real-time stock alerts, based on current stock situation.
Increasing volatility in demand and supply: ■ Limited real-time and advanced analytics doesn't provide sufficient capabilities for CSCOs to predict demand and identify issues quickly. ■ Most processes requiring human intervention don't offer opportunities to automate specific tasks and have users focus on exception-based management.	MRP enterprises can be more resilient against supply and demand volatilities due to the following: ■ Real-time alerts of supply problems, improving transparency into critical situations. ■ Faster MRP runs to propagate demand information faster and allow quicker action in response to changes in demand and supply. ■ Prescriptive algorithms such as decision support in case of changes in demand and supply. ■ Simulations and evaluations of supply alternatives. ■ Ability to manage and track change requests.

Table 3.1 Manufacturing Challenges and SAP S/4HANA Advances

Challenge for the CSCO	How SAP S/4HANA Can Help
Increased complexity: ■ Lack of support for using robotics. The usage of robotics continues to increase as new applications are found across the value chain from production to warehousing, distribution, and the customer. ■ Increased complexity due to globalization and the respective efforts to expand into new markets, seeking low-cost manufacturing locations and the need to offer new and innovative products and services.	Simplifications in the following processes: ■ Introduction of MRP area level, offering a more advanced and efficient logic and allowing more differentiation possibility in MRP. ■ Simplified subcontracting logic. ■ Simplified sourcing logic. ■ Several product master fields eliminated to avoid redundant setup. ■ Production planning and detailed scheduling embedded into SAP S/4HANA, resulting in complexity in integration. ■ Extended solutions for complex manufacturing that are seamlessly integrated with the digital core.
Lack of collaboration: ■ Lack of collaboration between different departments due to different systems and lack of integration. Collaborative demand planning should establish flexibility in the planning process on different levels of aggregation with different groups of customers. ■ Lack of collaboration with external partners for support for codevelopment.	New functionality that allows for the following: ■ MRP Cockpit for seamless collaboration between production and procurement departments. ■ Improved collaboration among R&D, sales, and manufacturing by creating seamless visibility into new product development projects, available and required capacities, and current sales figures and promotion budgets, as well as better integration of product design with manufacturing. ■ Improved integration between sales and production through the integrated ATP processes. ■ Improved collaboration through standard integration with SAP IBP.

Table 3.1 Manufacturing Challenges and SAP S/4HANA Advances (Cont.)

In the next section, we'll look at the major functionalities that SAP S/4HANA has introduced for manufacturing.

3.2 Key Manufacturing Functionality

We'll begin this section with the one of the first innovations implemented in SAP S/4HANA for the manufacturing area, which is MRP Live, the optimized MRP functionality. Then, we'll continue with the changes implemented to product masters due to some process changes. Next, we'll describe the embedded production planning and detailed scheduling functionality that was released as part of 1610. We will also discuss complex manufacturing and demand-driven MRP, both added as part of 1709. Finally, we'll close this section with some general process optimization information.

3.2.1 MRP Live

SAP S/4HANA offers *MRP Live*, an optimized MRP functionality in an SAP Fiori app with several improvements, including real-time data and advanced analytics to improve material flow visibility and enable better decision-making for the material planner. With MRP Live, production planning can be performed based on real-time data, and stock situations can be analyzed based on the most up-to-date material and stock information. This will allow for a more accurate MRP run and reduce the lead time for planning.

With MRP Live, users have access to real-time data that can be run on any device via SAP Fiori and for which the UI is fully adoptable based on the user role. Companies can analyze material flows in real time with single-query access to data. The rules that define shortages can be flexibly determined to provide insights into material shortages, and supply and demand can be presented in chronological order, showing the exact level of stock by day.

The system supports a real-time alert functionality based on the current stock requirements situation. This allows users to be proactive—rather than reactive—and take actions quickly to avoid critical situations. ATP confirmation to customers will be faster and more accurate. With the real-time data and analytics in SAP S/4HANA, users can monitor the standard processes in an efficient way and focus specifically on exceptions. Companies will have better control over their material availability, resulting in fewer stock-outs, decreased stock levels, and an increase in customer satisfaction.

The MRP Cockpit is the main entry point for the material controller to identify disruptions in the material flow and review the impact of these issues quickly. MRP proposes solutions and provides simulation capabilities to support user decision-making, resulting in decreased material shortages.

With the Manage Material Coverage app, users can view the current material situations with availability details and solution suggestions by the system. The system will perform a rating for each solution to indicate the viability of the solution; two stars resolves the issue, and one star resolves the issue partially. The user can preview the suggested solution, and the system will provide a simulated view of it, considering any possible constraints, such as maximum order quantities and inventory in supplying plants.

Figure 3.1 shows a display screen from MRP Live, in which users can simulate and predict material situations.

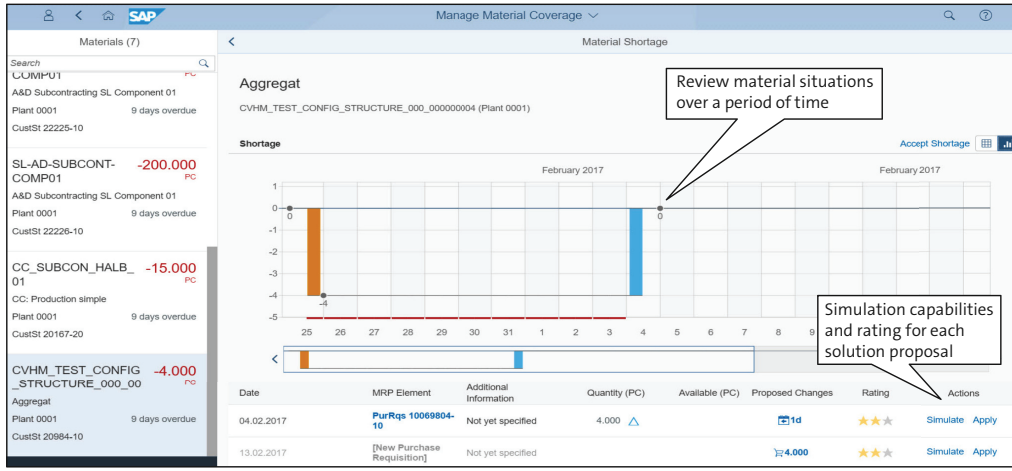


Figure 3.1 MRP Live Screen with Overview of Current Material Situations

In addition, in MRP Live, the MRP Dispatcher offers automatic determination and selection of planning mode for each material based on the functional requirements of the material. It offers a new mode and a classic mode, as follows:

- **New mode**
  Supports procurement and in-house production, delivery schedules, and configurable materials. This mode will be enhanced continuously in future releases.

- **Classic mode**
  Supports capacity planning and discontinuation. Special functionalities in MRP will remain in the classic mode, together with existing customer enhancements, which means there is no loss of functionality and special functionalities can be used immediately in a compatible way.

SAP S/4HANA significantly improves the performance of the MRP run (see Figure 3.2). In classic MRP, the application server must call to the database table multiple times for each table one by one, and a lot of data has to be transferred and read by the application server. This causes performance issues, so executing an MRP run in the traditional system is a time-consuming process and often must be scheduled in batches to handle the data.

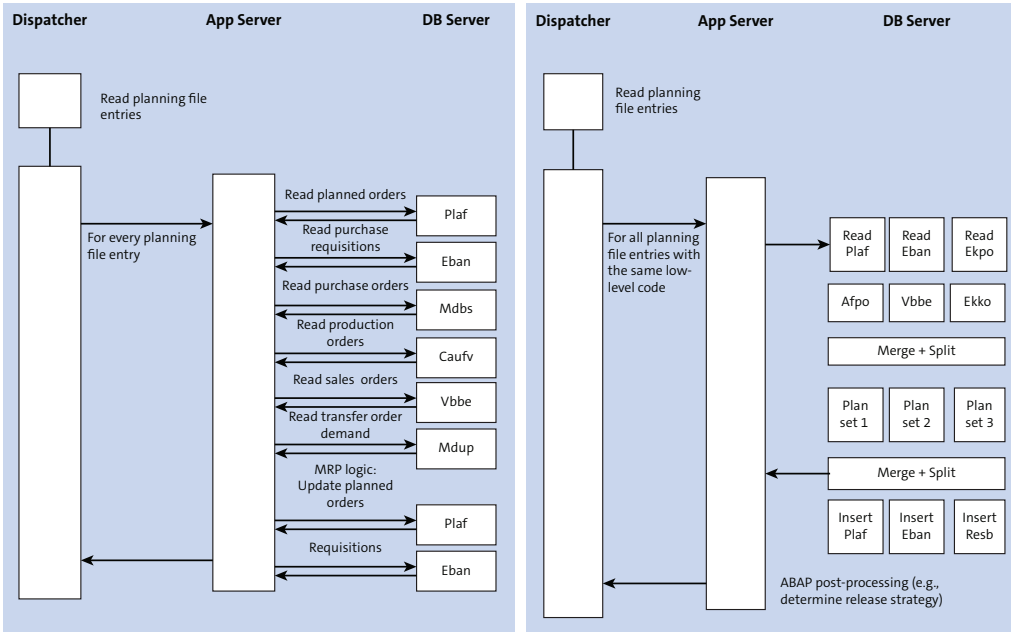


Figure 3.2 Classic MRP versus MRP Live

With SAP S/4HANA, the MRP run is significantly improved. With the parallelization functionality of SAP HANA, different tables can be read at the same time, and data from these tables can be transformed into a common structure, ignoring all the columns that aren't needed by MRP. The data in the database server is used to detect material shortages. MRP creates planned orders and purchase requisitions to cover

these shortages, and these objects are again inserted into the database at one time. MRP Live can read material receipts and requirements, calculate shortages, and create planned orders and purchase requirements all in one database procedure. In SAP S/4HANA, an MRP run can be up to 10 times faster than in classic MRP, and users can run MRP as frequently as needed without system performance issues.

MRP Live offers the following business benefits:

- Increased visibility of material flow, improving efficiency and accuracy of production planning
- Proactive decision-making and ability to react quickly to demand changes due to improved analytics and real-time reports
- Flexibility in tailoring capacities and receipts to meet required quantities
- Real-time visibility of inventory levels and automation of procurement proposal creation

With MRP Live, SAP provides a product design that is lean and flexible. With the real-time analytics and decision support of MRP Live, material planners can now work more efficiently and focus more on exceptions and problem solving, rather than on standard operational tasks.

3.2.2 Product Master Optimization

In addition, changes have been made to the product master data in SAP S/4HANA, as the material number has been extended to 40 characters. The related functionality for extended material numbers can be switched on; however, the technical Data Dictionary (DDIC) object contains this length of material number. This change doesn't represent any issues for a greenfield implementation and, in fact, paves the way for industry-specific content to be enabled within the SAP S/4HANA core release, such as for the automotive industry. In fact, the IS-Automotive extension is where the 40-character material number originated.

Also in the realm of the product master, several fields in the MRP view won't be used any longer in SAP S/4HANA (e.g., storage location MRP, quota arrangement usage [procurement data], etc.). There is also a new material type, SERV. In SAP S/4HANA, material type SERV is introduced for the product master for simplification purposes. Because not all fields and user departments are relevant for this type of material, in SAP S/4HANA these fields are hidden to produce a more simplified and leaner look. Additional configuration for this material type is required.

3.2.3 Embedded Production Planning and Detailed Scheduling

With release 1610, production planning (PP) and detail scheduling (DS) can now be accessed in SAP S/4HANA through manufacturing planning capabilities. This change will reduce integration efforts because integration with master data and work center resources isn't needed any longer, thus leading to more seamless master data and UI harmonization. Functionalities include the following:

- Use the new Create Optimal Orders for Shipment SAP Fiori app to order multiple materials in one purchase order and to optimize order quantities to best use the means of transport.
- Plan critical products (e.g., long replenishment lead time).
- Optimize and plan the resource schedule by taking the resource and component availability into account.
- Cover product requirements in procurement proposals for in-house production or external procurement.
- Create executable production plans.
- Access the production scheduling board through a web-based graphical scheduling tool for PP/DS that allows access to some of the new functionalities in this list.

Figure 3.3 shows the traditional process in SAP ERP versus the new reinvented process in SAP S/4HANA. With embedded PP/DS functionality, no core interfaces are required any longer for master data; it's all shared within one system.

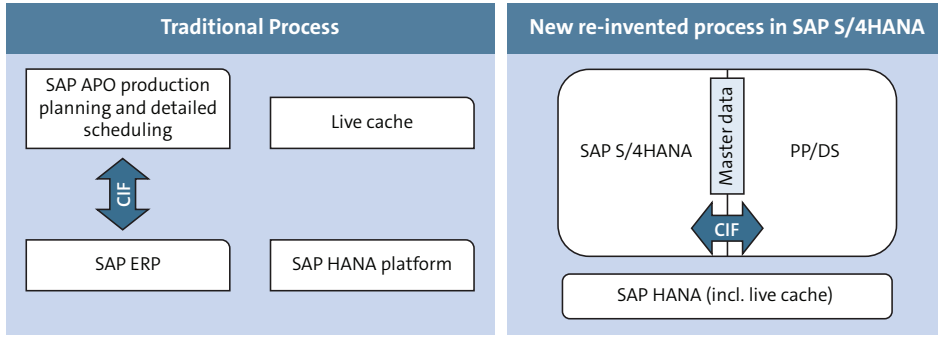


Figure 3.3 Production Planning and Detailed Scheduling: Traditional SAP ERP versus SAP S/4HANA

3.2.4 Complex Manufacturing

In SAP S/4HANA 1709, *complex manufacturing* has been added as an extended LoB solution. This solution contains of three key functionalities, as follows:

- **Manufacturing engineering**
  With this functionality, SAP offers a solution to bridge the gap between engineering and manufacturing through digital collaboration. Manufacturing engineering enables enterprises to hand over master data from engineering to the manufacturing bill of materials (BOM). It provides 3D visual support for BOMs and work instructions as well as process planning functionality such as author work instructions and definition of routings. Additionally, it provides intelligent change management capabilities for engineering and manufacturing and change impact assessment and implementation support.
- **Manufacturing for complex assembly**
  This functionality provides seamless integration and a digital "thread" between product engineering for highly complex products and the SAP S/4HANA digital core through a unified systems of record. It offers the following:
  - A comprehensive planning capabilities for material requirements, production, and capacity planning.
  - Capabilities for manufacturing process planning.
  - Capabilities for change impact analysis.
  - Capabilities to monitor shop floor-related operations with automatic issue detection, root cause analysis, and decision support.
  - Ability to provide the full set of relevant information through the adaptive user interface.
- **Extended production operations**
  This functionality enables enterprises to manage their shop floor operations with automated monitoring and data collection to track and trace their products and perform root cause analysis. Key capabilities of this functionality are as follows:
  - Ability to manage changes to production orders and related master data.
  - Ability to manage the work queue and the information necessary to streamline operations.
  - Ability to track and trace individual parts and part-specific genealogy by shop floor item.

3.2.5 Demand-Driven MRP

The second major 1709 innovation for manufacturing is demand-driven MRP, which is also delivered as an extended LoB solution for SAP S/4HANA. This is a more personalized and dynamic way of replenishment planning. With the demand-driven MRP concept, companies can do the following:

- Manage buffers of components and semi-finished products across the complete bill of material.
- Prioritize existing demand and sales orders over forecasts.
- Re-classify and redetermine stock levels
- Provide real-time prioritization of supply orders.

This functionality improves the overall transparency of the manufacturing process and additionally offers decision support for MRP-related issues by providing detailed analytics based on lead time and consumption.

3.2.6 General Process Optimization/Simplification

In SAP S/4HANA, storage location MRP is no longer available; MRP can only be planned on the plant and MRP area levels. With the introduction of MRP areas, MRP requirements for different subcontractors can be differentiated within the same plant. MRP areas cover the same requirements for MRP on the storage location level (through MRP type ND or VB).

In the traditional MRP, SAP ERP doesn't create planning file entries on the storage location level. MRP in SAP ERP must plan all materials separately in the planned storage locations and plant levels every time inventory or an expected receipt is changed in a single separately planned storage location. In SAP S/4HANA, the system can create planning file entries on the plant and MRP area levels. There is no need to set up MRP area-specific materials master data for every subcontractor anymore.

SAP S/4HANA has also simplified the subcontracting and sourcing logic. In SAP ERP, there are three different ways of planning parts for a subcontractor, as follows:

- Planning subcontracting demand together with internal demand in the make-to-stock planning section (SAP ERP 3.0 logic)
- Separating subcontracting demand and stock into single subcontracting planning sections (one section per subcontractor) and planning uncovered subcontracting demand together with internal demand in the make-to-stock planning section (SAP ERP 4.0 logic)

- Planning the demand of every subcontractor separately by means of subcontracting MRP areas (SAP ERP 4.5 logic)

In SAP S/4HANA, the 4.0 logic was removed, and the 4.5 logic was simplified. In addition, the following is now true:

- Default parameters are used if MRP area-specific material master records don't exist.
- MRP areas for every subcontractor can be created.
- MRP area/supplier-specific material master data can still be created if required.

SAP S/4HANA offers a reduced set of sources of supply and a simplified sourcing logic. The following types of sources of supply are offered:

- *Production versions*: procurement type E (in-house production) or X (both procurement types)
- *Purchasing info record*: procurement type F (external procurement)
- *Delivery schedules*: procurement type F (external procurement)
- *Purchasing contract*: procurement type F (external procurement)

The following are some of the key simplifications in sourcing logic in SAP S/4HANA:

- *Production versions* are the only sources of supply for in-house production and are integrated into quota arrangements. In the traditional SAP ERP system, the source of supply for internal production was determined via a selection method in the material attributes of quantity, explosion data, and production version. A production version references a routing, and the routing is used to create production orders.
- In SAP S/4HANA, MRP only selects production versions that are neither **Locked for Usage** nor **Locked for Automatic Sourcing**, as opposed to **Locked** or **Not Locked** in SAP ERP. The new status **Locked for Automatic Sourcing** corresponds with the **Relevant for Automatic Sourcing** indicator in the purchasing info records. One production version can be defaulted for new planned orders and manually dispatched to proper lines/work centers.
- In SAP S/4HANA, you don't have to create a source list entry for purchasing info records that are relevant for MRP. A new indicator in the purchasing info records, **Relevant for Automatic Sourcing**, can be set for records that are relevant for MRP.
- Source lists aren't yet considered in the latest SAP S/4HANA releases, as a workaround quota arrangement can be used.

- You no longer need to set up material master attributes for consideration of quota arrangements for SAP ERP. In SAP S/4HANA, MRP will always consider quota arrangements.

3.3 Outlook

SAP will continue to add more predictive and machine-learning capabilities to provide better analytics for decision-making. They will continue adding more innovative manufacturing scenarios, such as manufacturing 4.0 scenarios and production and replenishment scenarios. Table 3.2 lists the key innovations scheduled for manufacturing in future releases of 2018 and beyond.

Area	Future Innovations
Analytics	■ Increased predictive and machine-learning algorithm to be able to identify new patterns and detect process issues and root-cause analysis ■ Prescriptive analytics capabilities ■ New capabilities for boardroom-like user experience with preconfigured content
Process innovations	■ Improved process monitoring and decision support through predictive capabilities ■ Artificial and machine learning capabilities for production master data and process optimization ■ Intercompany and intracompany stock transfer order demand-driven scenarios ■ Standardized API integration to enable innovative business processes on SAP Cloud Platform
Manufacturing engineering	■ Extended scenarios for manufacturing 4.0 ■ Intelligent assistance for handling changes
Manufacturing planning	■ New demand-driven scenarios for production of individualized products and replenishments ■ IBP integration with demand and supply ■ Plant simulation capabilities for capacity, purchasing, and financial planning

Table 3.2 Outlook for Manufacturing with SAP S/4HANA

Area	Future Innovations
Distributed manufacturing	■ Manufacturing and execution processes integrated across the distributed supply network ■ IoT-based capabilities for track and trace of one-piece-flow manufacturing ■ New subcontracting scenarios for distributed supply networks ■ Improved collaboration capabilities, improving end-to-end traceability across the supply chain

Table 3.2 Outlook for Manufacturing with SAP S/4HANA (Cont.)

3.4 Summary

In this chapter, we discussed the key challenges within manufacturing and the SAP S/4HANA functionalities that will resolve and improve today's pain points. The highlights for manufacturing are as follows:

- *MRP Live:* new MRP functionality that will resolve today's major pain points. Companies can now run their MRP in a fraction of the time. Predictive and simulation capabilities also will enable better decision-making and less frequent stock-out situations.
- *Embedded PPDS functionality:* reduction in data complexity and optimized processes due to all functionality being embedded within the core. Less effort for building core interfaces required.
- *Several process and master data optimizations:* such as optimized subcontracting processes and product master optimization, due to several changes to MRP process.

The outlook for manufacturing is to increase the scenarios for various processes, such as scenarios for manufacturing 4.0 and more machine-learning and artificial intelligence capabilities added to several processes. In the next chapter, we'll focus on the supply chain LOB.

Chapter 4
Supply Chain

In this chapter, we will specifically focus on the supply chain industry pain points and the SAP S/4HANA supply chain–related innovations that will address these challenges.

In this chapter, we will focus on the supply chain line of business within SAP S/4HANA Enterprise Management. We will review the industry pain points for the supply chain and explain what key SAP S/4HANA benefits will resolve today's pain points. Then, we will discuss the SAP S/4HANA innovations in a more detailed way, starting with the simplified data model and material valuation.

Next, we'll discuss the embedded extended warehouse management and transportation management functionalities and their key benefits compared to the decentral option.

We'll conclude this chapter with the planned innovations for the supply chain and a summary of the SAP S/4HANA innovations that will resolve the pain points.

4.1 Industry Pain Points and SAP S/4HANA Benefits

In today's world, a company must meet three key demands: speed, individuality, and innovation. With the rise of new technologies, customer expectations have increased significantly. Customers have more specific product requirements and want the delivery of their orders as quickly as possible. In addition, with the heavy competition today, customers have a lower threshold and can switch at any moment to another supplier or to someone who hasn't entered the market before.

The following are some of today's key challenges for supply chains:

- Increasing customer requirements cause companies to produce products adapted to individual requirements. Classic inventory planning can't keep up with the flexible accommodations or custom configurations that customers are expecting today.

- Lack of real-time reports on stock levels often leads to delivery delays and dissatisfied customers.
- Lack of transparency and real-time insights causes companies to struggle with data analysis.

Inventory management in SAP S/4HANA enables organizations to harmonize warehouse inventories and demand and supply planning, as well as use all data and analysis on a company-wide basis. With real-time processing of inventory postings and inventory values rather than overnight jobs, warehouse spaces can be reduced to a minimum and lead to a higher accuracy of inventory, increase in turnover, and reduced days of items in stock.

In addition, inventory management can take all production locations and external supply chains into account and can manage the changing demand for smaller lot sizes passing through entire logistics operations with all involved parties. Real-time information, including early error detection, creates precise where-used information per unit.

SAP S/4HANA allows real-time processing of inventory postings and visibility of warehouse inventory, resulting in the following business benefits:

- Improved on-time delivery
- Increased inventory turnover
- Reduced cost of inventory
- Single source of truth for inventory in one system
- Decreased stock levels due to increased transparency

The user experience offered by SAP Fiori enables users to access data anytime and anywhere. Within the SAP Fiori apps, there are three types of SAP Fiori applications: transactional, analytical, and fact sheet.

Transactional SAP Fiori apps allow you to execute specific tasks and transactional activities. Those that are currently available for inventory management allow you to do the following:

- Post goods receipts (GRs) for purchase orders
- Transfer stock from one storage location to another storage location and make changes to stock type
- Manage stock by posting an initial GR or scrapping from stock

Analytical SAP Fiori apps are used to provide real-time insights and/or KPI information into specific parts of a process. Related to inventory management, an analytical SAP Fiori app is available for material document overview and stock overview (for a single material). It provides the user with an overview of inventory level and material postings at any point in time and on any device.

Fact sheet SAP Fiori apps allow users to quickly navigate to other related documents and provide links to follow-on processes. Fact sheets for inventory management are provided for the following:

- Goods receipt
- Goods issue
- Material

Table 4.1 describes the key challenges for the chief supply chain officer (CSCO) for the area of supply chain management and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Can Help
Lack of visibility: ■ Lack of visibility of most-up-to-date stock levels (internal and extended supply chain). ■ Lack of real-time support to improve planning and execution decisions. ■ Lack of support to identify where and how many products are stocked, how to allocate stocks to improve the service levels and reduce logistics costs, and how to reduce waste along the supply chain.	SAP S/4HANA increases visibility using the following functions: ■ Real-time insights on inventory levels, improving accuracy. ■ Advanced available-to-promise (ATP), improving visibility into remaining non-committed inventories and possibilities to cover incoming customer orders. ■ Embedded Extended Warehouse Management (EWM) in SAP S/4HANA. ■ Embedded transportation management.
Increasing volatility in demand and supply: ■ Limited system capabilities to provide real-time data to identify issues and to react to stock shortages and ultimately improve service levels and optimize processes.	Enterprises can be more resilient against supply and demand volatilities due to the following benefits: ■ Better real-time data and analytics, allowing enterprises to quickly identify issues and follow up. ■ Real-time alerts for the current stock situation and supply issues.

Table 4.1 Supply Chain Management Challenges and SAP S/4HANA Advances

Challenge for the CSCO	How SAP S/4HANA Can Help
Increased complexity: ■ Complex data models for inventory management (various tables for stock status), increasing complexity in programming and decrease of throughput. ■ Inflexible valuation methods, not allowing different currencies, and complexity in table structures containing transactional data and master data attributes (decrease of throughput).	SAP S/4HANA provides simplifications in the following processes: ■ Simplified data model for inventory management, reducing memory footprint. Only main tables remain, with no redundancies. ■ Simplified inventory valuation data model of one valuation method instead of two in the traditional SAP ERP system (Inventory Management and Material Ledger). In addition, transactional data is retrieved from the Material Ledger instead of stored in separate tables, increasing system throughput. ■ Embedded EWM in SAP S/4HANA, reducing complexity of interfaces and data setup. ■ Integrated quality management processes and increased efficiency achieved by optimizing quality inspection process.
Lack of collaboration: ■ Inability to view accurate inventory levels across different departments, resulting in different views, incorrect commitments to customers, and misalignment between departments.	SAP S/4HANA improves collaboration using the following: ■ Advanced available to promise (AATP), allowing better visibility into remaining noncommitted inventories and possibilities to cover incoming customer orders. ■ Increased collaboration among manufacturing, logistics, sales, and quality teams through embedded quality management and extended warehouse management processes.

Table 4.1 Supply Chain Management Challenges and SAP S/4HANA Advances (Cont.)

In the next section, we'll describe the key innovations in the supply chain and provide you with some more details about SAP S/4HANA functionalities and how they can resolve the issues in the traditional system.

4.2 Key Supply Chain Functionality

In this section, we'll look at some of the major changes SAP S/4HANA brings to the supply chain—for example, the simplification of the Materials Management/Inventory Management (MM/IM) data model and the simplification of the inventory valuation data model.

We'll conclude the section by discussing the embedded SAP Extended Warehouse Management (SAP EWM) functionality that is included in SAP S/4HANA as of release 1610 and the embedded SAP Transportation Management (SAP TM) functionality included as of release 1709.

4.2.1 Data Model Simplification

In SAP ERP, material documents are stored in two document tables, `MKPF` and `MSEG`. In addition, there are other tables that store aggregated actual stock quantity and material master attributes. On top of these, specific tables with aggregated actual stock quantity by stock type (e.g., sales order stock) also exist.

With SAP S/4HANA, material document data isn't stored in tables `MKPF` and `MSEG` any longer. Instead, it's stored in the new denormalized table `MATDOC`, which will contain the header and item data of a material document, as well many other attributes. The tables for aggregated actual stock quantities don't exist any longer; instead, actual stock quantity will be calculated on the fly from the new material document table `MATDOC`. As a result, the new data model will work on the database level in an `INSERT` mode without database locks.

Figure 4.1 shows the traditional data model and the new simplified data model in SAP S/4HANA.

The key benefit of the SAP S/4HANA data model change is a significant decrease in aggregates and history tables (24 tables), resulting in the following improvements:

- Increased throughput due to fewer tables to be updated and thus fewer tables to be locked
- Better and faster reporting due to most information coming from just one table, `MATDOC`, and more flexibility because actual stock quantity data is calculated on the fly
- Flexible design for new stock types (no additional tables)

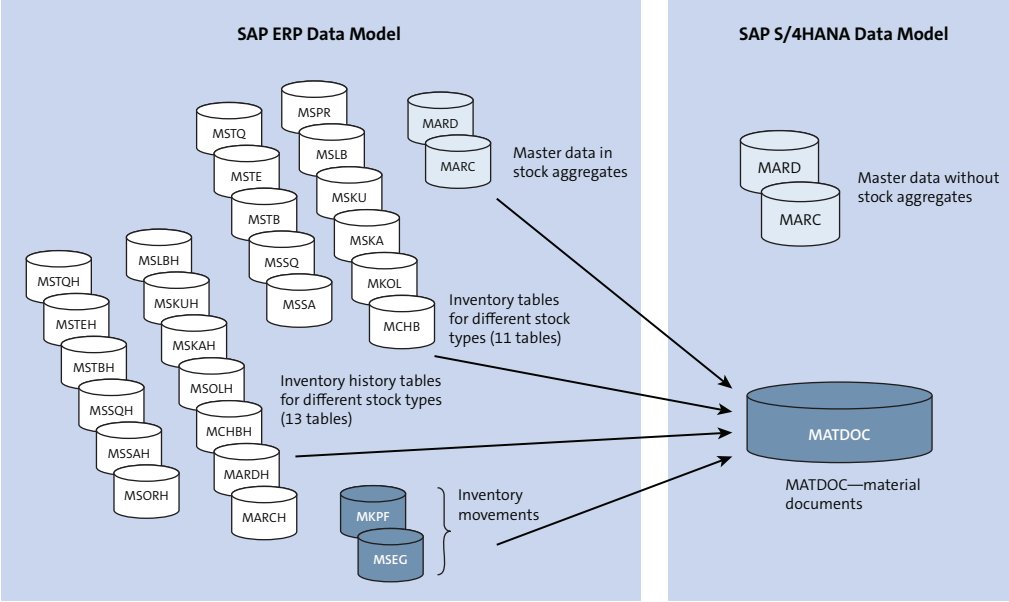


Figure 4.1 Inventory Management: Data Model Design

All aggregates tables will continue to exist in SAP S/4HANA. Through a redirect feature in SAP S/4HANA, any redundant table will be guided to the new table. Therefore, all customers' coding will continue to work in SAP S/4HANA.

4.2.2 Simplified Inventory Valuation

In SAP ERP, the inventory valuation tables contain transactional and master data attributes. With SAP S/4HANA, this is simplified. The inventory valuation tables do still exist as DDIC definitions as well as database objects. However, they will only be used to store material master data attributes. The transactional fields will be retrieved from the Material Ledger (ML), which is mandatory in SAP S/4HANA. As a result, those fields aren't updated any longer in the original tables. The original tables will be updated less often, which will increase the system throughput.

SAP S/4HANA features scalable material valuation capabilities using only one ML. That way, customers can use multiple currencies and valuation methods per different accounting laws, such as generally accepted accounting principles (GAAP). In the

traditional SAP ERP system, material valuation needs to occur on the IM level and the MM level.

Activation of the ML is mandatory in SAP S/4HANA, which enables improved and more flexible valuation methods in multiple currencies and parallel accounting standards. It also improves scalability of the business processes. In addition, the ML is a prerequisite for the use of actual costing.

With SAP S/4HANA, there is a simplification of the data model structure for inventory valuation. Data will now be stored mainly in the Universal Journal table ACDOCA.

4.2.3 Embedded EWM

Traditional Warehouse Management (WM) is available within SAP S/4HANA, and all existing business processes and functionalities will remain available. However, traditional WM isn't the target architecture; in the long term, it will be replaced by SAP EWM. Release 1511 already provided integration for a decentralized SAP EWM deployment. As part of release 1610, one of the key innovations was SAP EWM embedded in SAP S/4HANA, which provides state-of-the-art warehousing capabilities within one system. With this functionality, SAP offers an additional deployment option for its customers to have SAP EWM deployed within the core of SAP S/4HANA.

Figure 4.2 shows the available options for deployment options for SAP EWM

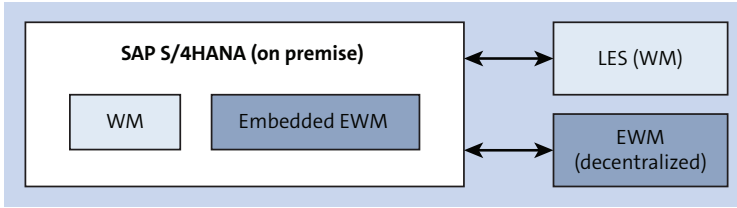


Figure 4.2 Warehouse Management Deployment Options in SAP S/4HANA

In the long term, SAP will continue to support and invest only in SAP EWM (SAP EWM embedded in SAP S/4HANA and decentralized SAP EWM), and a common core of functionalities within SAP EWM will evolve over time for both options. Decentralized SAP EWM, either integrated with SAP S/4HANA or SAP ERP, will remain a valid deployment option in the longer term due to various business reasons for customers, such as the following:

- Risk mitigation
- Regional SAP EWM systems
- Multiple SAP ERP connections (e.g., some logistic service provider scenarios in which multiple SAP ERP systems need to be connected)

SAP EWM embedded in SAP S/4HANA will contain the scope of SAP EWM 9.4, and both deployment options will have an almost identical common core, covering the same business scenarios and processes with very few minor exceptions (e.g., multiple SAP ERP connections aren't possible in SAP EWM embedded in SAP S/4HANA). The technical integration with SAP ERP will be different for SAP EWM embedded in SAP S/4HANA and decentralized SAP EWM; however, the same integration will be used with other systems (e.g., SAP Global Trade Services [SAP GTS] or SAP TM). SAP EWM embedded in SAP S/4HANA will use the scope of SAP EWM 9.4 with a focus on simplification and reduction of redundant objects and data.

With SAP EWM embedded in SAP S/4HANA, SAP provides the latest warehousing capabilities. The following are the high-level key benefits of this change:

- A single system
- Reduction of data redundancy
- Elimination of the Quality Inspection Engine
- Simplification

We'll describe these benefits in greater detail in the following subsections.

A Single System

First, with SAP EWM embedded in SAP S/4HANA, the integration with SAP S/4HANA core processes is simplified. Core interfaces are no longer required for master data objects, resulting in a reduction of data replication, which offers the following benefits:

- Reduced database footprint
- Reduced effort for monitoring and data alignment and thus less total cost of ownership (TCO)
- Simplification of system and data setup

Master data objects and actual data—for example, accounting objects and material values—are all contained within one system, allowing a direct read of data, increasing system throughput, and reducing system complexity. In the decentralized SAP EWM version, several almost identical Customizing tables exist between the SAP ERP system and SAP EWM. In SAP EWM embedded in SAP S/4HANA, these redundant tables are reduced, resulting in a significant reduction of Customizing in SAP EWM.

In addition, with SAP EWM embedded in SAP S/4HANA, the SAP Fiori launchpad is enabled, providing warehouse users with a similar UX as is found with the SAP Fiori launchpad as the single point of access for all SAP Fiori apps.

We'll now describe the main details of these changes for each object:

- **Business partners**
  In the classic version of SAP EWM, core interfaces are needed to transfer business partners (customers/vendors) to SAP EWM, and these will be mapped to business partner objects in SAP EWM. SAP EWM uses different numbering, and due to differences in data objects, different address check routines need to be set up in SAP ERP and in SAP EWM. With SAP EWM embedded in SAP S/4HANA, there will be only be one business object (i.e., business partner), which will be used for both customers and vendors across different lines of business (LOBs) in SAP S/4HANA.
- **Material master**
  Like business partners, in SAP EWM embedded in SAP S/4HANA, there's no need to transfer master data from the SAP ERP system to SAP EWM; instead, all the relevant data (e.g., various SAP APO tables) will be read through Core Data Services (CDS) views and used for SAP EWM. SAP EWM embedded in SAP S/4HANA also provides the additional benefit of support for 40-digit material masters.
- **Batch master**
  In SAP EWM embedded in SAP S/4HANA, all relevant batch information will be available immediately for usage within SAP EWM. This offers users various benefits, such as the ability to manage batches with shelf life even without batch classifications and the ability to manage batches based on plant-specific attributes, addressing a limitation of SAP EWM 9.4.

Figure 4.3 shows the traditional scenario and the new SAP EWM embedded in SAP S/4HANA scenario for the three data objects.

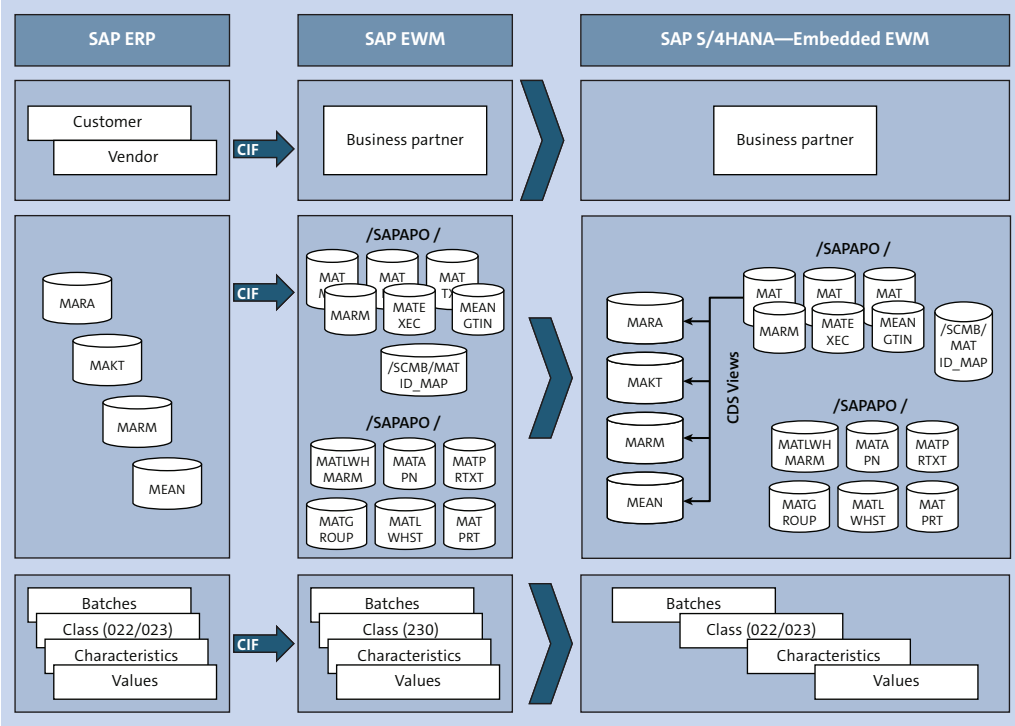


Figure 4.3 Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA

In addition to the data objects discussed previously, the same principles apply for the following data objects:

- **Product valuation data and accounting data**
  Standard table `MBEW` is used to store material valuation data. Specific information from this table in the traditional scenario is transferred through Remote Function Calls (RFCs) into two tables in SAP EWM to store the material price and split valuation. In SAP EWM embedded in SAP S/4HANA, all material values can be read directly in SAP S/4HANA from the main table `MBEW`.

  In addition, only relevant accounting objects will be replicated in SAP EWM through RFCs; therefore, not all accounting-related information is available in SAP EWM. With SAP EWM embedded in SAP S/4HANA, all accounting documents will be immediately available and can be accessed directly. There is no longer any need to replicate accounting objects.

- **Project stock**
  With SAP EWM embedded in SAP S/4HANA, the existing table `/SCWM/ERP_PSP` with

the mapping and conversion routine will be redundant because you can access standard table PRPS directly.

- **Dangerous goods/hazardous substances and phrases**
  No data replication through Application Linking and Enabling (ALE) is required. With SAP EWM embedded in SAP S/4HANA, you have direct access to all standard tables.

With SAP EWM embedded in SAP S/4HANA, several Customizing tables have been eliminated due to similar Customizing in SAP ERP. An example is table THUTYPE in SAP ERP for the handling unit type configuration and its equivalent in SAP EWM, table /SCWM/THUTYPE, with the exact same configuration. As a result, 12 different tables have been removed in SAP EWM, eliminating double data maintenance and the risk of data mismatch.

Reduction of Data Redundancy

The following changes have been made to optimize processes and reduce data redundancy:

- **Expected goods receipt (EGR) will no longer be used**
  With decentralized SAP EWM, EGR can be used to copy data from a purchase order or production order to the inbound delivery. Data replication occurs through a report in SAP EWM. With SAP EWM embedded in SAP S/4HANA, EGR no longer exists and isn't needed any longer because the inbound delivery can be created directly from the purchase order or production order with the most up-to-date information. Figure 4.4 shows the decentralized SAP EWM option versus the new SAP EWM embedded in SAP S/4HANA version.
- **Delivery request (notification) and posting change request document eliminated**
  The delivery request (notification) document can be used for inbound and outbound processes to save and transfer all relevant information from a reference document to the delivery document. With decentralized SAP EWM, the delivery request (notification) document is skipped; instead, the delivery document in SAP EWM is created directly from either the inbound or outbound delivery document in SAP S/4HANA. Therefore, any functionalities in standard SAP EWM that are linked to the delivery request or notification document will no longer be available in SAP EWM embedded in SAP S/4HANA.

  The same applies for the posting change request document. In SAP EWM embedded in SAP S/4HANA, the posting change document is created directly from the outbound delivery document.

  Figure 4.5 shows the current process and the new option for both inbound and outbound processes.

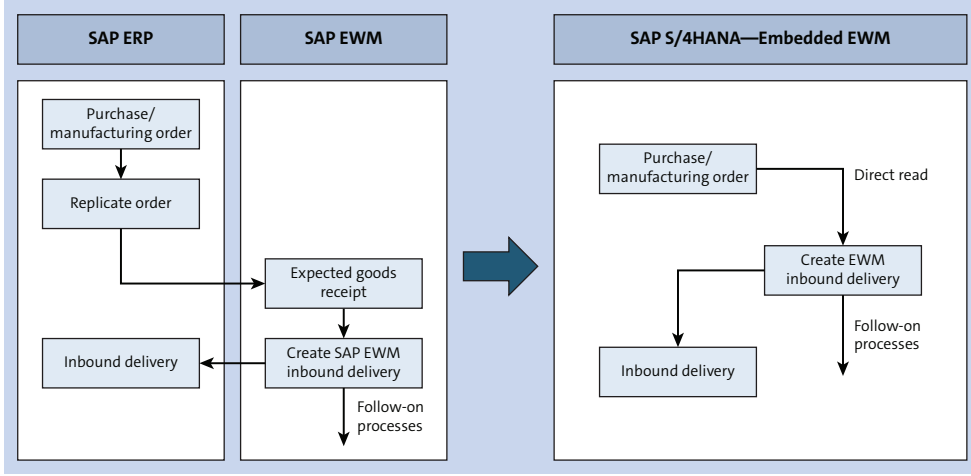


Figure 4.4 Expected Goods Receipt in Classic SAP EWM versus SAP EWM Embedded in SAP S/4HANA

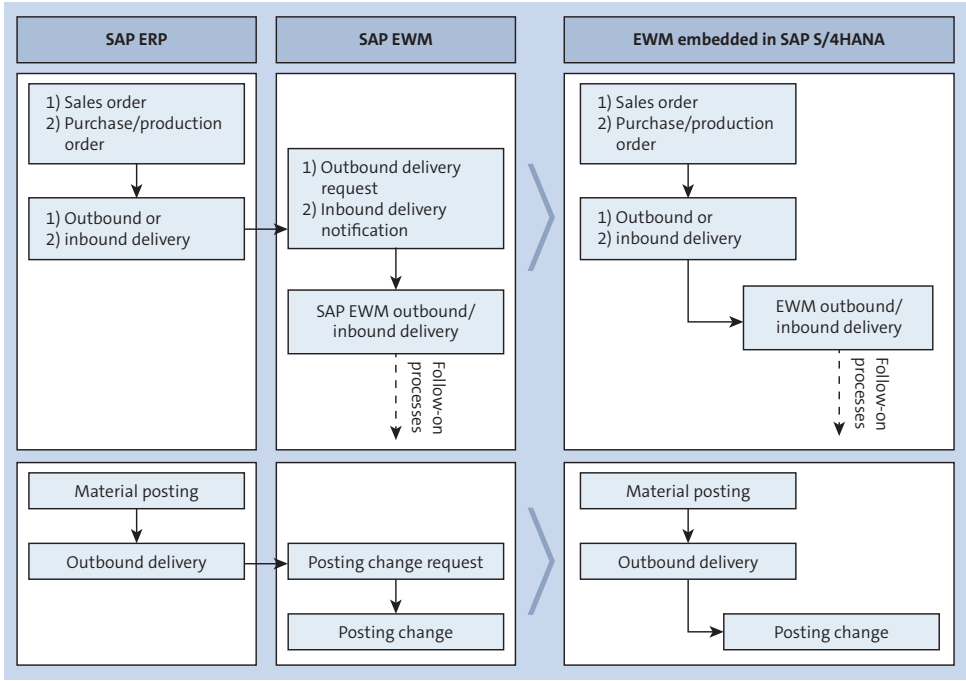


Figure 4.5 Delivery Request (Notification) and Posting Change Request Documents in Classic SAP EWM versus SAP EWM Embedded in SAP S/4HANA

Elimination of the Quality Inspection Engine

The elimination of the Quality Inspection Engine is the result of reduction of data redundancy and is an important new benefit. The Quality Inspection Engine had been used as a lean solution to support the quality inspection process and offered functionalities that provided flexibility for configuration inspection rules. In the classic SAP EWM scenario, inspection details are set up in the material master, and the inspection rule details are set up to determine the inspection relevance of a document.

With SAP EWM embedded in SAP S/4HANA, no inspection setup is required in the material master; all details are captured in SAP EWM embedded in SAP S/4HANA.

Due to the elimination of the Quality Inspection Engine, the process will be optimized significantly. In classic SAP EWM, the inspection process is as follows:

1. In SAP EWM, a GR of an inbound delivery is waiting to be posted.

> **Note**
>
> The trigger can also be at delivery creation or "in yard" status.

2. Based on the inspection rules setup, the Quality Inspection Engine will determine whether it's relevant for the inspection process.
3. If yes, an inspection document is created and saved.
4. After release of the inspection document, the Quality Inspection Engine informs the SAP ERP system of the creation of an inspection document.
5. An inspection lot is created based on the inspection setup data in SAP ERP. The inspection document in the Quality Inspection Engine and inbound delivery is updated accordingly.
6. The inspection is executed and details are recorded in SAP ERP.
7. The usage decision is also recorded in SAP ERP.
8. SAP ERP transfers the relevant inspection details to the Quality Inspection Engine, and the inspection document is updated.
9. Follow-up actions in SAP EWM are executed accordingly.

With SAP EWM embedded in SAP S/4HANA, the inspection process is as follows:

1. In SAP EWM, a GR of an inbound delivery is waiting to be posted.
2. Based on the inspection rules setup, using the quality management functionalities in SAP S/4HANA, the system determines whether it's relevant for the inspection process.

3. If yes, the system determines the inspection setup data and creates an inspection lot.
4. The inspection is executed and details are recorded in SAP S/4HANA.
5. The inspection details are recorded.
6. The usage decision is recorded.
7. In SAP EWM, follow-up actions are executed accordingly.

In the first release of SAP EWM embedded in SAP S/4HANA, the quality inspection process comes with a basic scope. Several processes have still not been included yet in SAP S/4HANA release 1709.

The following are some of the processes that aren't included yet:

- Several inspection object types, such as preliminary inspection inbound delivery, counting, and preliminary inspection handling unit
- Partial inspection lot decisions
- Presampling in production
- Returns inspection

The following are the processes included in the core quality management functionalities instead:

- Physical sample-drawing procedure, quality level, or dynamic modification
- Inspection rule features, document attachment, and findings

Simplification

With release 1610, SAP EWM embedded in SAP S/4HANA offers massive simplifications through reduction of redundant data and through leaner processes and fewer business documents. In addition, specific functionalities within the classic SAP EWM have been disabled or replaced to meet SAP S/4HANA guidelines and vision. The following functionalities have been disabled/replaced:

- **SAP TM (freight order management [FOM])**
  The decision not to include FOM in SAP EWM embedded in SAP S/4HANA arose mainly because SAP TM offers enhanced functionalities and has been made available as an embedded functionality within SAP S/4HANA. SAP TM is also offered as a sidecar solution. We will describe embedded SAP Transportation Management in more detail in the next section.
- **Labor demand planning**
  Labor demand planning isn't offered in the first releases of SAP S/4HANA because

reengineering of the SAP S/4HANA core functionalities is required to meet SAP S/4HANA guidelines. As a result, labor demand planning will be scheduled for a later release of SAP S/4HANA.

- **Supply chain routing (SAP Supply Chain Management [SAP SCM] routes)**
  SAP doesn't want to offer routes in SAP ERP, SAP TM, and SAP SCM in the long run; therefore, the SAP SCM routes are disabled, and only SAP ERP routes are used.
- **Microsoft Silverlight UI replaced by SAPUI5 technology**
  The official end-of-support date for Microsoft Silverlight is October 5, 2021. Microsoft Silverlight will be replaced by SAPUI5 technology for the following four use cases:
  - Creating appointments
  - Monitoring appointments
  - Planning staging areas
  - Maintaining capacity

Due to the mentioned massive simplifications of SAP EWM embedded in SAP S/4HANA, the effort required for basic setup of SAP EWM has been reduced significantly and now includes only a third of the setup in the SAP EWM/SAP ERP integration guide.

4.2.4 Transportation Management

One of the key innovations in supply chain for release 1709 is the embedded SAP TM basic shipping functionality. It offers best-of-breed transportation functionalities, leveraging existing SAP TM, built within SAP S/4HANA. Just like the embedded SAP EWM functionality, embedded SAP TM is the target architecture and will replace the legacy transportation management functionality brought over from SAP ERP in the long run. With SAP TM embedded within SAP S/4HANA, SAP is following the principle of one: one set of master data within one system, with no more data redundancy.

Figure 4.6 shows the different options to deploy basic shipping functionalities within SAP S/4HANA. In the traditional SAP ERP system, basic shipping functionalities were offered through Transportation in SAP ERP (LE-TRA); however, in the longer term this will be replaced by embedded SAP TM. With the first option, SAP offers compatibility packs to enable users to continue use the existing transportation functionalities (which are based on LE-TRA) within SAP S/4HANA until end of life of the compatibility packs. The second option, available since 1709, is to use the embedded SAP TM option within SAP S/4HANA. The third option is to deploy SAP TM as a sidecar.

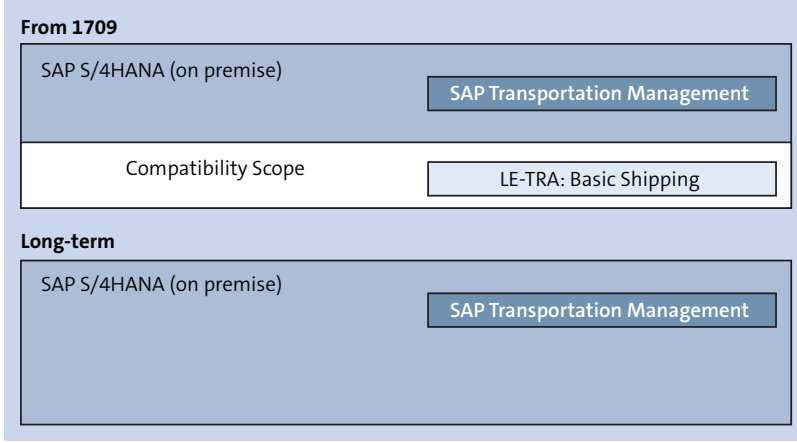


Figure 4.6 Different Deployment Options for Basic Shipping Functionalities

Key benefits of embedded SAP TM in SAP S/4HANA are as follows:

- One system, leading to the following:
  - Harmonized master data, with no interfaces required any longer (see Figure 4.7)
  - Harmonized Customizing
  - Harmonized transport scheduling
- Real-time embedded analytics
- SAP Fiori launchpad UI for SAP S/4HANA
- Integrated transportation management and extended warehouse management functionalities

Figure 4.7 shows the business partner and material master requirements for traditional SAP ERP and the embedded SAP TM within SAP S/4HANA.

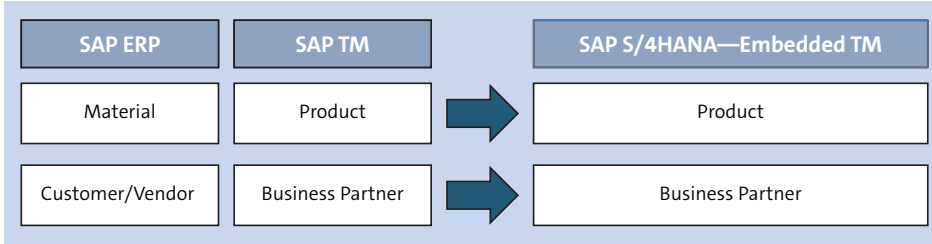


Figure 4.7 Integration of SAP TM with Traditional SAP ERP versus Embedded SAP TM Functionality in SAP S/4HANA

Because SAP TM is the target architecture, SAP is planning to continue providing more innovations and simplifications in the upcoming releases.

4.3 Outlook

As mentioned earlier in this chapter, embedded SAP EWM and SAP TM will be the target architecture; as a result, SAP has scheduled more innovations in these two areas. In addition, SAP will add more enhanced and predictive analytics, especially in the area of logistics, inventory management, and extended warehouse management. Machine-learning and artificial intelligence will be introduced in several areas, such as quality management and inventory management, to improve process optimization.

Table 4.2 lists key innovations that are scheduled for the supply chain in future releases coming in 2018 and later.

Area	Future Innovations
Inventory management	■ More predictive analytics for improved decision making ■ New scenarios for demand-driven intercompany and stock transfers ■ Machine learning and artificial intelligence for master data and process optimization
Logistics execution	■ New and improved analytics for shipping and receiving specialists ■ Improved KPIs and KPI monitoring capabilities to foster insight to action
Transportation management	■ Industry requirements for the following: – Retail, – E-commerce – DSD – Bulk transportation ■ Internet of Things (IoT) integration capabilities for track and trace ■ Simulation capabilities for freight capacity ■ Integration into external optimization/planning ■ Integration into supply chain planning and SAP BW/4HANA ■ Driver management

Table 4.2 Key Innovations Planned in Supply Chain Areas

Area	Future Innovations
Quality management	■ Improved analytics of quality management data to provide insights to action ■ New SAP Fiori apps and pages for compliant management ■ Simplified inspection planning processes ■ Machine-learning capabilities for compliant processes with solutions proposals capabilities ■ Standardization of issue-resolution procedures
Extended warehouse management	■ Simulation and forecasting capabilities ■ Industry specific extensions (e.g., automotive) ■ New scenarios for IoT ■ Enhanced analytics ■ Expanded warehouse automation ■ Extended e-commerce capabilities

Table 4.2 Key Innovations Planned in Supply Chain Areas (Cont.)

4.4 Summary

In this chapter, we've shown the key pain points from our C-level executives and how SAP S/4HANA innovations can resolve some of these. The innovations discussed in this chapter include the following:

- Simplified data model and table structure, reducing the data model complexity and reduced complexity for custom code implementation
- Embedded functionalities in SAP S/4HANA, such as SAP EWM and SAP Transportation Management, strengthening the back-office functionalities from the core and reducing complexity in system landscape
- No redundant data and simplified processes because all processes are executed within one system (direct postings and no redundant documents, such as expected goods receipt documents)
- Real-time analytics providing the most accurate information on inventory levels and ability for better decision-making due to improved visibility
- One material valuation instead of two (IM and ML), reducing complexity and redundant setup and information

SAP will continue to provide innovations for the supply chain LOB. The areas of focus for next releases will be embedded transportation management, improved analytics, and machine-learning and artificial intelligence capabilities.

Chapter 5
Sales, Marketing, Commerce, and Service Management

This chapter will focus on the industry pain points within the sales, marketing and commerce, and service management lines of business and address the SAP S/4HANA innovations that will help C-level executives to address these key pain points.

In this chapter, we'll focus on three lines of business: sales, marketing and commerce (which are often grouped), and service management. We'll start with a look at industry pain points and the benefits SAP S/4HANA offers. Then, we'll discuss the key functionalities for each LOB, starting with sales. For example, within sales, the highlights are the sales order cockpit and new functionalities such as condition contract settlement and advanced ATP. As in previous chapters, we'll discuss each functionality in a more detailed way in later sections to provide a good understanding of what these functionalities have to offer.

Then, we'll discuss the functionalities within marketing and commerce and especially go into a little more detail for the embedded SAP CRM and integration with SAP Billing and Revenue Innovation Management. Finally, we'll conclude the chapter with the functionalities SAP S/4HANA offers for service management, service master data maintenance, and service parts and service agreements management.

The final sections of this chapter will include an outlook and a summary for all three LOBs.

5.1 Industry Pain Points and SAP S/4HANA Benefits

The role of the internal sales representative has become increasingly challenging. Today, customers are more demanding than ever and are expecting a more personal approach to service. In addition, they want the most up-to-date information related to their orders and delivery time lines at any point in time. Expecting sales

representatives to share information with them, listen to their feedback, and involve them in the order fulfillment process creates many challenges for the sales representative:

- **Lack of real-time data**
  Real-time data is necessary for managers to make more efficient order fulfillment decisions.
- **Advanced analytics**
  Lack of advanced analytics hinders the creation of a holistic view of the supply chain processes.
- **Integration**
  Better integration of the various components of the supply chain is necessary to identify risks and issues more quickly (e.g., stock shortages).
- **Collaboration with customers**
  Enterprises need to collaborate with their customers to improve and personalize the customer experience and thus drive growth.

SAP S/4HANA can support today's key challenges in sales. Its capabilities offer an internal sales representative a comprehensive overview of the current order fulfillment situation. Real-time data and on-the-fly analytics can be used for troubleshooting and decision-making purposes.

SAP S/4HANA can support the key challenges that CSCOs face today. Table 5.1 describes how SAP S/4HANA innovations can address the key challenges from sales, marketing and commerce, and service management perspectives.

Challenge for the CSCO	How SAP S/4HANA Can Help
Lack of visibility: ■ Traditional SAP ERP system doesn't provide capabilities to provide a holistic overview of the order fulfillment flow. ■ Lack of real-time visibility of accurate inventory level results in incorrectly committed sales orders.	SAP S/4HANA provides the following: ■ Advances a single source of holistic transparency into sales order fulfillment issues on desktops and tablets. ■ Increased visibility for remaining noncommitted inventories and possibilities to cover incoming customer orders. ■ Sales order fulfillment cockpit improves visibility of the order flow and allows internal sales representatives to monitor and focus on exceptional cases. ■ Increased visibility through new improved SAP Fiori apps for performance and order fulfillment management.

Table 5.1 Sales Challenges and SAP S/4HANA Advances

Challenge for the CSCO	How SAP S/4HANA Can Help
Increasing volatility in demand and supply and insufficient capabilities to meet the increasing customer demand due to the following: ■ Lack of order flow status and inability to track orders. ■ Insufficient system support to allow exception-based work. ■ Inability to have an accurate overview of stock levels.	SAP S/4HANA improves the process as follows: ■ Improved sales processes help enterprises be more prepared for volatility in supply. ■ Improves customer retention by enhancing the flow of information on order status and tracking. ■ Accelerated complaints and returns management. ■ Exception-based working to monitor and react to shortages faster. ■ Clarification of issues effectively and efficiently by prescriptive decision support and facilitated collaboration. ■ Advanced ATP process with flexible rules to quickly reschedule orders based on customer and demand priorities with prescriptive decision support.
Increased complexity: ■ Complexity in document tables. ■ Inefficient and complex process to get order status flow or stock status; need to go through different screens or different sources to get the full status.	The following simplifications have been made: ■ One central master data object (business partner) for vendors, customers, and business partners. ■ SAP GTS replaces SD foreign trade/customs. ■ SAP Credit Management replaces SD credit management. ■ Settlement Management replaces SD rebates. ■ SAP Revenue Accounting and Reporting replaces SD revenue recognition. ■ Various document status tables were eliminated and moved to corresponding header and item tables. ■ Elimination of redundant document and rebate index tables. ■ SD foreign trade will be replaced by SAP GTS as the central solution for foreign trade-related requirements. ■ Embedded SAP CRM functionality to strengthen back-office activities in the core of the enterprise and reduction in complexity due to all elements being embedded in one system. ■ Fully embedded service management processes within the core and embedded functionalities for SAP Hybris Billing solution reducing complexity in IT landscape.

Table 5.1 Sales Challenges and SAP S/4HANA Advances (Cont.)

Challenge for the CSCO	How SAP S/4HANA Can Help
Lack of collaboration: ■ Lack of integrated view of the ATP situation. ■ Lack of integration with SAP CRM–related systems, resulting in an inability to view customer data to predict demand and act accordingly.	Better collaboration due to the following: ■ Improved integration of sales and production through the integrated ATP process. ■ Standard integration with the SAP S/4HANA extended solution SAP Hybris for improved collaboration. ■ Embedded SAP CRM functionalities.

Table 5.1 Sales Challenges and SAP S/4HANA Advances (Cont.)

5.2 Key Sales Functionality

In this section, we'll discuss the SAP S/4HANA innovations for sales. Most of today's pain points in this area related to the lack of real-time analytics and visibility across the entire order fulfillment process. We'll discuss how innovations such as the sales order cockpit can help internal sales order representatives significantly in performing their work in a more efficient and effective way. Other areas of innovations are related to condition contract settlement and advanced ATP functionality, which will enable enterprises to be more flexible due to the more rule-based and flexible architecture of the solutions.

5.2.1 Data Model Simplification

In SAP S/4HANA, various existing status tables have been eliminated, and all fields under these tables have been moved to the corresponding header and item tables for sales documents, deliveries, and billing documents. The document flow table has been simplified as well. Redundant document and rebate index tables have also been eliminated (see Figure 5.1).

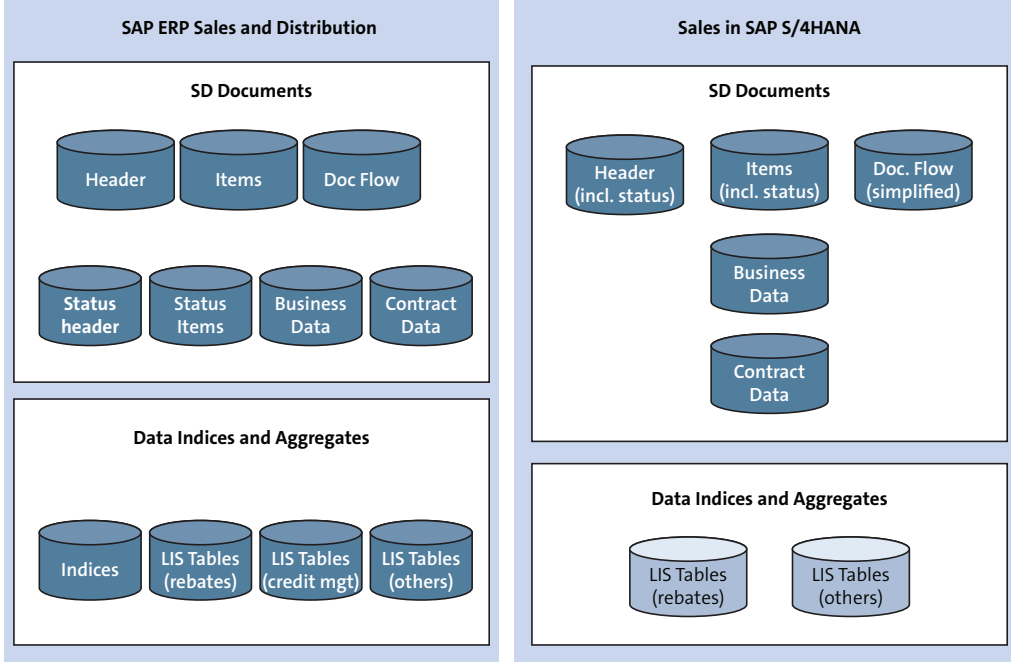


Figure 5.1 SD Data Model Simplification

With the changes in the data model, SAP S/4HANA offers the following key benefits:

- Lower TCO due to data model simplification
- Reduced memory footprint (e.g., simplified document flow, elimination of index tables, fewer aggregates)
- Increased performance of SAP HANA queries and code pushdown (one SELECT statement instead of two SELECT statements; easier join for header/items, including status and business data)
- Increased robustness of rebate processing (no redundancies due to aggregates)
- Faster business outcomes with reduced operational cost
- Increased competitiveness with integrated, fast, and flexible business processes
- Higher employee productivity with focus on value-added tasks

5.2.2 Sales Order Fulfillment Cockpit

SAP S/4HANA allows the user to monitor, manage, and collaborate on sales orders due for shipping and invoicing, allowing customers and company agreements to be fulfilled easily, on time, and accurately. By using the SAP S/4HANA sales order fulfillment cockpit facilitated by the SAP Fiori frontend UX, the sales representative can filter sales orders with issues and gain insight into the process execution. He can visualize issues over the entire end-to-end sales process in a single dashboard.

The sales order fulfillment cockpit in SAP S/4HANA offers the following business benefits:

- Enables visibility into order fulfillment
- Provides internal sales representatives the ability to focus on critical issues/exceptional cases
- Combines analytical insights with operational actions to allow internal sales representatives to run actions directly and track the progress at any point in time
- Improves collaboration with internal and external contacts to resolve issues

With the sales order fulfillment cockpit, companies can reduce their order-to-cash cycle time, increase their service level, and reduce outstanding payments. In the traditional SAP ERP system, the internal sales rep must check multiple reports for a holistic view of all related processes. Multiple issues in one order can't be detected easily in one step, creating a higher risk of undetected exceptions. Problem-related communication and decisions can't be tracked in the system, and reports need to be run multiple times.

Within the sales order fulfillment cockpit, the user can, immediately and on one screen, view all the sales order fulfillment issues, categorized by issues within the sales orders, delivery issues, supply chain issues, or billing issues. The SAP Fiori UX enables the user to drill down into each type of issue and immediately make corrections through the sales order fulfillment cockpit.

Figure 5.2 shows the sales order fulfillment cockpit, with the number of issues for each category and the sales documents details visible.

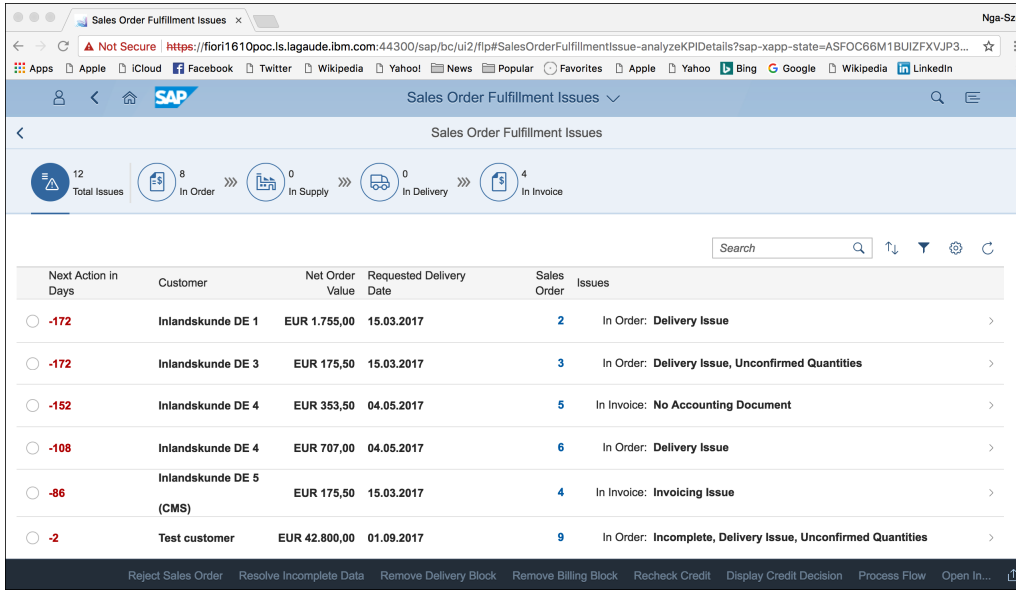


Figure 5.2 Sales Order Fulfillment Cockpit

5.2.3 Condition Contract Settlement

In SAP S/4HANA, sales and distribution rebates will be replaced by the condition contract settlement process, followed by the settlement management process. This means that all existing rebate agreements can only be processed up until the end of validity date and then closed by a final agreement. Customers with SAP CRM Trade Promotion Management (TPM) who want to integrate their existing SAP CRM TPM scenarios with SAP S/4HANA will have to use SD rebate processing, which has been optimized for the database footprint. Consider the following key differences between condition contract settlement and the SD rebate agreement functionality:

- With condition contract settlement, SAP provides a central solution for customers and vendors conditions. In the traditional solution, all customer rebate–relevant billing documents are stored in table VBOX. For changes that needed to be applied retrospectively, this table will need to be updated through a separate transaction (VBOF) and all billing documents in this table would be locked at the same time. The other issue is the size of the table; this table could contain millions of entries required for rebate calculation.

- In condition contract settlement, there is no table VBOF equivalent any longer. Rebate settlement-related information doesn't need to be stored in a table any longer; instead, rebate conditions will be applied instantly. In addition, condition contract settlement enables the user to use multiple data sources for rebate settlements. Traditionally, this can only be done based on the billing documents.

Figure 5.3 shows the traditional SD rebate agreement versus the condition contract settlement.

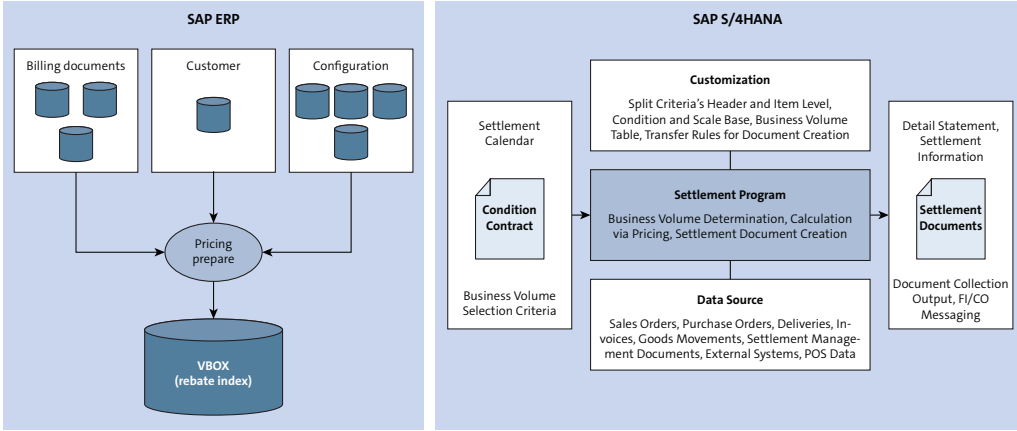


Figure 5.3 SAP ERP versus SAP S/4HANA Customer Rebates

The key benefits of condition contract settlement are as follows:

- It's a flexible and state-of-the-art solution for settlement scenarios. Users can determine business volume sources based on flexible and definable criteria that can be configured in customizing.
- It's designed for high performance (with SAP HANA).
- It enables new and innovative rebate scenarios to be set up thanks to its open architecture.

5.2.4 Advanced ATP

As part of release 1610, SAP has provided a new functionality related to ATP, which is called *advanced ATP* (AATP). It combines the simplicity of the traditional SAP ERP

system with the sophisticated back order and product allocation checks of SAP APO using an entirely new logic, making it more flexible and more user-friendly within one system. Within AATP, you can divide the new functionality into three key areas of innovations:

1. Backorder processing
2. Product allocation
3. Release for delivery

Now, let's explain each area in more detail.

Backorder Processing

The backorder processing functionality in SAP S/4HANA consists of four new SAP Fiori apps that will provide increased flexibility and enable the user to configure back order processing rules, set up and schedule backorder processing (BOP) runs, and monitor the results of the back order processing run.

Figure 5.4 shows the available SAP Fiori apps that will enable users to set up the entire back order process, as follows:

- **Configure BOP Segment**
  This SAP Fiori app allows users to define their own sets of rules and to prioritize the distribution of supply when the demand of materials exceeds the available inventory.
- **Configure BOP Variant**
  This SAP Fiori app will enable users to define a variant for BOP processing for automatic reschedule processing and materials rescheduling in case of limited supply. In a variant configuration, a combination of filters of prioritizers are assigned to a confirmation strategy for back order processing.
- **Schedule BOP Run**
  This SAP Fiori app enables users to schedule a BOP run to occur at any point.
- **Monitor BOP Run**
  Once the BOP run has been executed, this SAP Fiori app will enable the user to display the result of the executed run, in either simulation or active mode, and show the confirmation status of requirements and any processing issues during the run.

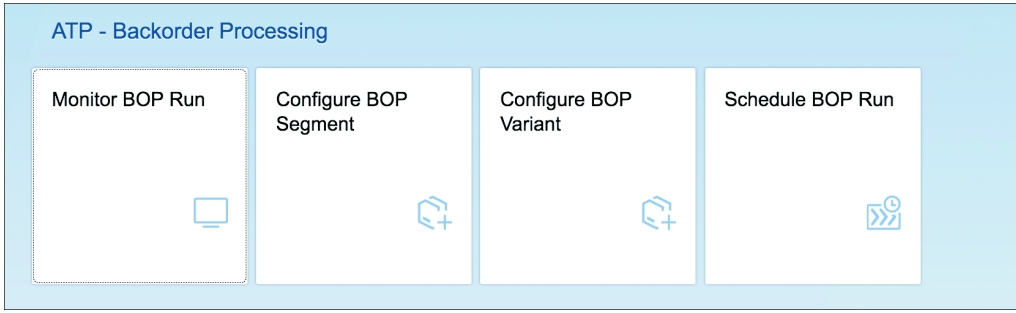


Figure 5.4 Backorder Processing

Within AATP BOP, there is a new concept for requirement classification, which allows orders to be confirmed according to predefined criteria. There are five classifications (win, gain, redistribute, fill, and lose), each with its own rule for order confirmation prioritization. For example, the winner and the gainer have the highest priorities and will never lose their confirmed quantities, whereas the loser will always lose all the confirmed quantities to any of the other classifications. Figure 5.5 shows the five requirement classifications in BOP and their priorities for order confirmation.

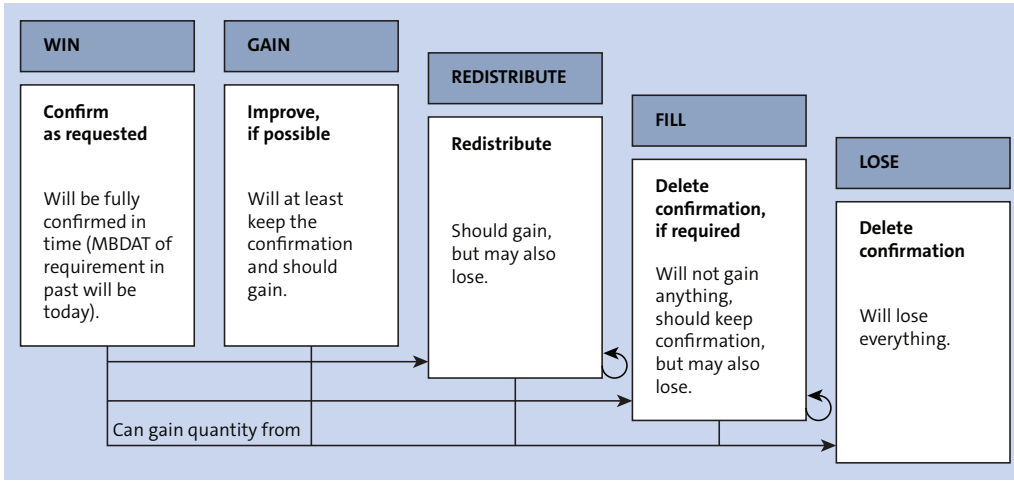


Figure 5.5 Requirement Classifications

Within the segment definition of the BOP variant, users can use a global filter (optionally). A global filter can be restrictive or inclusive. Figure 5.6 shows an example of BOP processing without a global filter.

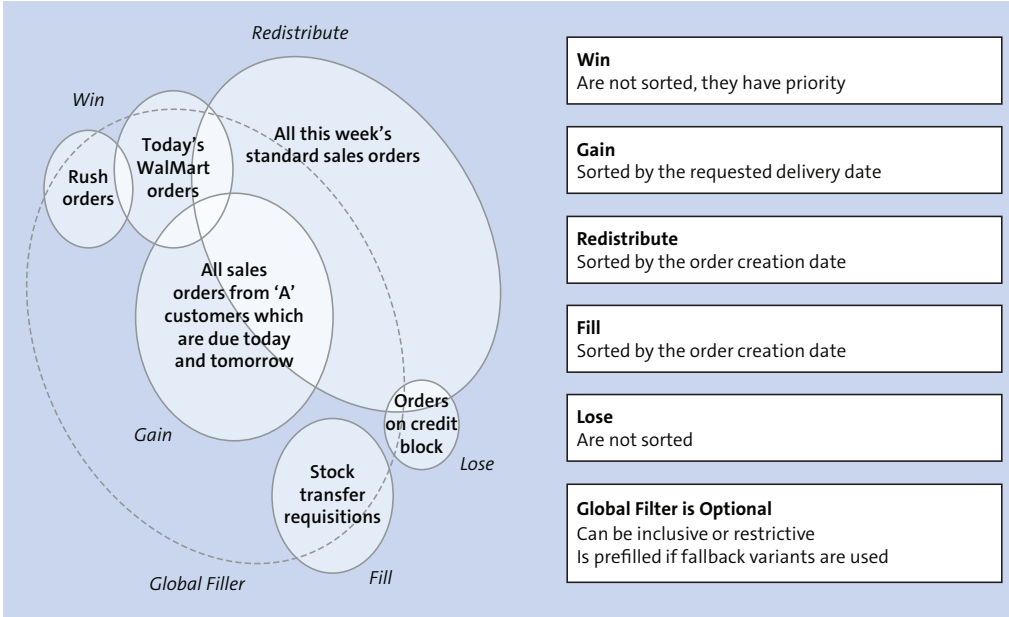


Figure 5.6 Backorder Processing without Global Filter

When no global filter is used in the BOP segment definition of the BOP variant, the BOP run will only take orders into account that fall within the criteria of the BOP segment definition and will reschedule and reconfirm orders based on the priority of each requirement classification.

When a global filter is applied within the BOP segment definition, BOP first will account for orders that meet the segment definition, then a global filter will be applied that will restrict all the orders for BOP processing that aren't part of the global filter. Figure 5.7 shows an example of BOP with a restrictive global filter.

In the example in Figure 5.8, the global filer is the master filter, which will define the set of requirements to be included in BOP. The BOP segmentation definition is only used to cluster and prioritize requirements within the BOP variant.

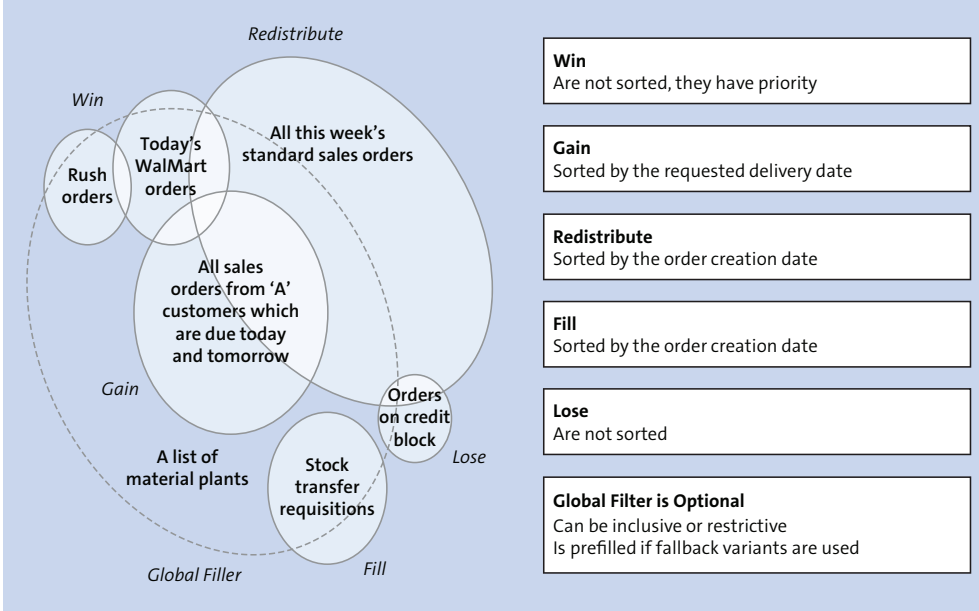


Figure 5.7 Backorder Processing with Restrictive Global Filter

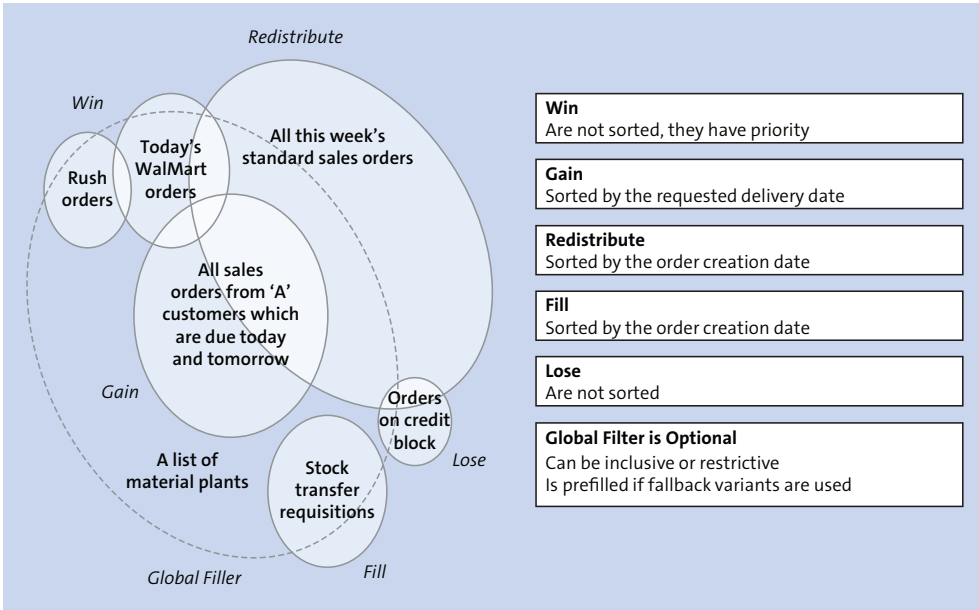


Figure 5.8 Backorder Processing with Inclusive Global Filter

Once the BOP run has been executed, users can access the SAP Fiori app to monitor the result and see the orders that have been successfully (re)confirmed and the issues that occurred during processing, as shown in Figure 5.9. In this example, orders that are successfully confirmed have a green status (checkmark), and ones with issues have a red status (exclamation point).

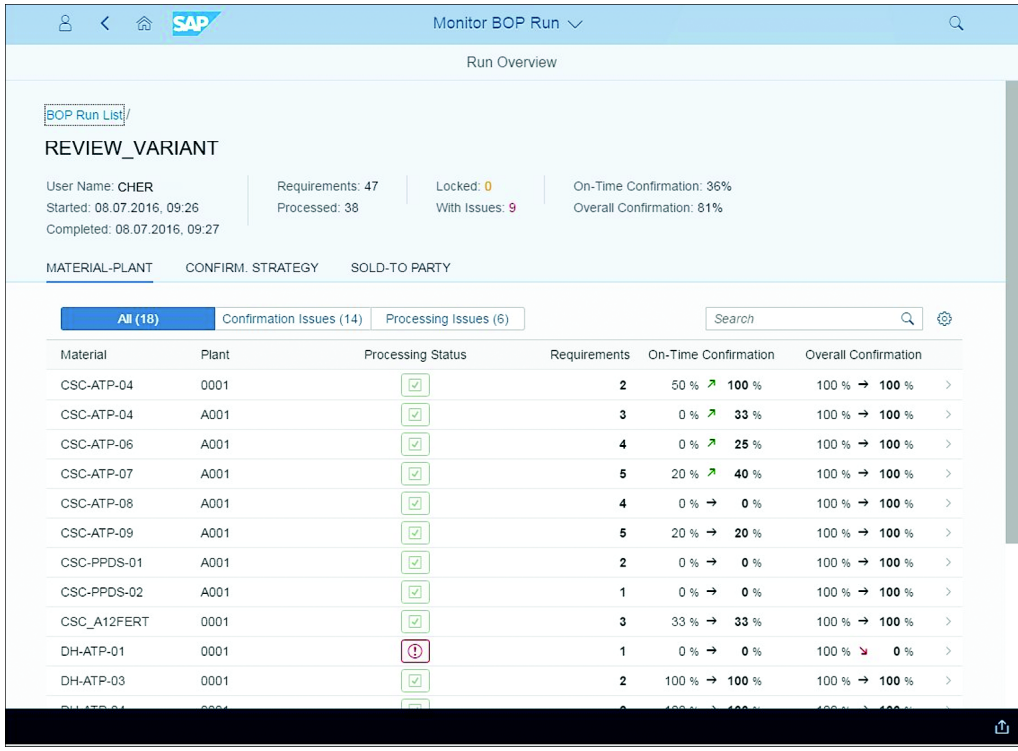


Figure 5.9 Result of BOP Run

Product Allocation

We'll now walk through the product allocation design within the advanced ATP functionality in SAP S/4HANA. As with BOP, SAP S/4HANA provides a completely new design for product allocation that enables increased flexibility for users to set up product allocation rules by using three new SAP Fiori apps. The product allocation apps are displayed in Figure 5.10.

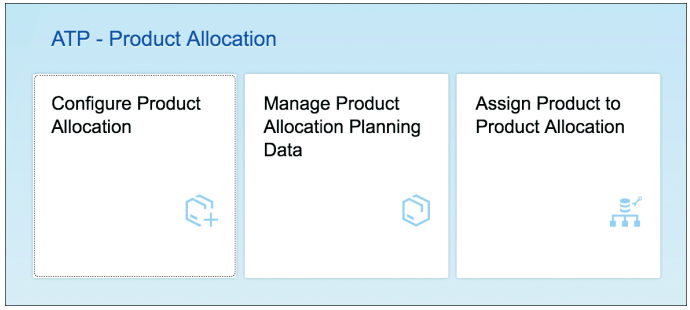


Figure 5.10 Available SAP Fiori Apps for Product Allocation

These three SAP Fiori apps will enable users to set up product allocation functionality in a more flexible way compared to traditional SAP ERP, in which product allocation is set up through configuration. The details of each app are as follows:

1. **Configure Product Allocation**
   This SAP Fiori app enables users to configure product allocation objects based on a variety of attributes at the sales order, material, plant, or customer level.
2. **Assign Product to Product Allocation**
   This SAP Fiori app allows users to assign a product allocation object to a product to support business decisions about whether and to what extent a sales order must be confirmed.
3. **Manage Product Allocation Planning Data**
   This SAP Fiori app enables users to manage product allocation data. The user can view all product allocation-relevant data in one screen and can use group and aggregation capabilities to allow mass allocations and easy maintenance of characteristics and planned allocation quantities.

Release for Delivery

The last key innovation within the advanced ATP functionality that we will describe is the Release for Delivery SAP Fiori app, which enables the user to do the following:

- Review order confirmation situations and timely actions on short-term supply and demand changes
- Redistribute already confirmed quantities to the order according to the company prioritization strategy

Figure 5.11 shows the Release for Delivery SAP Fiori app, which enables users to review and redistribute order confirmation situations.

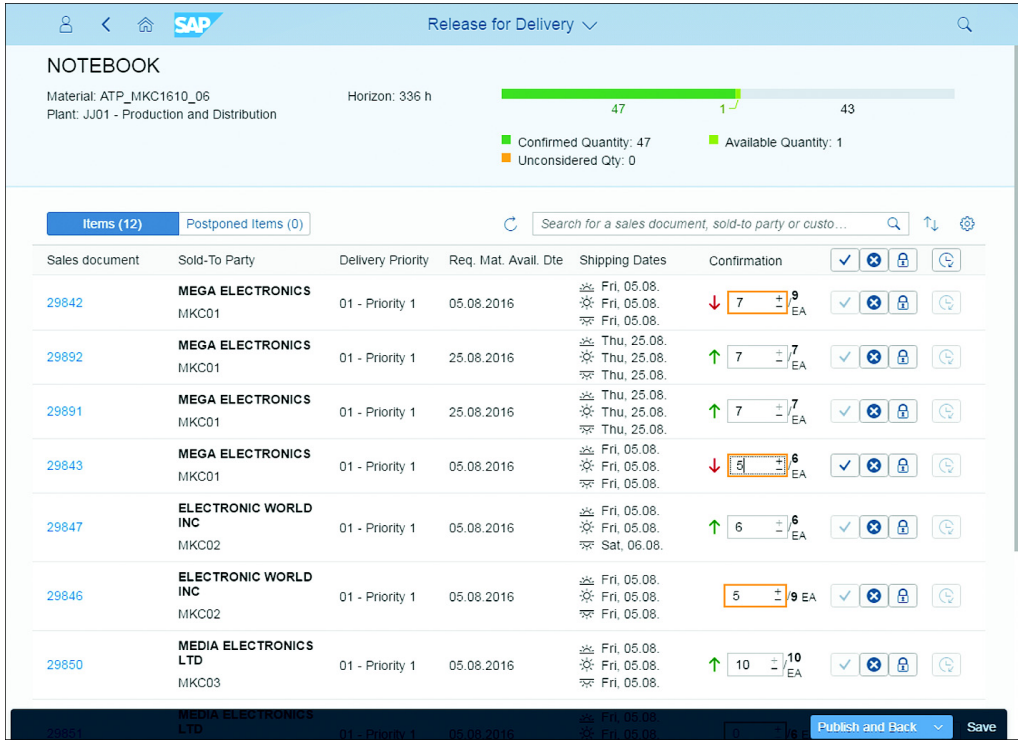


Figure 5.11 Release for Delivery SAP Fiori App

Based on the three key functionalities of AATP, its benefits compared to the traditional ATP functionality are as follows:

- Built for high-performance mass ATP check
- Increased automation due to more flexible order confirmation rules and priorities
- New requirement classification enables automatic exception handling
- Improved accuracy due to real-time inventory information
- Unified and simplified data all within one system

5.2.5 General Process Optimization/Simplification

Beyond the key innovations already discussed, SAP S/4HANA offers a few general optimizations that simplify sales processes. Let's look at a few:

- **SAP Global Trade Services (GTS) replaces SD foreign trade/customs**
  The foreign trade/customs functionality won't be available any longer in SAP S/4HANA; SAP GTS is the successor of this requirement. SAP GTS (previously provided as an external service installed as an additional instance) can be natively integrated with SAP S/4HANA. Letter of credit, legal control, export control, and preference management in foreign trade/customs aren't available any longer in the material master; instead, the SAP GTS-based functionalities are used. SAP GTS offers additional functionalities for import management and export management. For intrastate reporting a customer can leverage the functionality within SAP S/4HANA.

  Prior to conversion, careful analysis of all currently used foreign trade processes is needed. If the customer uses a third-party foreign trade system, it's possible that an adjustment will be needed from the respective third-party foreign trade system; alternately, SAP GTS can be connected to SAP S/4HANA to run the respective foreign trade processes.
- **SAP Credit Management replaces SD credit management**
  With SAP S/4HANA, SAP Credit Management (FIN-FSCM-CR) will be used. SAP provides tools to migrate to SAP Credit Management, which contains several elements:
  - Configuration data
  - Master data
  - Credit exposure data
  - Credit decision data
- **SAP Revenue Accounting and Reporting replaces SD revenue recognition**
  SD revenue recognition isn't available in SAP S/4HANA. Instead, SAP S/4HANA functionality should be used that supports the new revenue accounting standard according to International Financial Reporting Standard 15 (IFRS 15) and adopted by local GAAPs.

5.3 Key Marketing and Commerce Functionality

Let's turn our attention to key innovations in marketing and commerce.

One of the key innovations delivered as part of 1709 is the embedded SAP CRM functionality, which will bring core SAP CRM functionality into the core of your enterprise. With this change, SAP communicates a clear split between front-office and

back-office activities by strengthening the back-office activities through the embedded SAP CRM functionalities. Enterprises can choose to integrate SAP S/4HANA with extended solutions as well, such as SAP Hybris Sales Cloud and SAP Hybris Service Cloud to bring more functionalities to the front-office end. In addition, SAP S/4HANA also offers integration with the SAP Billing and Revenue Innovation Management solution.

5.3.1 Customer Relationship Management

One of the key highlights of release 1709 is the SAP CRM functionality, as an extended LoB solutions, within the core of SAP S/4HANA. With this functionality, SAP is heading in a new product direction. Traditionally, SAP CRM and SAP ERP are separated; between the two systems, there are many duplicate functionalities, such as quote management, pricing, and order and contract management. The integration between the two systems is rather complex; replication effort in both systems is required to move and transfer the appropriate information between both systems.

With SAP S/4HANA, SAP offers rich SAP CRM functionality in the core with seamless integration and low TCO, with the end goals of optimizing the processes in the back office (SAP S/4HANA) and simplifying the processes in the frontend with SAP Hybris. Figure 5.12 illustrates how the traditional scenario is changed by this new production direction.

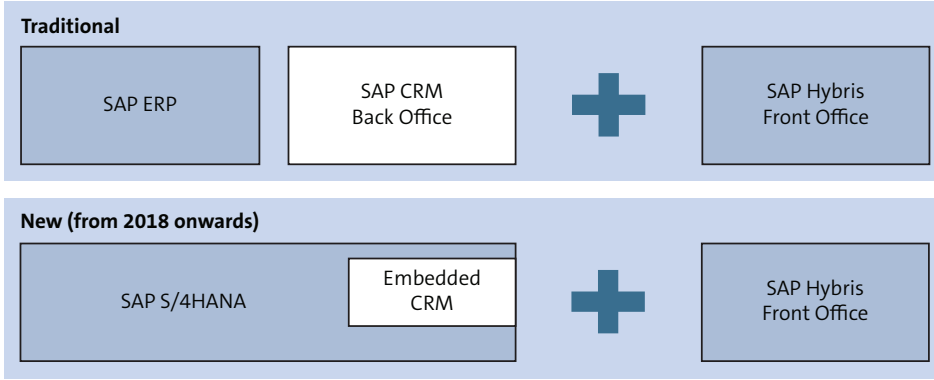


Figure 5.12 Traditional Back-Office and Front-Office Scenario versus New Scenario

With the first release of SAP CRM functionalities into SAP S/4HANA, SAP brings the key service management-related functionalities into the core of SAP S/4HANA.

Key benefits of SAP S/4HANA SAP CRM are as follows:

- Simplified landscape and operations due to embedment within the SAP S/4HANA core, thus reducing interfaces and middleware systems
- Reduction of functional redundancies
- Data harmonization
- SAP Fiori 2.0 UX

5.3.2 SAP Billing and Revenue Innovation Management

SAP Billing and Revenue Innovation Management is the SAP solution that enables enterprises, especially in the telecom and utilities industries, to process high volumes of transactions while enjoying increased flexibility and better integration with the different components of the offer-to-cash cycle.

In SAP S/4HANA, Contract Accounts Receivable and Payable (FI-CA) is integrated with SAP Biller Direct. With this integration, enterprises can offer their end customers a solution in which they can view their account status, receive invoices, and make self-service payments online. The SAP Biller Direct functionality is not the target architecture within SAP S/4HANA, but will still be available for now. In addition, master data replication, such as for business partners and contract accounts, is supported from FI-CA to SAP convergent charging as joint replication, which means only the master data related to provider contracts that are received in FI-CA will be replicated.

As of release 1709, the following existing solutions are not yet available in SAP S/4HANA:

- Billing and invoicing of consumption data is not possible within SD and FI-AR, but will only be available in FI-CA. Therefore, replication of provider contracts and the automatic creation of contract accounts without existing contract accounts in SAP CRM isn't possible.
- The Common Object Layer Framework, used to transfer data among SAP CRM, SAP convergent charging, and SAP ERP, will not be provided any longer. With SAP S/4HANA, this functionality will be redundant, as the transfer of data will be performed directly.

With the available integration with SAP S/4HANA, enterprises will now have more flexibility and scalability, leveraging the benefits of the SAP Billing and Revenue Innovation Management solution and integrated with SAP S/4HANA. Companies will now have the ability and flexibility to create new business models and leverage the following functionalities in FI-CA:

- Pricing simulation
- Subscription order management
- Billing, receivables, and collections
- Transaction pricing
- Usage metering

5.4 Key Service Management Functionality

In this section, we'll discuss the functionalities provided by SAP S/4HANA for the service management area. Most importantly, beginning with release 1610, enterprises can now leverage the SAP S/4HANA core to perform full end-to-end service management processes. Let's walk through the key functionalities that will enable enterprises to perform their service and service master data management processes, the management of spare parts, and service agreement processes.

5.4.1 Optimized Service and Service Master Data Management

SAP first offered service management functionalities with SAP S/4HANA release 1610. For service master data management, the following functionalities are available:

- **Technical assets and structure history**
  This includes the master data maintenance for the maintenance of installed equipment at the customer site, including details relevant to the customer, such as customer location, call center, field service, depot repair, and so on. Within the master data setup, you can provide relevant hierarchical and relationship structures for increased visibility. You also can view the history related to changes to service maintenance activities and master data changes.
- **Service task lists and catalogs**
  SAP S/4HANA provides a service task list with a sequence of individual tasks, including the required resources, tools, and materials to complete maintenance service requests. Through service catalog functionality, enterprises define and standardize a set of activities as a predefined service offered to their customers.
- **Service maintenance plan and event scheduling**
  This includes the automatic scheduling of service maintenance tasks based on available time and resources, determined by real-time data. With SAP S/4HANA, companies can plan predictive and preventive services based on a predefined and automatically scheduled maintenance plan.

5.4.2 Service Parts and Service Agreement Management

Service parts and service agreement functionalities in SAP S/4HANA can be divided into the following subprocesses:

- **Service management**
  Within the service management area, enterprises can now capture the different service management processes in SAP S/4HANA. During service initiation, all relevant tasks related to the service will be captured, and requirements such as resources and parts requirements will be defined to allow planning and scheduling of the service.

  With SAP S/4HANA, field service engineers and service management departments now have access to the most up-to-date data related to the service history and the service requirements to be able to deliver and execute the service. Once the service is successfully fulfilled, billing information can be retrieved instantly from all relevant sources, and monitoring capabilities will be provided to ensure tracking of timely billing and service revenue.
- **Service parts warehousing and fulfillment**
  Within SAP S/4HANA, several analytical apps are available to provide instant data on the available inventory and full integration with the core functionalities of SAP S/4HANA. This will enable enterprises to increase efficiency in the planning, procurement, and warehousing of parts.
- **Service agreement management**
  This includes the handling of service agreements across different industries. SAP S/4HANA enables companies to support different types of service agreements, such as service contracts and warranties. Within the service agreements, companies can capture all relevant information related to the service, like the type of service and the scope, which conditions are applied to the agreements, and how the service will be executed.

5.5 Outlook

Table 5.2 outlines the direction and planned future innovations for sales, marketing and commerce, and service management. Some of the key innovations scheduled for the upcoming releases are related to SAP CRM to enhance the core SAP S/4HANA functionalities with more SAP CRM capabilities and machine-learning capabilities for order processing.

Area	Current Planned Innovation
Sales	■ Machine-learning and natural language-processing capabilities within order and billing processes ■ Improved integration functionalities for the integration of third-party products and customer developments ■ New capabilities to create customer-specific reports ■ Improved capabilities to create queries and reports for KPI monitoring in a simpler way ■ Integration of letter of credit with treasury management
Marketing and commerce	■ Improved UX, such as new apps for SAP Hybris Billing ■ Improved real-time analytics ■ Adoption of machine-learning and artificial intelligence capabilities and predictive models ■ Collaborative invoice cockpit for product bundles, incorporating converging billing
Service management	■ Additional sales core functionalities and further enhanced service core functionalities based on SAP CRM add-ons, such as the following: ■ Lead and opportunity management ■ Activity, tasks, and territory ■ Call lists ■ Integration with SAP S/4HANA order management functionality ■ Complaint and in-house repair ■ Basic field service ■ Improved UX and introduction of SAP CoPilot ■ Improved analytics (e.g., to increase efficiency for sales operations)

Table 5.2 Outlook for Sales, Marketing and Commerce, and Service Management with SAP S/4HANA

5.6 Summary

In this chapter, we discussed the pain points and challenges in sales, marketing and commerce, and service management. We walked through the key innovations in sales, such as data model simplification and the sales order cockpit, and covered how new functionalities like AATP can help enterprises reduce complexity, improve sales

order–fulfillment visibility, and be more flexible when setting up new scenarios for backorder processing and rebate agreements.

In marketing, commerce, and service management, the key innovation in SAP S/4HANA is the embedded SAP CRM functionality, which makes SAP S/4HANA a stronger core for back-office activities when paired through standard integration with extended solutions such as billing and revenue and innovation management. For service management, SAP offers a full end-to-end solution within the core to enable service master data management and service parts and service agreement management.

In the next chapter, we'll focus on the sourcing and procurement LOB.

Chapter 6
Sourcing and Procurement

In this chapter, we'll address C-level pain points specifically in the sourcing and procurement area and see how SAP S/4HANA can help C-level executives resolve their pain points.

This chapter will focus on sourcing and procurement. We'll discuss the challenges in this area and how SAP S/4HANA can help address them. We'll then provide some more details about SAP S/4HANA innovations and about the future innovations and direction for the sourcing and procurement LOB.

6.1 Industry Pain Points and SAP S/4HANA Benefits

One of the key challenges within sourcing and procurement today is the technical complexity of the landscape related to the previous solutions introduced for procurement, such as SAP Ariba, SAP Supplier Relationship Management, and SAP Supplier Lifecycle Management. Different systems are providing operational, tactical, and strategic activities, resulting in many challenges in aligning data across systems and supporting the data.

In addition, challenges in today's ERP system are related to the following:

- Lack of visibility to view the entire purchasing flow and lack of real-time data to be able to provide accurate inventory levels
- Insufficient capabilities in the system to enable users to search for and view purchasing information efficiently
- Inability to be able to use advanced analytics to better understand and react to changes in the environment
- Lack of integration between systems, forcing users to go in different systems via different UIs

With the introduction of SAP S/4HANA Enterprise Management, some of the traditional challenges are being addressed in the following ways:

- Leveraging the Ariba Network to overcome the complexity of supply chains and to provide a system that functions as a single point of interaction
- Enabling self-service purchasing using SAP Ariba
- Integrating SAP Supplier Lifecycle Management functions with collaboration tools for a more efficient and tighter collaboration with business partners to reduce time to market, increase flexibility in the context of volatile demands, and increase supply chain visibility
- Introducing a simplified process using one data object for purchasing requirements, which helps to shorten process cycle times
- Using built-in transactional or strategic analytics—for example, through improved contract monitoring or supplier evaluation reporting

SAP S/4HANA provides a streamlined view of all procure-to-pay processes and gives you the visibility and insights you need to make strategic decisions or to optimize the procure-to-pay processes. With the new system capabilities combining OLAP with OLTP on the same SAP Fiori screen, drilling down into the lowest level of detail with real-time exposure gives performance providers a compelling value proposition to exploit. In the following subsections, we'll discuss the most important new functionalities introduced with SAP S/4HANA Enterprise Management for the sourcing and procurement space.

Table 6.1 lists the key challenges for the CSCO for the sourcing and procurement area and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Can Help
Lack of visibility: ■ No single view of the entire purchase order flow. ■ Lack of real-time data to provide accurate inventory levels. ■ Limited search capabilities; users go through different screens (or even different systems) to view data related across contract worklists and contract and supplier data.	Improved visibility and transparency with the following: ■ Ability to track purchase order flow. ■ Visibility of accurate inventory position across multiple plants. ■ Dynamic and flexible search feature across contract worklists with capability to navigate directly to contract and supplier fact sheets.

Table 6.1 Sourcing and Procurement Challenges and SAP S/4HANA Advances

Challenge for the CSCO	How SAP S/4HANA Can Help
■ Users access different systems to view different data across the entire flow.	■ One system for purchasing of all direct materials, indirect materials, and services with a harmonized UI.
Increasing volatility in demand and supply: ■ Lack of an integrated view of the process doesn't provide sufficient support to enterprises to be more prepared for volatility in demand and supply. ■ Lack of analytics.	SAP S/4HANA for sourcing and procurement helps reduce the impact of volatility in supply with the following: ■ Standard integration for SAP Ariba for a more efficient procurement process. ■ Advanced analytics to identify discounts and pricing opportunities for better supply planning.
Increased complexity: ■ Technical complexity of the landscape due to different solutions for different parts of the processes. ■ Challenges aligning data across different systems.	Complexity is reduced by the following: ■ One-step management of contracts and use of self-service requisitioning for procurement. ■ One central master data object (business partner) for vendors, customers, and business partners. ■ Standard integration with SAP Ariba for more optimized processes and a single source of truth.
Lack of collaboration: ■ Lack of integration between different systems, providing a single source of truth. ■ Inability to view an entire material flow for in-house production and procurement production.	Collaboration is enhanced with the following: ■ Ability to secure many-to-many networked collaboration with trading partners. ■ Seamless collaboration between production and procurement departments via MRP Cockpit. ■ Standard integration with SAP S/4HANA solutions such as SAP Ariba to improve collaboration.

Table 6.1 Sourcing and Procurement Challenges and SAP S/4HANA Advances (Cont.)

6.2 Key Sourcing and Procurement Functionality

In this section, we'll walk through the key SAP S/4HANA innovations in sourcing and procurement. We'll start with the innovations in the operational purchasing and provide some examples of SAP Fiori apps that will enable companies to perform operational procurement processes more efficiently. Then, we'll discuss the key functionalities for invoicing, sourcing, and contract management. Finally, we'll examine innovations in supplier evaluation and analytics.

6.2.1 Operational Purchasing

There are several key changes to the operational procurement processes that will be employed within the SAP S/4HANA Enterprise Management core in the following areas: self-service procurement, collaboration, UI changes, and purchase order output.

In the traditional SAP ERP system, there are no real-time insights for the operational purchaser to perform his day-to-day tasks. Decisions are made based on outdated data, and there is no real-time KPI reporting, which makes improving the service level challenging.

With SAP S/4HANA, users can get real-time insights and KPIs immediately. The operational purchaser can do his job based on the most up-to-date information, and at any point in time users can run real-time KPI reports to get insight on their performance. SAP S/4HANA offers the following real-time KPI reports:

- Purchasing and invoicing spend
- Contracts
- Purchase order average delivery time
- Supplier information

SAP S/4HANA provides the operational purchaser a holistic view of activities within operational procurement. Real-time analytics facilitates the purchasers directly reacting to spend exceptions or overdue purchase order items.

The **Procurement Overview Page** (Figure 6.1) provides all companies with all their relevant KPI information in one screen, enabling them to immediately see their current performance without running multiple reporting as in the traditional SAP ERP system. They can immediately see exceptions and act on them.

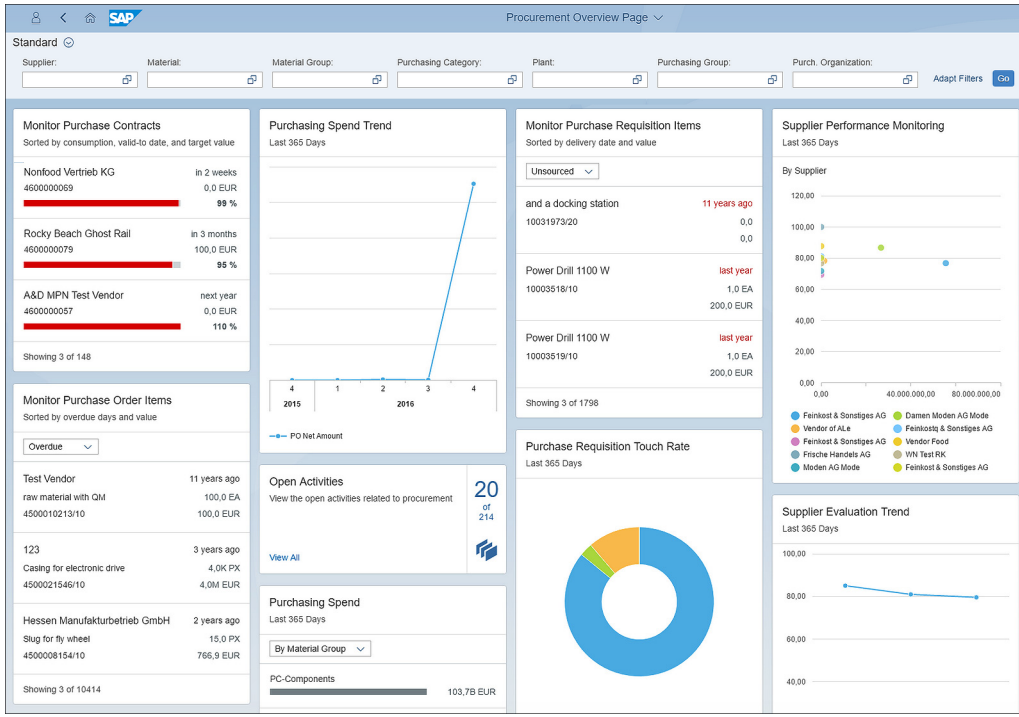


Figure 6.1 Procurement Overview Page with All Procurement KPIs on One Screen

Figure 6.2 shows an example of one of the standard KPIs for purchase order average time. This app enables the strategic buyer to monitor performance and follow up with the supplier proactively based on available statistics. Like other analytical SAP Fiori apps, it offers users several views for display, such as the following:

- **By Supplier**
- **By Material Group**
- **By Plant**
- **By Purchasing Category**
- **By Document**

Self-service requisitioning is a new capability in SAP S/4HANA. The self-service procurement processes have been simplified by consolidating the shopping cart and purchase requisition objects into a single structure based on the purchase requisition. The basic process of requisition, approval, purchase order creation, and goods receipt is facilitated by the new UI changes, described in next section With SAP S/4HANA, cus-

tomers have integrated catalog functionality within the purchasing requisition SAP Fiori apps that's based on the Enterprise Search functionality. The SAP ERP self-service procurement business function is made obsolete with the SAP S/4HANA core deployment.

Figure 6.2 KPI SAP Fiori App for Purchase Order Average Delivery Time

In the traditional system, a user must go through multiple screens to find and assign sources to purchase requisitions. The creation of purchase orders is often performed through a batch input report. In SAP S/4HANA, all tasks to search, find, assign a source of supply, and create a purchase order can be handled from one screen. The system automatically proposes the available sources of supply to the purchaser. This significantly increases the efficiency and the speed of the purchaser when assigning supplies to the purchase requisitions. In addition, a new SAP Fiori interface has been introduced to convert purchase requisitions to purchase orders. Transaction ME57 is still available through SAP GUI.

The creation of manual purchase orders in SAP S/4HANA is supported by several capabilities to improve efficiency:

- Users can select previous purchase orders or sources, such as a template, thus minimizing errors and improving efficiency.
- Several fields are prefilled based on the selected supplier or material type.
- A draft purchase order is created automatically when sessions are lost and retrieved automatically when logged on again.

Several additional SAP Fiori apps are delivered to manage this streamlined procurement process:

- **Create Purchase Requisition**
  The Create Purchase Requisition app enables users to select products from different catalogs and create a purchase requisition. It offers the ability to create free text descriptions for items in the purchase requisitions. Improved search capabilities let users easily and efficiently find relevant catalog items.
- **My Purchase Requisitions**
  The My Purchase Requisitions app (see Figure 6.3) offers users a single app to check the status of purchase requisitions and all other information relevant to purchase requisitions. You can filter based on predefined criteria and go to display or change mode to make changes to purchase requisitions directly from this SAP Fiori app. It offers procurement in a single app, as a go-to point for all purchase requisition-related information and follow-up.
- **Post Goods Receipts**
  With the Post Goods Receipts app, users can directly post received goods with reference to the purchase order.

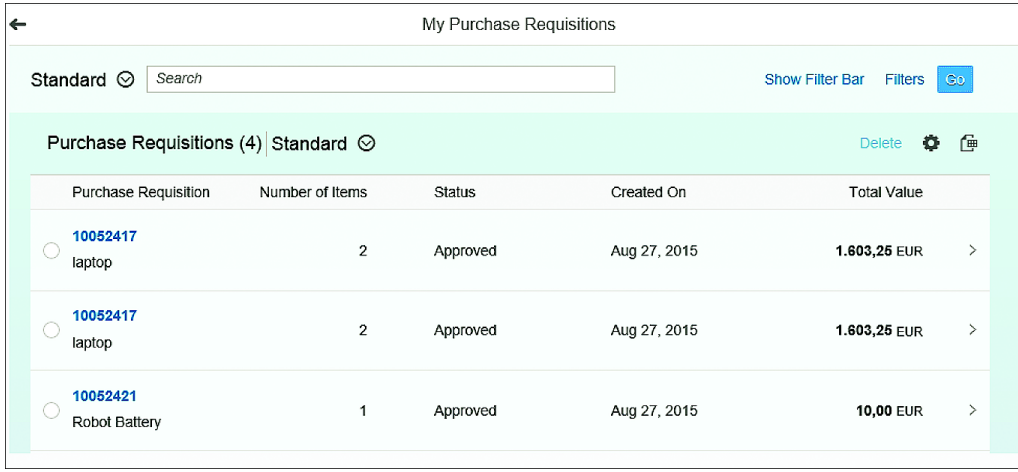


Figure 6.3 My Purchase Requisitions App

The Ariba Network is currently only available for use with SAP ERP 6.0 and forms a core part of the SAP S/4HANA release. SAP Ariba integration can be performed via one of three distinct methods (see Figure 6.4):

1. Direct integration of SAP S/4HANA through standard output management
2. SAP Process Orchestration (SAP PO; on-premise)
3. SAP Cloud Platform Integration (cloud deployment)

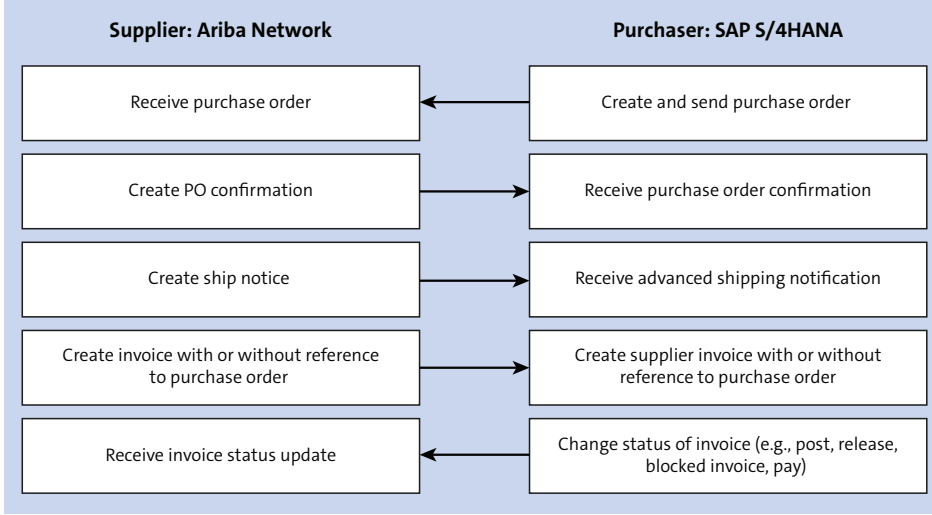


Figure 6.4 SAP Ariba and SAP S/4HANA

With SAP S/4HANA, a new output management approach is in place. By design, the new output management includes cloud qualities, such as extensibility enablement, multitenancy enablement, and modification-free configuration. Therefore, the complete configuration differs from the configuration used when output management is based on table NAST. The new configuration is based on the Business Rule Framework plus (BRFplus), which is accessible for customers. In SAP S/4HANA, the target architecture is based on Adobe Document Server and Adobe Forms only. For the form-determination rules (along with other output parameters), the BRFplus functionality is used (in this sense, in combination with the message determination). Output management based on table NAST is no longer supported for new documents in purchase orders. Purchase orders that are migrated from legacy systems and for which table NAST-based output has been determined can be processed with this technology. For all new purchase orders, the new output management is used. Therefore, in procurement for purchase orders, there is a need to adapt the configuration settings related to output management.

6.2.2 Invoice and Payables Management

Organizations face several challenges within accounts payable (AP) processes that should be addressed with systemized solutions in the future:

- Slow invoice processing, leading to late payments and endangering supplier relations
- Lack of visibility into invoice and payment data
- Slow invoice/payment approvals
- High percentage of exceptions that require manual handling

SAP S/4HANA seeks in the future to address all these issues by simplifying processes for collecting, registering, and checking invoices; verifying them against preconfigured business rules; and handling exceptions with SAP solutions for invoice and payables management. However, this is currently an area in which little is delivered within the SAP S/4HANA core that can be considered best practices. The current processes focus on the standard Logistics Invoice Verification (LIV) processes, in conjunction with SAP Fiori-enabled invoice approvals. The SAP roadmap will start to incorporate the open-text Vendor Invoice Management (VIM) functionality, but it's currently unclear to what extent—that is, whether this will include optical character recognition (OCR) and exception handling and how it will integrate with invoice handling in the Ariba Network.

In addition, there's a change of authorization concept for the supplier invoice. In the past, when posting invoices for a specific company code, the user was checked to ensure he was authorized for any plant. Now, the system checks the authorization for the company code in general. If an item is changed with a purchase order reference, the specific plant is checked.

In line with the change in the data model, the business partner is now the primary business object, meaning the business partner transactions are now used to complete the creation or maintenance of the business partner. This will allow a holistic view of the business partner for all applications. However, in terms of managing the configuration, certain constraints exist when dealing with the business partner object; for example, the customer vendor integration (CVI) mapping and business partner number ranges must be considered across multiple application areas.

The traditional SAP ERP system has redundant object models for master data. With SAP S/4HANA, the business partner approach is now capable of centrally managing master data for business partners, customers, and vendors. In a business relation-

ship, the business partner can assume other business partner roles and—in this case, with SAP S/4HANA—the general data, which is independent of a business partner's function or application-specific extensions, need not be created again. This prevents data from being created and stored redundantly.

As a result, the standard IDoc type for vendor master integration, CREMAS, is discontinued and not available within an SAP S/4HANA system. Therefore, the replacement technology for business partner replication via service-oriented architecture (SOA) must be used.

6.2.3 Sourcing and Contract Management

The processes from a sourcing and contract management perspective that are delivered within the first releases of SAP S/4HANA are streamlined and mostly based on the standard SAP ERP transactional processes, facilitated through the same SAP Fiori apps that have been available since the first release of SAP S/4HANA

The processes and transactions available within the SAP S/4HANA core components related to sourcing processes are limited to the standard request for quotation (RFQ) and quotation transactions from SAP ERP.

The contract management functions that are present within the SAP S/4HANA initial releases are the same as those contained within the SAP Business Suite powered by SAP HANA enabled by SAP Fiori.

There are three main SAP Fiori apps that enable operational contract management:

1. Purchase Contract
2. Contract Line Item
3. Manage Purchase Contracts

The contract management processes are facilitated through these SAP Fiori apps, which deliver a display-only view of the standard SAP ERP data structures for contracts. The Purchase Contract app (Figure 6.5) displays basic information about a contract. The Manage Purchase Contracts app delivers an analytical view of contract usage, status, and validity. It enables users to search and display all contract-related information and verify the status of contracts immediately through a single screen. From this SAP Fiori app, you can navigate to other transactions.

With the Contract Line Item app, users can view details about a contract item and navigate from this screen to other transactions to make changes to contract items directly.

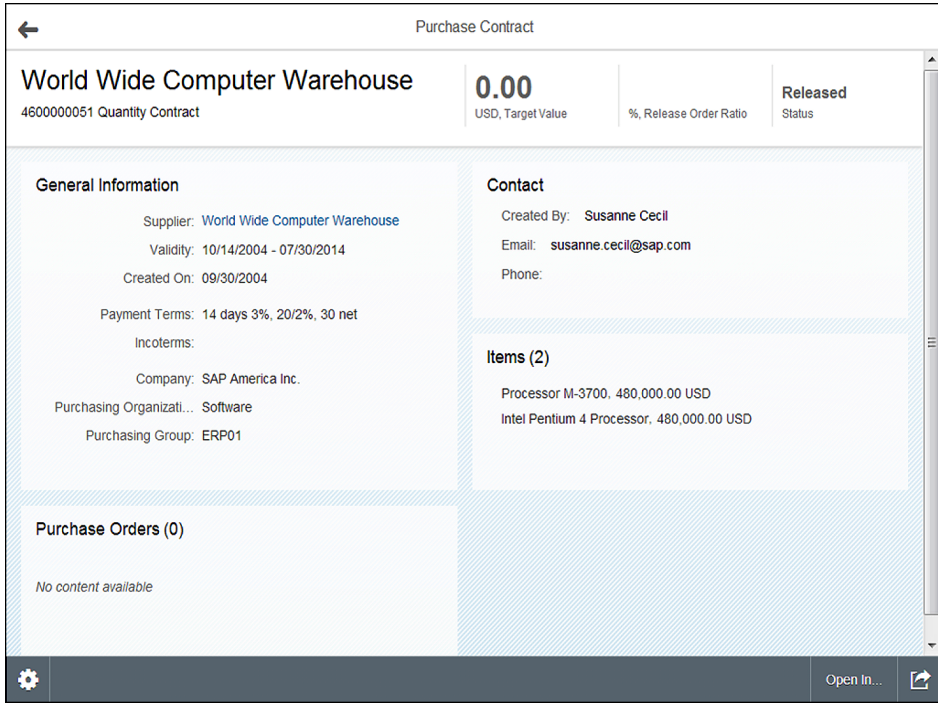


Figure 6.5 Purchase Contract App

A set of SAP Fiori apps for establishing and managing purchasing info records is used within the SAP S/4HANA core component, allowing for an overview of the various sources of supply for a material across plants and purchasing organizations. The Manage Sources of Supply app provides a list display of the purchasing info record and links to SAP Fiori fact sheet apps for displaying purchasing info records.

For complex source-to-contract functions, we recommend SAP Ariba.

6.2.4 Supplier Evaluation and Analytics

With the initial release of SAP S/4HANA Enterprise Management, SAP has made the move to incorporate the following three core business functions from the SAP Supplier Lifecycle Management solution within the latest releases of SAP S/4HANA:

1. **Supplier portfolio management**
   Strategic procurement activities such as supplier categorization are now enabled through the portfolio management business function. Specifically, strategic buy-

ers can classify and manage their supply base within purchasing categories. The integration components for Dunn & Bradstreet (D&B) integration also are included in the SAP S/4HANA core delivery.

With SAP S/4HANA, suppliers can be classified based on various criteria such as spend, strategic importance, risk, and so on. Companies can define internal activities to track supplier performance and view and analyze supplier information. This gives companies transparency in their supplier portfolios based on these classifications and reduces risks by identifying low-performing suppliers.

2. **Supplier evaluation**
   Supplier evaluation and performance management processes can be initiated and managed across the supplier base by strategic buyers.

   In the traditional system, no real-time data was available due to the volume of the data, causing a lack of transparency and decision support. In SAP S/4HANA, the full question library and survey management functionality is available for use, so business user input on supplier performance can be evaluated and included as input for supplier management activities, with additional improvements in SAP S/4HANA:

   – Questionnaires definable directly in SAP S/4HANA
   – Monitor and search flexibility for evaluation responses and ability to navigate to response details
   – Ability to create evaluation requests and distribute to appraisers

3. **Collaboration and activity management (integration with SAP Jam)**
   Increased collaboration functions are enabled for purchasing users to communicate and collaborate with internal parties through activity integration with SAP Jam. The sell-side components and functionality aren't yet available in the initial release, so relevant sell-side integration with suppliers isn't yet possible.

In addition, several new SAP Fiori apps have been developed for use with SAP Supplier Lifecycle Management functions:

- Task processing for management of internal collaboration activities
- Completion of supplier evaluation surveys by internal users
- Supplier activity management
- Supplier lists and portfolio statuses
- Supplier appraisal
- Supplier portfolio and category management

- Purchasing categories created, managed, and assigned to supply base
- Management of supplier evaluation processes by the strategic buyer, including evaluation of results

The SAP GUI transactions for vendor masters are made obsolete in line with the data model change in SAP S/4HANA. The business partner is now the primary business object for both vendor and customer master data, so business partner transactions will be used to create or maintain business partners.

6.3 Outlook

Table 6.2 lists key innovations scheduled for sourcing and procurement in releases for 2018 and beyond.

Area	Current Planned Innovation
Sourcing and contract management	■ Central contract management capabilities with contract hierarchies, distribution, and annual contract negotiation capabilities
Supplier evaluation and analytics	■ Central supplier collaboration portal with supplier registration, supplier qualification, and certificate management ■ SAP Ariba collaborative sourcing integration ■ Improved supplier monitoring
Invoice and payables management	■ Machine-learning and invoice-monitoring capabilities for efficient invoice handling and exceptions management
Operational purchasing	■ Machine learning for automation of purchase document approvals

Table 6.2 Outlook for Sourcing and Procurement with SAP S/4HANA

6.4 Summary

SAP S/4HANA will resolve some of today's C-level key challenges. It will help you improve your supply chain visibility and transparency through better monitoring tools and real-time data. With embedded advanced analytics, companies now can run advanced analytics at any point in time to be able to react quickly to changes in their environment and have better insights for negotiation.

Simplified processes and data, reduced complexity, and standard integration with SAP Ariba allow more optimized processes, a single source of truth, and improved collaboration capabilities, such as many-to-many secured network collaboration with trading partners.

Chapter 7
Research and Development and Asset Management

This chapter addresses functionalities such as SAP PLM and SAP PPM that fit under the umbrella of research and development and asset management to extend SAP S/4HANA functionality. We'll cover topics that are driving digital transformation in this area.

Few companies can rest on their laurels and cease product development. For example, pharmaceutical companies might need to develop new products or a new active pharmaceutical ingredient to alleviate health-related problems faced by society—but even in other industries, like banking, companies are using research and development (R&D) to create new product or services.

Consequently, an organization's R&D area has two broad goals: to improve a product portfolio and to improve processes or operations. Companies can improve their product mix by introducing new products and segments or by improving their existing product lines to differentiate themselves from the competition. They can improve processes or operations by making workflow changes to reduce costs or reduce rejections in the production line or by making changes in operations for overall cost reductions. This requires an organization to focus on and institutionalize R&D.

Similarly, an organization's asset management function is focused on getting the maximum use out of an existing asset. It considers questions such as how to manage an asset in a way that avoids unplanned outages or how to improve in-house prediction capability to minimize the impact of assets' downtime on supply chain capability. Another aspect of asset management is putting tools into the hands of technicians so that errors are minimized during maintenance and providing tools such as 3D visualizations and augmented reality to deployed workforces.

SAP has taken this challenge and created products in this area so that the digital journey of an organization can be fruitful. In this chapter, we'll introduce tools within SAP S/4HANA and other products for R&D and asset management, highlighting existing

and expected key features and discussing how these products can be utilized to fulfill important product- or process-related objectives. We begin with a discussion of industry pain points and the challenges faced by chief supply chain officers, then focus on R&D products and asset management products.

7.1 Industry Pain Points and SAP S/4HANA Benefits

Research and development is an important support function for each industry; it helps an organization offer products and processes based on its customers' requirements. Some of the key trends visible across industry are increasing speed of disruption, diminishing returns in research and development, constant innovation as a growth driver, and management of investment in both R&D and in the existing product portfolio.

For example, consider the following common pain points that many organizations wrestle with:

- Consumer requirements are changing at an ever-increasing pace. An organization needs to understand these requirements and offer suitable products and processes to meet customer needs.
- Organizations need to institutionalize their innovation roadmap so that customer requirements can be fulfilled.
- Companies must align R&D processes and resources to improve time to market for innovative products at an optimized cost.
- Collaboration with various stakeholders in the innovation process is essential.

SAP Innovation Management provides transparency in innovation management from idea generation to offering products and processes to the market. It also engages employees to contribute meaning fully with fewer irritants, and integrates fully with product development. SAP also offers an intuitive UX in cloud and on-premise solutions, which can be accessed around the clock via mobile devices and desktops.

In addition, asset management is an important function in all organizations, especially when the key success factor of the industry depends on efficient utilization of assets, such as in the airline industry. In the current environment, the R&D industry faces some pain points, such as the following:

- Unplanned downtime, outages, reduced asset availability, and reduced asset reliability
- Low return on investment for assets, lack of complaint and risk management, and inefficient maintenance spend
- Inaccurate asset master data, which can cause incidents and inefficiency
- Data and information stored in multiple systems
- Decision-makers and technicians lacking the right knowledge at hand

To transform, the business and organization must prioritize the following:

- Managing cost, risk, and performance holistically
- Balancing capital expenditure and operating expenditure and moving towards total expenditure
- Monitoring and predicting performance of assets, people, and processes
- Bringing operation data into a business process context
- Collaborating with other stakeholders, such as manufacturer, service provider, and engineering and procurement supplier
- Integrating with sensors and other Internet of Things (IoT) objects

SAP has worked toward addressing these pain points and toward a strategic initiative by providing maintenance management in SAP S/4HANA Enterprise Management. SAP has included additional capabilities for asset operation and environment, health, and safety in add-ons and has also provided other product suites such as SAP Master Data Governance (SAP MDG), SAP Predictive Maintenance Services, SAP Asset Intelligence Network, and SAP Mobile Asset Management.

SAP S/4HANA will resolve some of today's C-level challenges. It will help technicians and engineers become mobile users and will improve decision-making capability through the improved UX, embedded analytics, and contextual help. Some of the key challenges in asset management for CSCOs in asset management area are described in Table 7.1.

Challenge for CSCO	How SAP S/4HANA Can Help
Needs a preventive maintenance solution for more uptime for production equipment.	Use of predictive analytics services in conjunction with better UX will help improve uptime.

Table 7.1 CSCO Challenges in Asset Management

Challenge for CSCO	How SAP S/4HANA Can Help
Lack of system mobility for work that must be complete on-site.	Mobile applications such as the SAP Work Manager and the SAP Inventory Manager will help overcome such challenges.
Requires improved collaboration and connectivity.	Use of IoT and its integration with SAP S/4HANA and the asset intelligence network will help in this area.

Table 7.1 CSCO Challenges in Asset Management (Cont.)

7.2 Key Research and Development Functionality

Outside of the core of SAP S/4HANA, SAP offers four major products in the R&D area, which complement an organization's R&D functionality:

1. SAP Innovation Management
2. SAP Portfolio and Project Management
3. SAP Commercial Project Management
4. SAP Product Lifecycle Costing

These products may require additional licenses beyond SAP S/4HANA. In the following sections, we'll discuss each product in turn.

7.2.1 SAP Innovation Management

SAP Innovation Management is a product powered by SAP HANA and is available separately either in the cloud or on-premise. This product can installed standalone and/or integrated with ERP systems such as SAP S/4HANA, with SAP Portfolio and Project Management, with SAP Jam, and with other software.

SAP Innovation Management has a user-friendly UI for desktop or mobile. This product can be used during your idea-generation and conceptualization phases. SAP Innovation Management can help you run campaigns for idea generation either globally or locally. It can also help you evaluate ideas and process those ideas, and take the process further by adding the ideas to portfolios. These ideas can be further developed as a project and managed in SAP Portfolio and Project Management; they also can be managed in SAP Commercial Project Management.

The following are key features of SAP Innovation Management:

- Evaluate the most promising ideas with the help of a stage-gating process.
- Engage employees in the innovation process and reward employees.
- Collaborate with various stakeholders in the innovation process.

The business value of innovation management can be derived where innovation can be institutionalized and improve the quality of the innovation pipeline, as shown in Figure 7.1. An organization can also leverage experts and its subject matter expert network through the expert finder.

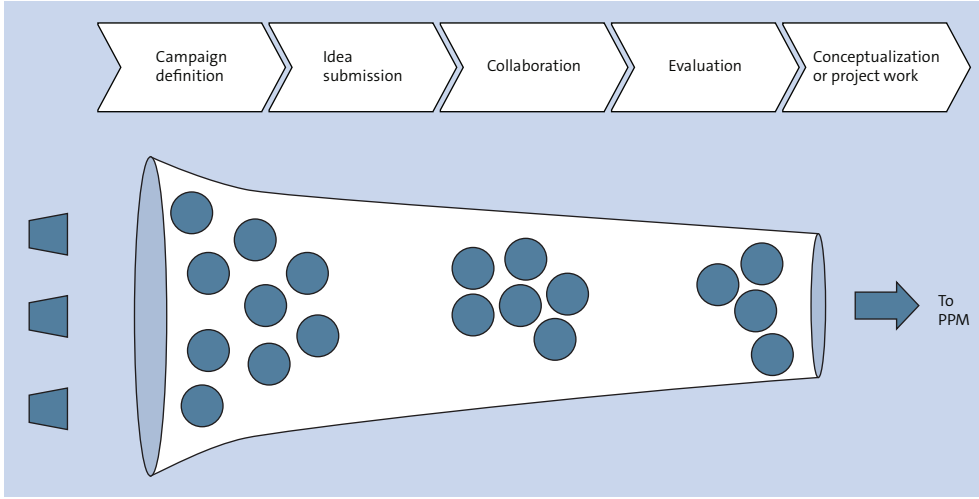


Figure 7.1 Scope of SAP Innovation Management

7.2.2 SAP Portfolio and Project Management

SAP Portfolio and Project Management is on-premise software that can be used standalone or be integrated with an ERP system such as SAP S/4HANA. This product can also integrate with third-party (non-SAP) HR and financial software through RFCs. It can be used to manage the portfolios of projects created after idea evaluation and conceptualization.

SAP Portfolio and Project Management helps project managers achieve the following objectives:

- Align portfolios with business goals and strategy.
- Gain visibility into entire portfolio and KPIs.

- Manage portfolios, including projects, programs, and services.
- Effectively manage innovation projects using structuring, scheduling, and visualization.
- Support different implementation models, such as Six Sigma, Phase Gate, Critical Path, and Product and Cycle Time Excellence.
- Incorporate all HR resources and financial resources.
- Perform resource management.
- Track portfolio project details such as baseline, forecasted, and actual costs.
- Perform real-time what-if analysis to simulate various situations and changes.

7.2.3 SAP Commercial Project Management

SAP Commercial Project Management can be used whenever R&D services are being provided to clients as a service. As a tool that can be used to analyze investment alternatives and to track project budgets, milestones, and delivery, SAP Commercial Project Management facilitates the following:

- Get real-time access to project data.
- Generate project status reports using embedded analytics.
- Accurately forecast quantity, cost, and revenue.
- Unify financial management through the project lifecycle.
- Accurately identify project issues and track the same.
- Manage change requests, including approvals and rejections.

SAP Commercial Project Management allows you to monitor projects when provided to clients as a service. It has collaboration features that can be used to collaborate with suppliers of various inputs and services and manage risk. The change management functionality is useful for project managers; it helps track all the changes coming to projects and manage associated risks. The project finances can be monitored and tracked with various deliveries.

7.2.4 SAP Product Lifecycle Costing

SAP Product Lifecycle Costing is an on-premise product with a UI that has a similar look and feel to Microsoft Excel. This software is built on SAP HANA and can be used to cost products during the engineering phase—which is particularly useful for products created under the engineer-to-make principle.

Let's consider some useful SAP S/4HANA features for product engineering during R&D and the pilot stage:

- Modern and real-time cost calculation engine powered by SAP HANA
- Flexibility to handle calculation using manual overrides and recalculation
- Target costing
- Version and what-if simulation
- Custom attributes and fields and formulas
- Multiple costing sheet
- Local master data and integration with Microsoft Excel
- Time-dependent price and rates
- Inbound integration with SAP ERP, Excel, and other applications using APIs
- Export to Excel and other applications using APIs
- Pricing selection for components and activities
- Support for multiple currencies
- Support for overhead calculation
- Analytics and reporting for various costs and comparison of different versions

The business value of this product lies in getting the right costing for new or engineered products. This will help an organization reduce product costs and reduce time to market for the new product.

7.3 Key Asset Management Functionality

In the following subsections, we'll examine a few areas of asset management, from maintenance planning and scheduling to maintenance operation and execution to mobile asset maintenance.

7.3.1 Maintenance Planning and Scheduling

Asset resource scheduling is a new feature in SAP S/4HANA. Its key capabilities include availability of KPIs to monitor work center load and balance the load. Maintenance planner can analyze work center load and view work order operations.

SAP Multiresource Scheduling can be also used as an add-on for SAP S/4HANA. SAP customers can tap into a few additional features here, such as the Scheduler Workplace.

Schedulers can now use a graphical planning board with a drag-and-drop feature, manual and automatic planning, visualization of clocking data, and alert monitoring in SAP Multiresource Scheduling. This means that schedulers can plan for employees, contractors, work centers, and equipment and tools, along with resource placeholders.

7.3.2 Maintenance Operation and Execution

In maintenance operation and execution, changes include improvements in UX, improvements in analytics, and use of mobile applications. Earlier, in SAP ERP, only vendor codes, material group, and cost element were displayed in the maintenance order. Now, the description is added so that user can understand these codes. Additionally, the **Maintenance Activity Type** field is now available in maintenance notifications and maintenance plans.

Selecting and deselecting objects now is easy from the maintenance order, in which select all or block selection options are available. In SAP ERP, users had to select objects individually. Simplified order views enable navigating to overview pages of preceding or follow-on orders to create, change, or display PM orders. Follow-on orders can be created from the **Operation** tab of PM orders.

Now, measurement documents can be viewed from the application, allowing you to create, change, and display equipment, and create, change, and display functional location.

Maintenance plan call details can be viewed from the change order and operation transaction and the change PM orders transaction. Material availability checks can also be determined from the maintenance order. The planning plant can be used for filtering the deadline-monitoring transaction.

7.3.3 Mobile Asset Maintenance

Mobility in asset management now includes three products: SAP Work Manager and the SAP Inventory Manager, and SAP Asset Manager (planned for future releases).

SAP Work Manager can be used to complete the work order and provide access to asset details, such as history, location, work order details, and materials needed. SAP Work Manager also can be used create notifications and work orders, display master data and measurement documents, install and dismantle equipment, and perform linear asset management and uploading and downloading of attachment and inspection rounds.

SAP Work Manager can be integrated for geotagging using additional components. It has an embedded visual enterprise viewer, augmented reality, and a meter-management component.

SAP Inventory Manager can be used to manage cycle counts, issues, receipts, and transfers. It supports warehouse management and inventory management functionality.

7.4 Outlook

In general, in the R&D space, the focus will be on engaging multiple stakeholders and on making those interactions interesting through gamification features such as leaderboards, points and badges, feedback, and voting.

Table 7.2 lists the key innovations scheduled for R&D for future releases in 2018 and beyond.

Area	Planned Innovations
Employee suggestion box	■ Evaluation request ■ Create and assign evaluation request ■ Request acceptance and completion date ■ Monitoring of evaluation result
Open innovation	■ Companywide voting ■ Voting on any campaign from within the company or from external stakeholders ■ Campaign milestones ■ Definition of additional campaign milestones
Continuous improvement	■ Idea-management view ■ Flexibility of ideas view list ■ Campaign results ■ Summarization of idea results ■ Ideas list view enhancement ■ Add action to idea list ■ Vote aging ■ Compute score with aging as a factor

Table 7.2 Outlook for Research and Development

On the asset management front, we anticipate developments in using business context and sharing operational data, using benchmarks and intelligent services, and more complete coverage of the asset life cycle—for example, asset optimization and simulation, with deeper integration with SAP ERP, SAP S/4HANA, SAP Hybris Service Cloud, and SAP CRM. Also, integration with IoT will become a standard feature and can't be ignored.

Table 7.3 lists key innovations scheduled for asset management for future releases in 2018 and beyond.

Area	Current Planned Innovation
Asset strategy and performance	■ Proactive maintenance strategy planning with integration with SAP IBP and third-party content library for planning and forecasting for the assets in the supply chain. ■ Maintenance budget planning ■ Collaborative inventory and spare parts optimization
Maintenance planning and scheduling	■ Comprehensive scheduling of resources using individual resource assignments ■ Asset management resource scheduling in the cloud ■ Integrated scheduling using workforce management (multiresource scheduling and SAP S/4HANA)
Maintenance execution	■ UX enhancement through adding quick action buttons, searches, and object pages in maintenance plans, task lists, measurement points, and measurement documents ■ Simplified test equipment calibration by eliminating the need for maintenance plans, maintenance orders, and confirmations
Environment, health, and safety	■ Assistance for workers and environment, health, and safety specialists to access their data from any device ■ Use of predictive and real-time analytics to improve safety and risk management ■ Support of a central database for various pollutants ■ Management of change as an embedded functionality in SAP S/4HANA

Table 7.3 Outlook for Asset Management

Area	Current Planned Innovation
Asset networks—asset information and collaboration	■ Collaborative work order management to enable joint scheduling and confirmation of planned work ■ Equipment as a service for renting and booking ■ Support for additional industry standards and content ■ Resale of content and best practices ■ Integration with SAP Integrated Business Planning
Asset networks—asset information governance	■ Support for additional objects on demand ■ Enhancements to the asset information workbench
Asset networks—SAP Predictive Maintenance Services	■ Dynamic maintenance scheduling using constraint-based optimization ■ Library of ready-to-use machine learning content per asset type ■ Fingerprint similarity analysis for assets ■ Support for edge computing ■ Prescriptive maintenance ■ Package management for root-cause analysis ■ Diagnostics trouble code analytics ■ Collaboration exploration

Table 7.3 Outlook for Asset Management (Cont.)

7.5 Summary

SAP S/4HANA and other associated products in the R&D space can be used standalone or in conjunction with other products. Not all products may be required by an organization, so each company should evaluate products to consider whether they align with their requirements and IT strategy.

SAP Innovation Management will be useful during initial phases and can engage all employees. When employees are engaged and have visibility into ideas, they become motivated, which is important for an organization. SAP PPM is useful for management of multiple projects, programs, and services. The insight into the portfolio of projects and its alignment with the organization's strategy is an important outcome of the software. SAP CPM is another tool provided by SAP to reduce cost and time to quotation for projects provided to clients as a service. SAP Product Lifecycle Costing is important during the product engineering phase and can be used to reduce the

product cost and time to market. Its UI is like Excel's, although it doesn't currently produce an Excel sheet.

The asset management solution in SAP S/4HANA is enhanced by improving UX, by adding functionality in SAP Fiori apps, adding display fields for the codes, and by simplifying some options, such selecting and deselecting rows. New products such as SAP Asset Manager will be added in future releases. In addition to improvement in core asset management and SAP Multiresource Scheduling, additional products such as SAP Predictive Maintenance Services, SAP Asset Intelligence Network will help an enterprise to change from reactive to preventive. Addition of maintenance features in SAP IBP will help organizations plan for maintenance impacts on supply chain planning.

Chapter 8
Industry Solutions

In this chapter, we'll touch on solutions for industries such as retail, fashion, and oil and gas. We'll compare some of the features and highlights of each of the industry solutions.

SAP has delivered industry-specific solutions for several industries. In this chapter, we focus our attention on two of the most widely used industry solutions: Retail and Oil & Gas. There solutions were first released in 1610, and a lot of additional functions have been released in 1709. SAP also released functionality for the fashion industry, which often ties in with retail, in version 1709; we touch on this topic here as well.

8.1 Retail

The official name of the latest product for retail is SAP S/4HANA Retail for merchandise management. In the following sections, we'll focus only on the retail-specific changes that make a difference compared to legacy SAP for Retail.

As of release 1610, SAP S/4HANA Retail for merchandise management covered all relevant end-to-end merchandise management processes for retailers. In SAP S/4HANA Retail for merchandise management, SAP included several fashion-related concepts which were developed in SAP Fashion Management based on SAP ERP. This was a value-add for fashion retailers, but it largely consisted of a harmonized retail and fashion foundation, and didn't include the full-blown fashion scope.

With SAP S/4HANA 1709, we have now the first true release of fashion capabilities for SAP S/4HANA, with a focus on covering fashion wholesale requirements. Major functionality, including order allocation (supply assignment), backorder processing, stock segmentation, stock protection, logistic enhancements, and others are enabled. With release 1709, SAP S/4HANA for fashion and vertical business helps fashion companies (and others) that are vertically integrated and have multiple sales channels and businesses to act as a unit.

For both Retail and Oil & Gas later in the chapter, we'll begin by examining a few technical simplifications that SAP has performed on the backend, followed by key functionality available for important industry processes. We'll close each section with a look at the latest arrivals with SAP S/4HANA 1709.

8.1.1 Technical Simplifications

As shown in all elements of SAP S/4HANA, efforts have been made in SAP S/4HANA Retail to reduce the backend complexity of the system. Although not all elements discussed in the following list are specific to SAP S/4HANA Retail, we've attempted to provide the most relevant simplifications for this industry. These simplifications are as follows:

- **Software component architecture**

  In the legacy system, activation of IS-Retail was a complex process requiring you to switch on industry extension ISR_Retail (SAP Retail) and enterprise extension EA-RET (Retail). There were also some additional retail functionalities that were included in Enhancement Packages (EHPs).

  As of SAP S/4HANA 1610, SAP has removed EA-RET and the content of business function set ISR_Retail (SAP Retail). Retail coding is now a part of the SAP S/4HANA single core software component (S4CORE 101). Activation is much easier than in SAP ERP and is no longer exclusive; enterprise business function `ISR_RETAILSYSTEM` (Retail) can be activated in parallel to other industries. Some more generic parts of the retail functionality are available even without activating it.

- **Cross-industry combinations**

  Many customers who use IS-Retail functionalities have a core business that belongs to an industry other than retail. For example, telecom operators typically run a chain of customer service locations at which you can not only sign a new contract with your operator, but also buy a new mobile phone or a battery charger. In the past, it was difficult—sometimes even impossible—to combine cross-industry operations with retail. For example, a fashion company had to run its textile manufacturing on an IS-Mill system and manage direct sales in retail stores in a separate IS-Retail system.

  SAP S/4HANA Retail can be activated in parallel with other industries, such as SAP S/4HANA Oil & Gas. The solution can also work together with several business function sets that were not feasible in SAP for Retail—for example, for catch weight management.

- **Customer/vendor integration (CVI)**
  Customer and vendor masters were handled separately in SAP ERP, and using business partners was optional (with some exceptions). In SAP S/4HANA, the business partner (Transaction BP) is the single point of entry to maintain master data for business partners, customers, and vendors.

  The specific transaction codes used to maintain customer/vendor master data separately from SAP ERP are not available in SAP S/4HANA. At the same time, the main legacy tables for customer (table `KNA1`) and vendor (table `LFA1`) data remain in SAP S/4HANA.

- **Sites and business partners**
  In SAP for Retail, each site had the role of a customer and also can have the role of a vendor (optionally). Therefore, each site master had a customer master record assigned and sometimes also a vendor master record. In the legacy system, it wasn't possible to have business partners for customers/vendors assigned to retail sites.

  In SAP S/4HANA, business partner harmonization becomes available for the site (every customer/supplier record must have a business partner as a leading entity). There is a new BP role with a new role category for sites (BPSITE). There are also new business partner groupings for different types of sites (distribution centers, stores, franchisees etc.).

  During the conversion from SAP ERP to SAP S/4HANA Retail, there is a special migration program to execute that will create business partners for all customers/vendors assigned to sites. There will be one business partner created per site, with a role C or with both roles C and V.

  Note that receiving points and departments are no longer maintained in the site maintenance transaction as of SAP S/4HANA 1610 FPS 01, but are maintained only through the business partner maintenance function. This change should be addressed in the site/business partner distribution process.

Note

For more details on sites, refer to SAP Note 2310884 (SAP S/4HANA Conversion for Site Master).

- **Addresses**
  As of 1610 FPS 01, there is one central maintenance option for maintaining addresses for business partners, including geolocation data for a retail site. This

used to be possible in two ways—via site maintenance and via business partner maintenance. Both options were independent of each other and not synchronized.

- **Harmonization of retail article and material**
  The long-term target of SAP is to harmonize both material and retail articles as product master data. SAP S/4HANA 1610 takes the first small step in this challenging journey.

  In the past, the method of storing characteristic valuations of variants of a generic article and a configurable material were different. Now, in SAP S/4HANA, both are harmonized; a generic article will be assigned to a configuration class, which will provide variant-creating characteristics for this article. The side effect of this simplification is a complex, three-step migration procedure that must be performed during the transition to SAP S/4HANA (premigration activities in SAP ERP, data transformation during downtime, and postmigration activities in SAP S/4HANA).

  There is also a common, harmonized SAP Fiori application for products (materials) and articles management, but in 1610 it's limited to single articles only.

Note

For more details on generic article harmonization, refer to SAP Note 2339010.

8.1.2 Available Functionality

In this section, we'll cover some of the functionality available in SAP S/4HANA Retail. Because covering the full scope of this functionality could fill a book itself, we'll focus our attention on those elements that have changed dramatically from what was available in SAP for Retail and on newly added functionality. Some of the most relevant elements are as follows:

- **Material Ledger and stock valuation**
  In SAP ERP, it wasn't possible to use the Material Ledger (ML) and actual costing in the IS-Retail system. This limitation was driven by system performance reasons; in retail, there might be hundreds of thousands of articles, which could "kill" the system due to complex ML processing. As a result, this limitation caused compliance issues in certain countries in which having such types of valuation is a legal statutory requirement.

  Now, in SAP S/4HANA, the ML is the single and obligatory engine of stock valuation, and SAP HANA in-memory processing speed eliminates all kinds of performance limitations. The functionality is managed by business function `ISR_RETAIL_`

MATERIAL_LEDGER, which is soft-switched when there are retail articles identified in the system.

In the material master, we have new (from the retail point of view) Material Ledger Accounting views, where we can see material valuation data in company code currency, including the total stock value at sales price (new in ML), plus valuation data in up to two additional parallel currencies. There are six ML views available: current, previous, and last previous year periods, and future, current, and previous costing runs.

- **Replenishment**
  There are also significant changes in the replenishment area. The main (classic) replenishment transaction, Transaction WRP1, and multistep replenishment transactions (Transaction WRFE, etc.) are not available any longer. As an alternative, SAP proposes two options. First, use materials requirements planning (MRP) functionality instead. The second option is the rapid replenishment and planning workbench (Transaction WRP1R)—available in SAP S/4HANA 1610, but listed as no longer strategic. Rapid replenishment offers much better performance than classic replenishment, even in SAP ERP on non-SAP HANA databases, but at the same time it adds some process/functional limitations (e.g., you can't use rapid replenishment for external sites [VMI processes]).

  Another currently available option is the use of SAP Forecasting and Replenishment for Retail—a part of SAP SCM—but this isn't in the target architecture either. This option also requires an additional SAP license, integration, and so on.

  For now, SAP is evaluating the option of developing the future strategic replenishment solution as a consuming application on the SAP Customer Activity Repository.

- **Catch weight management**
  In SAP S/4HANA 1610 FPS 01, the initial generic version of catch weight management has been introduced, but with certain limitations (e.g., only new implementations—i.e., no migration is yet possible from the legacy IS-CWM to SAP S/4HANA catch weight management—and retail scenarios aren't supported yet).

  What's required is the possibility of using SAP S/4HANA catch weight management in retail scenarios. The current lack of such an option in SAP ERP in combination with retail is one of the pain points of IS-Retail customers running grocery stores (with articles such as meat or cheese).

- **Seasons Workbench**
  The legacy IS-Retail season functionality is not available in SAP S/4HANA Retail. The same applies to season fields in the article master in the **Basic Data** view. There

are new fields—**SEASON YEAR**, **SEASON**, **COLLECTION**, and **THEME**—in the **Basic Data 2** view. Finally, seasons are not defined in the configuration any longer; instead, SAP S/4HANA provides a new Season Workbench application (Transaction FSH_SWB).

Note

For the detailed list of restrictions for catch weight management, refer to SAP Note 2357827 (SAP S/4HANA CWM 1610: Restriction Note).

8.1.3 Removed and Nonstrategic Functionality

There are several elements of SAP for Retail functionality that are no longer available in SAP S/4HANA Retail. The list includes different types of features and functionalities—for example, prepack allocation planning, retail short text replacement (plant to site, material to article, etc.), perishables planning, retail ledger, or retail-specific SAP Fiori factsheets for article, site, allocation, promotion, and bonus. In some cases, there are alternative solutions available; however, in other cases SAP has stated that there is no equivalent functionality available in SAP S/4HANA and that SAP will investigate whether such functionality will appear in a future release.

For some removed functionality, there are other SAP products that offer the desired functionality (e.g., planning can be found in SAP Merchandise Planning for Retail and SAP Assortment Planning for Retail).

There are also several elements of legacy SAP for Retail functionality that are still available in SAP S/4HANA but defined as no longer "strategic." Typically, these are functions that have been transferred to other SAP products for the retail industry (e.g., SAP Customer Activity Repository or SAP Forecasting and Replenishment for Retail) and will likely not be further developed in the core SAP S/4HANA Retail for merchandise management product. In some cases, there is new (replacement) functionality planned in future releases of SAP S/4HANA. For example, retail sales forecasting is still available in SAP S/4HANA, but the strategic direction for forecasting in retail is unified demand forecasting, which is a part of SAP Customer Activity Repository.

Note

You can find further information and the complete list of notes describing retail functionalities that are no longer available in SAP Note 2371618 (S4TWL—Retail Functionality not available anymore).

You can find further information and a list of SAP Notes describing retail functionalities that have been designated as no longer recommended for use in SAP Note 2371605 (S4TWL—Retail Functionality not strategic anymore).

8.1.4 Retail Integration

In this section, we'll discuss several aspects of integration possible beginning with SAP S/4HANA 1610 with other software components that are dedicated to the retail industry.

SAP S/4HANA can be the target of data distribution from standalone SAP Master Data Governance (SAP MDG) for the following data:

- Customers and vendors (standard SAP MDG business partner)
- Articles (SAP MDG for Retail and Fashion Management by Utopia)

SAP MDG can be also installed on top of SAP S/4HANA, but the scenario for articles isn't supported yet. The new version of SAP MDG for Retail and Fashion Management by Utopia featuring the article scenario in SAP S/4HANA is expected in 2017.

One of the foundational elements of SAP architecture supporting an omnichannel retail model is SAP Customer Activity Repository. There is no integration scenario for SAP Customer Activity Repository 1.0 and 2.0 with SAP S/4HANA Retail 1610, but it can be integrated with SAP CAR 3.0. SAP Customer Activity Repository consuming applications will offer the same integration possibilities as their underlying SAP Customer Activity Repository release.

SAP S/4HANA Retail 1610 can be integrated with SAP Hybris Commerce, but SAP Hybris Commerce, integration package for SAP for Retail doesn't support SAP S/4HANA integration up to version 2.3. Version 2.4 will provide integration for SAP S/4HANA 1709, which will provide support for SAP S/4HANA Retail-specific functionalities.

8.1.5 SAP S/4HANA 1709

SAP S/4HANA 1709 adds several simplifications and improvements for retail customers, including enhanced master data functions, additional SAP Fiori applications, fashion industry enablement, and improved integration solutions.

One highlight of release 1709 is fashion management wholesale enablement, which includes basic functionalities such as order allocation run and segmentation. Some additional highlights are as follows:

- **Master data**
  Improvements in the master data area include further material-article harmonization, enablement of two-level BOM-structured articles (which can be used, e.g., for displays or empties management), and enhanced harmonization and distribution of site master data across different systems.
- **Merchandise management**
  The merchandise management area adds the two-level BOM for structured articles, which can be leveraged for displays and empties.
- **Catch weight management**
  In SAP S/4HANA 1709, the first basic retail catch weight management scenarios are enabled. Catch weight functionality is critical for grocery retailers dealing with products like cheese or meat, for which you need to manage products in two independent units of measure across different stages of inventory management.
- **SAP Fiori apps**
  SAP S/4HANA release 1709 will deliver new and enhanced SAP Fiori applications to manage retail-specific business processes.

  There will be a new SAP Fiori app for products transfer. The Lookup Retail Product app will be enhanced to present promotion history and bonus buy. The Order Product app will be enhanced with forecast and stock replenishment information.
- **Fashion industry enablement**
  There were some fashion industry-specific functionalities and concepts already available in SAP S/4HANA 1610, but only SAP S/4HANA 1709 delivers a complete and advanced fashion industry solution, with a focus on fashion wholesale. The official name of the new 1709-based solution is SAP S/4HANA for fashion and vertical business.

  The most important new functionalities delivered include order allocation, back-order processing, fashion stock segmentation, and several enhancements in logistics. The new release brings the largest benefits to vertically integrated companies, which can now manage and operate their fashion distribution and retail parts as one integrated business. Further functionalities supporting fashion manufacturing are expected in SAP S/4HANA Enterprise Management release 1809.
- **Integration with SAP Hybris Commerce**
  SAP offers a solution to integrate back-end SAP systems with SAP Hybris Commerce and SAP Hybris Commerce Cloud, data hub that is called SAP Hybris Commerce, integration package for SAP for Retail (IPR). The new version of the integration solution—version 2.4—will provide integration of SAP S/4HANA 1709 with SAP Hybris Commerce 6.4, covering retail functionalities.

8.2 Oil & Gas

As of SAP S/4HANA 1610, full enablement of oil and gas industry functionality has been delivered, including a simplified data model for SAP S/4HANA Oil & Gas for hydrocarbon management and new features introduced for SAP S/4HANA Oil & Gas for hydrocarbon management and the Trader's & Scheduler's Workbench.

In the latest release at the time of writing (SAP S/4HANA 1709), significant progress has been made in delivering the core functionality within the oil and gas industry, with advancements in several areas and optimization of the data model. An oil and gas industry client generally would find that the core functionality to operate the business both upstream and downstream is present in this release, but there are several areas in which specific consideration should be made, as outlined in the following subsections.

8.2.1 Technical Simplifications

With the introduction of SAP S/4HANA release 1610, a new simplified hydrocarbon product management data structure was introduced, which provided the backbone for the oil and gas functionalities both upstream and downstream. This simplification rationalized the data structure for the oil additional quantities tables `MSEGO1` and `MSEGO2` into a combined table `MATDOCOIL`. This resulted in the removal of 16 oil inventory aggregated tables that can now be calculated on the fly, which vastly reduces the IS-Oil data footprint in SAP S/4HANA. This new simplified data model (Figure 8.1) has provided the foundation for future innovation within the SAP S/4HANA Oil & Gas industry solution.

There are many benefits delivered through this rationalized data structure; for example, processing time is reduced because there is no longer any aggregation required; there are fewer inconsistencies within the additional quantities table; and high-speed evaluation across material document information is possible. This allows the innovation delivered within this latest release to be used for upstream UOM group enhancements, allowing new UOMs to be added to a UOM group with minimal impact on existing data.

One of the key considerations for a system conversion to SAP S/4HANA 1709 (with respect to oil-specific data) are the data migration activities that need to be performed; this is due to the transformation from deprecated tables `MSEGO1` and `MSEGO2` into the new table structure. The tools to support this are delivered with the 1610 release.

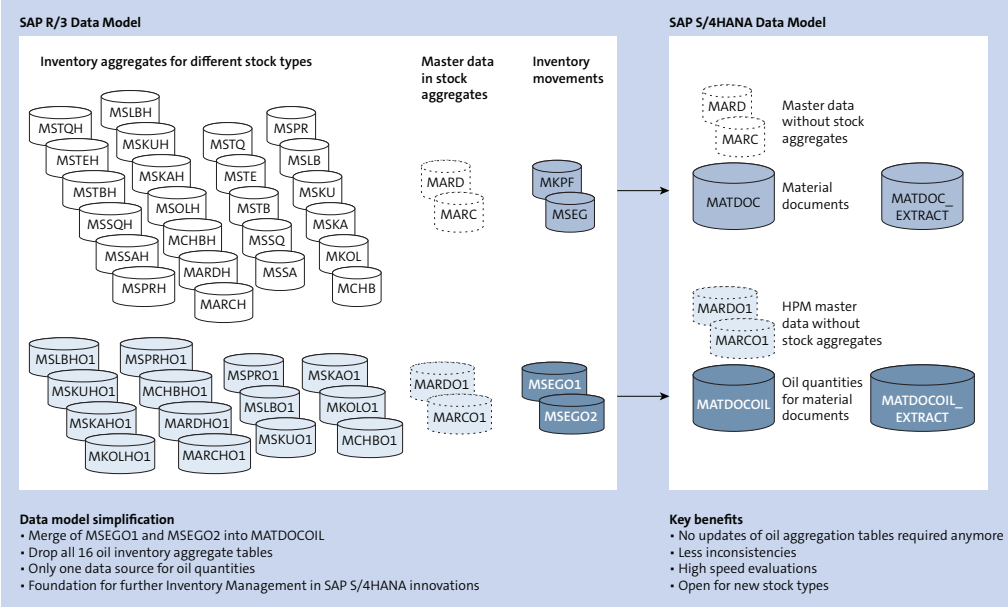


Figure 8.1 Data Model Simplification

The key to this SAP HANA-optimized aggregation for additional oil quantities is the new indexing format; this means that individual additional quantities are stored in separate columns within table `MATDOCOIL` and are then referenced within table `MATDOCOIL_INDEX`. This has a significant impact on any customized code that may have been developed within a system; previous interrogation of tables `MSEGO1` and `MSEGO2` will have relied on a header and item approach.

Clearly, the rationalized and optimized data model provides many SAP HANA-related performance benefits, but the data migration and custom code remediation related to any system conversion for an oil and gas customer should not be underestimated. The custom code remediation which would be required for processing of inbound or outbound movements or TAS integration when interacting with the new HPM data model would be particularly significant; this is an area likely to affect several oil and gas customers and should be evaluated in detail.

8.2.2 Upstream and Downstream

Upstream Oil & Gas functionality is well-supported in the latest release of SAP S/4HANA, with all core IS-Oil functionality enabled with compatibility pack

deployment, as well as several enhancements in specific upstream solutions. In SAP S/4HANA 1709, SAP S/4HANA Oil & Gas for upstream revenue management functionality is delivered with enhanced SAP HANA-based analytical content.

For customers on previous versions of SAP S/4HANA, SAP S/4HANA Oil & Gas for upstream revenue management is available with 1610, and the full upstream functionality is available via limited Compatibility Packs that can be combined with SAP S/4HANA Finance 1503 or 1605—for example, SAP S/4HANA Oil & Gas for upstream operations management, SAP S/4HANA Oil & Gas for upstream contracts management, and SAP S/4HANA Oil & Gas for upstream revenue management.

A specific enhancement has been delivered with the SAP S/4HANA 1610 release for upstream to provide enhanced functionality for UOM groups. This functionality allows a single UOM group to be enhanced with additional UOMs in a seamless way, with tooling provided to update the oil additional quantities table. This is a significant improvement in functionality and allows new and changing business requirements to be reflected in existing data easily.

In 1709, a revamped SAP S/4HANA Oil & Gas for upstream operations management will be released. The enhancements and simplifications are expected to include exploration and production data collection and analysis, extracted products volume allocation, product ownership analysis (partner share, royalty share, etc.), a network modeler to simulate and graphically present the network structure and related allocation processes, and forecasting SAP Fiori apps. Customers running legacy SAP Upstream Operations Management functionality should monitor the changes for inclusion of this component.

On the other side, the SAP S/4HANA Oil & Gas downstream functionality currently delivers more innovation and optimization; however, there are some key consideration in terms of target architecture components.

Core IS-Oil modules such as TSW, Transportation and Distribution (TD), Tariffs, Duties, and Permits (TDP), and Marketing, Accounting, & Pricing (MAP) are delivered with some innovations in usability, but little significant change in functionality, except for optimizations centering on the new HPM data model. There are some considerations regarding custom code remediation for existing customers wishing to migrate; for example, the deprecation of table `KONV` (replaced with table `PRCD_ELEMENTS`) in the pricing area can provide significant areas of complexity for a migration.

The key area for evaluation in the SAP S/4HANA solution for downstream business is located around the functionality to manage service stations. The previous Marketing

Retail Network (MRN)/Service Station Retailing (SSR) functionality is provided in Compatibility Packs only and, unfortunately, not everything is available for everyone; old SSR functionality is available as a universal Compatibility Pack. The new SAP S/4HANA Oil & Gas for retail fuel network operations functionality is available only as a limited Compatibility Package, so it can be combined with S/4HANA Finance 1503 or 1605 only.

In general, these issues are addressed within the additional add-on component S4SCSD (Supply Chain Secondary Distribution) released with FPS 02 in May 2017, the functionality of which is detailed in the next subsection, but does include the full deployment of SAP S/4HANA Oil & Gas for retail fuel network operations.

8.2.3 Trader's and Scheduler's Workbench

The Trader's & Scheduler's Workbench is one of the key areas of innovation of the SAP S/4HANA 1610 release, delivering increased supply chain visibility through optimized planning functionality. Despite this innovation, the core functionality within TSW for master data, nomination, and ticketing is the same as that of the traditional IS-Oil solution, leading to little impact on a client migrating from an existing SAP ERP system.

There are three core aspects of new Trader's & Scheduler's Workbench functionality delivered within SAP S/4HANA:

1. **Regional Inventory Dashboard**
   The Regional Inventory Dashboard is a new SAP Fiori application that provides inventory analysis on a graphical basis and provides alert monitoring, allowing the user to filter and display stock alerts. Direct integration is provided from the Regional Inventory Dashboard to the Inventory Planning Workbench.
2. **Nomination Planning Workbench**
   The Nomination Planning Workbench is a Web Dynpro application that provides multimaterial and multilocation planning from one easy-to-use screen. A mass update feature is provided, allowing the user to quickly adapt nomination quantities and generate what-if scenarios to share with fellow schedulers.
3. **Inventory Planning Workbench**
   An enhanced Inventory Planning Workbench providing real-time planning capabilities and next-generation what-if analysis and simulations allows business users to evaluate stock positions and react to alerting for inventory issues. Specific enhancements in FPS 02 are also delivered, including versions, global variants global alerts, time-based constrains, global simulations, and OData service enablement.

Most of the FPS 01 enhancements and simplifications to the SAP S/4HANA Oil & Gas solution have been delivered for the TSW. Within this release, the following SAP Fiori apps provide new features and enhancements:

- **My Nominations app**
  Schedulers can monitor nominations, access information, and set up new schedules, as well as add their own editable fields and append backed tables.
- **Regional Inventory Overview app**
  Allows users to set up alerts, monitor terminals, view stock information, and take actions on alerts and issues via the integrated Inventory Planning Workbench. An update was provided in FPS 02 for an additional alert framework to match the enhanced global alerts in the Inventory Planning Workbench. You can also generate a heat map that presents only alert symbols (without inventory numbers).
- **Mass Change Events app**
  Supports monitoring of event changes, creation and maintenance of nomination events, and mass change events for multiple nominations.

8.2.4 Transportation and Distribution

Within SAP S/4HANA release 1610, SAP has delivered a fully enabled transportation and distribution solution. The core shipment functionality that has existed within IS-OIL is retained, and the processing involved with shipment scheduling, load confirmation, and delivery confirmation follows the same structure as in previous SAP ERP releases.

On the future roadmap, SAP envisages integration directly between transportation management and bulk oil shipments, to provide enhanced logistics scheduling and tracking functionality. However, the shipment object is likely to be retained in SAP S/4HANA and provide the basis for this integration.

The key point of simplification which must be evaluated by clients is the previous functionality for freight shipment costing that was delivered through the LE-TRA component, which is not the target architecture within SAP S/4HANA. Instead, freight cost settlement functionality within SAP Transportation Management is the solution of choice and will be available as an extended separately licensed solution embedded within SAP S/4HANA. However, this integration isn't delivered currently for optimized bulk oil shipments and is on the roadmap for future innovation.

8.2.5 Secondary Distribution

Early in 2017, SAP released a new SAP S/4HANA-based product called SAP S/4HANA Supply Chain for secondary distribution. SAP S/4HANA Supply Chain for secondary distribution is an add-on for SAP S/4HANA Enterprise Management that allows users to manage telecom sales, data collation, and retail fuel network operations, as follows:

- Telecom sales functionality of SAP S/4HANA Supply Chain for secondary distribution helps users manage sales transactions and process documents such as quotations, sales orders, or contracts. It provides access to reference data such as sales history transactions, credit limit information, or notes created for a specific customer. It's possible to integrate tele sales with SAPphone to perform automatic customer searches by phone number or to make outbound calls.
- Data collation is a process of posting complex logistics business processes through entry of reference data only, completing the process after by completing the adjusting and follow-up documents that provide actual ex post volumes for loading, sales, and unloading. SAP S/4HANA Supply Chain for secondary distribution also offers functionality to integrate data interfaced from external partners like depots through ALE/IDocs or flat files. Received data packages can be verified, converted, and passed to data collation.
- SAP S/4HANA Oil & Gas for retail fuel network operations helps manage and monitor the network of fuel stations and related inventory (replenishment) and financial (cash payments, credit cards, clearing) activities. It can support different fuel station ownership models, like dealer-owned, company-owned, and hybrid combinations.

  Currently, migration from SAP ERP with the Oil & Gas Secondary Distribution (OGSD) or Bulk Secondary Logistics Management (BSLM) add-ons to SAP S/4HANA Supply Chain for secondary distribution is not supported; this feature will be released with SP 01 of SAP S/4HANA Supply Chain for secondary distribution, which is planned for Q4 of 2017.

8.2.6 SAP S/4HANA 1709

SAP plans to deliver innovations and simplifications for both upstream and downstream areas. Note that the items discussed in this subsection are based on preliminary announcements from SAP and might be changed in the officially released 1709 edition.

Oil and gas downstream innovations will include supply chain visualization—including visualization of open shipments, relevant inventory, and associated alerts in a geospatial presentation. There will be also new SAP Fiori apps released for My Nomination Tickets and TSW Tickets, and a new mobile offline ticketing app available as part of the multichannel ticketing framework. The Inventory Planning Workbench will be enhanced via the new alerting framework functionality and multiple versions.

There will be also improvements in the solution integration area. SAP S/4HANA Oil & Gas will be integrated with SAP Commodity Management, and TSW will be integrated with SAP Integrated Business Planning for demand.

In the upstream area, we expect only one change—but a very important one, especially for upstream customers from the United States: integration of SAP S/4HANA Oil & Gas for upstream revenue management with SAP S/4HANA Oil & Gas for upstream operations management.

8.3 Summary

This chapter introduced two different industry solutions: Retail and Oil & Gas. You should now have a good understanding of both of these solutions, including their benefits and features, as well as some of their restrictions.

In the next chapter, we will look at the architecture of SAP S/4HANA.

Chapter 9
SAP S/4HANA Architecture

This chapter provides information about the architecture of SAP S/4HANA, including some details of the underpinning SAP HANA platform and the SAP S/4HANA digital core.

The SAP S/4HANA architecture is based on the SAP HANA database, and it primarily uses an SAP Fiori-based UI. The architecture can support both Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) data. It largely consists of simplified data models from the SAP Business Suite; these simplifications ensure that no aggregation or index tables need to be persisted in the database.

In this chapter, we describe the SAP S/4HANA architecture, including data models, SAP HANA platform architecture, deployment models, and application lifecycle management (ALM). We also cover the SAP S/4HANA core, including how the other components complement this core and how the user experience (UX) has changed with the advent of the current SAP Fiori UX.

9.1 The Journey from SAP ERP to SAP S/4HANA

In this section, we'll talk about the evolution of the SAP product from the SAP Business Suite to the latest product, SAP S/4HANA. We'll also discuss the architecture of SAP S/4HANA, including how it forms the digital core of the modern enterprise, and the triggers for adopting SAP S/4HANA.

9.1.1 The Evolution of SAP S/4HANA

SAP launched the SAP HANA appliance in late 2010 to cater to high-volume, real-time operational analytics. Next, SAP released the SAP HANA database in 2011, with SAP

Business Warehouse (SAP BW) powered by SAP HANA. At present, both products have evolved for many clients and are used to cater to the overall analytics portfolio.

In 2013, SAP released the SAP Business Suite powered by SAP HANA, which provided faster transaction processing, as well as reporting capabilities. Up to this point, running your SAP Business Suite on SAP HANA was the same as running your SAP Business Suite on any other database, with the same data structure and almost the same code base. The only basic difference was that the code handling high volumes of data was being pushed down to the SAP HANA database layer.

With this release, supporting products evolved; for example, the SAP HANA Live views presented the same semantic layer for each product, like SAP ERP. These views were leveraged to create operational reporting, either on SAP HANA in one of the side-by-side scenarios in which SAP Business Suite ran on any database, or in an SAP Business Suite on SAP HANA scenario.

Currently, the SAP HANA Live views are used only in native SAP HANA applications, whereas Core Data Services (CDS) views are used in both native SAP HANA (version 10 and up) and SAP S/4HANA applications, as we'll explain in the next few paragraphs.

In 2015, SAP introduced SAP S/4HANA as a completely new product, which is, as discussed previously, based on the simplified data model of the SAP HANA database, a changed code base, and an SAP Fiori-based UI for many of the processes.

ABAP-based CDS views are used to access the underlying data model, and the code generated for these views is executed in the database layer. Now there are multiple versions of the SAP HANA platform with the release of SAP HANA 2.0. (For more details on the analytics product suite, see Chapter 16.)

What does the overall SAP S/4HANA architecture look like? At the core, the new simplified data models are represented as the physical tables. The SAP S/4HANA business functions read/update data into these data models, and there are virtual data models (VDMs) based on CDS views built on top of these physical tables. Of note, even in SAP S/4HANA 1709, not all the data models of the SAP ERP core have been transformed into simpler models. This simplification is still evolving.

As shown in Figure 9.1, a VDM is a structured representation of SAP HANA database views. Originally, VDMs referred to the SAP HANA Live view for SAP Business Suite.

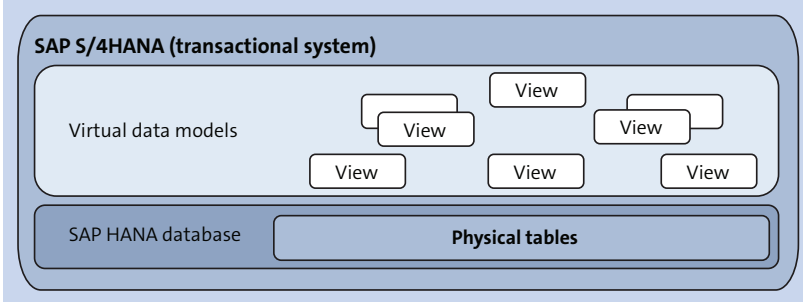


Figure 9.1 Virtual Data Model

CDS views are reusable views that serve as semantic data models not only to expose the underlying data into the operational reporting layer but also to provide additional functions, such as views with aggregation, analysis, and union (combining multiple selections into one result set) functions. CDS views can be created on top of tables or views. From SAP NetWeaver 7.4 on, CDS views are objects created in the ABAP layer. Before that, these views were built in the SAP HANA database layer and consumed in the ABAP layer as native SAP HANA objects. An example of the results of a query based on a CDS view is shown in Figure 9.2.

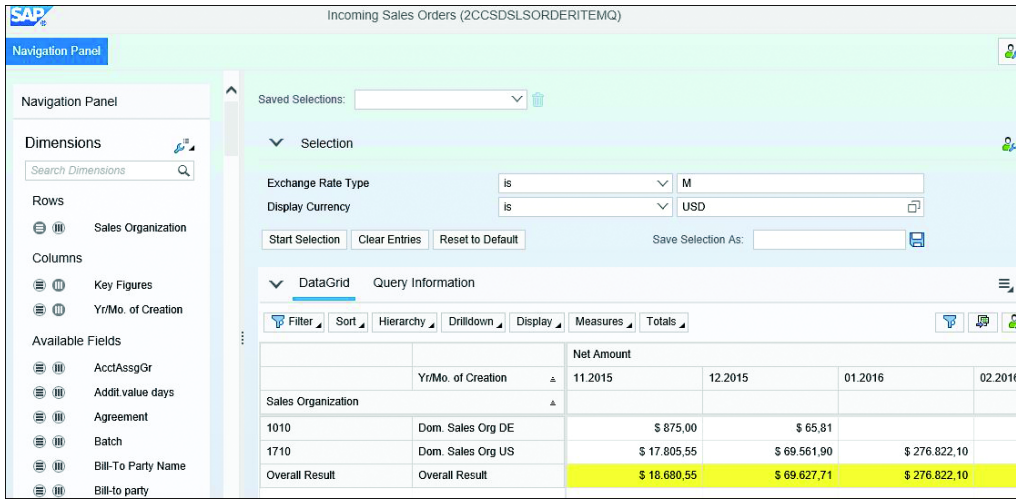


Figure 9.2 CDS Query Sample Result

The underlying technical innovation for the SAP S/4HANA architecture shown in Figure 9.3 is the SAP HANA platform, which uses the in-memory SAP HANA database.

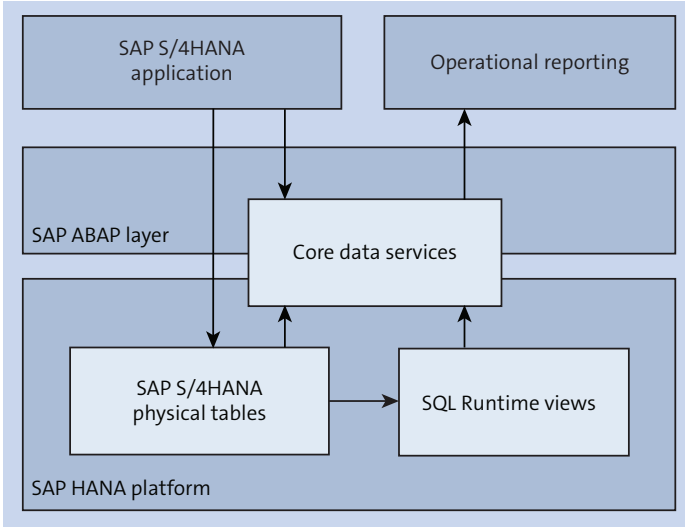


Figure 9.3 SAP S/4HANA Architecture

Before SAP NetWeaver AS ABAP 7.4 SP 05, CDS was available only in the design-time and runtime environments of SAP HANA. Now, the CDS concept is also fully implemented in SAP NetWeaver AS ABAP, whereas the code execution is pushed down to the database. Thus, CDS can be handled in the ABAP layer using the same transport mechanisms as other ABAP artifacts.

CDS views are of three main types:

1. **Basic CDS views**
   Built on top of database tables/views. Used for some basic joins and calculations. Models are highly reusable.
2. **Composite CDS views**
   Use the basic views as a source and builds complex logic as per business requirements. Multiple basic and other composite views can be merged as well. Models are reusable.
3. **Consumption CDS views**
   Used to make information available for consumption by applications like SAP Fiori-based apps, such as Query Browser, KPI Modeler, SAP BusinessObjects reporting tools and more.

An example of how a CDS view can be built up from the base views is shown in Figure 9.4.

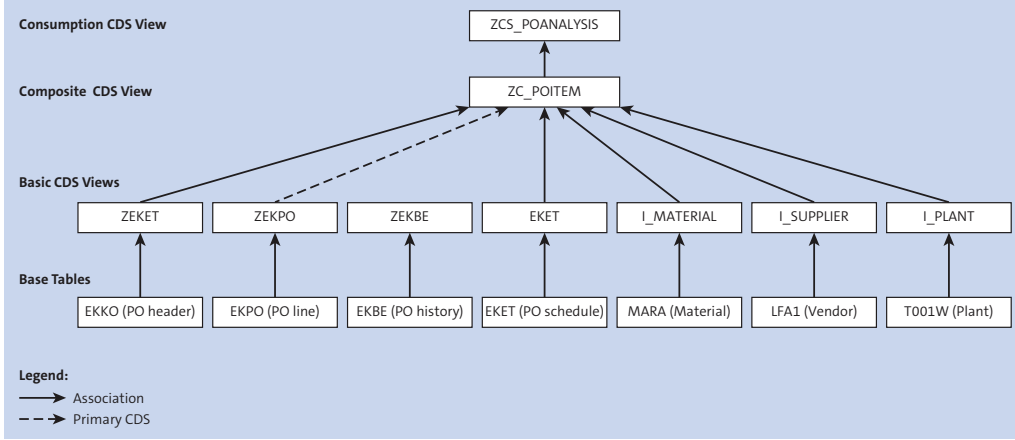


Figure 9.4 Schematic Diagram of CDS Views Relationship Model

You can look up a CDS view in the SAP S/4HANA system by running Report RUTDDLSSHOW2.

Note

Useful information on CDS views can be found at the following websites:

- *http://bit.ly/2x3SSuh*
- *http://bit.ly/2fkq0Vl*

The simplification in the data model will result in a reduction in the database size as the number of redundant tables and the data to be stored in them diminishes with increasing simplification.

Some examples, as we saw in Chapter 2, are found in the finance area, in which the following physical tables no longer exist, replaced by views:

- Table `ANLC`: Fixed Assets: Cumulative Values
- Table `BSAD`: Index for Customers (Cleared Items)
- Table `BSAK`: Index for Vendors (Cleared Items)
- Table `COSP`: Cost Totals of External Postings
- Table `COSS`: Cost Totals of Internal Postings
- Table `FAGLSBSAS`: Index for G/L Accounts—New G/L (Cleared Items)
- Table `FAGLBSIS`: Index for G/L Accounts—New G/L

- Table GLTO: General Ledger Totals
- Table GLT3: Summary Data Preparations for Consolidation
- Table MLCD: Material Ledger

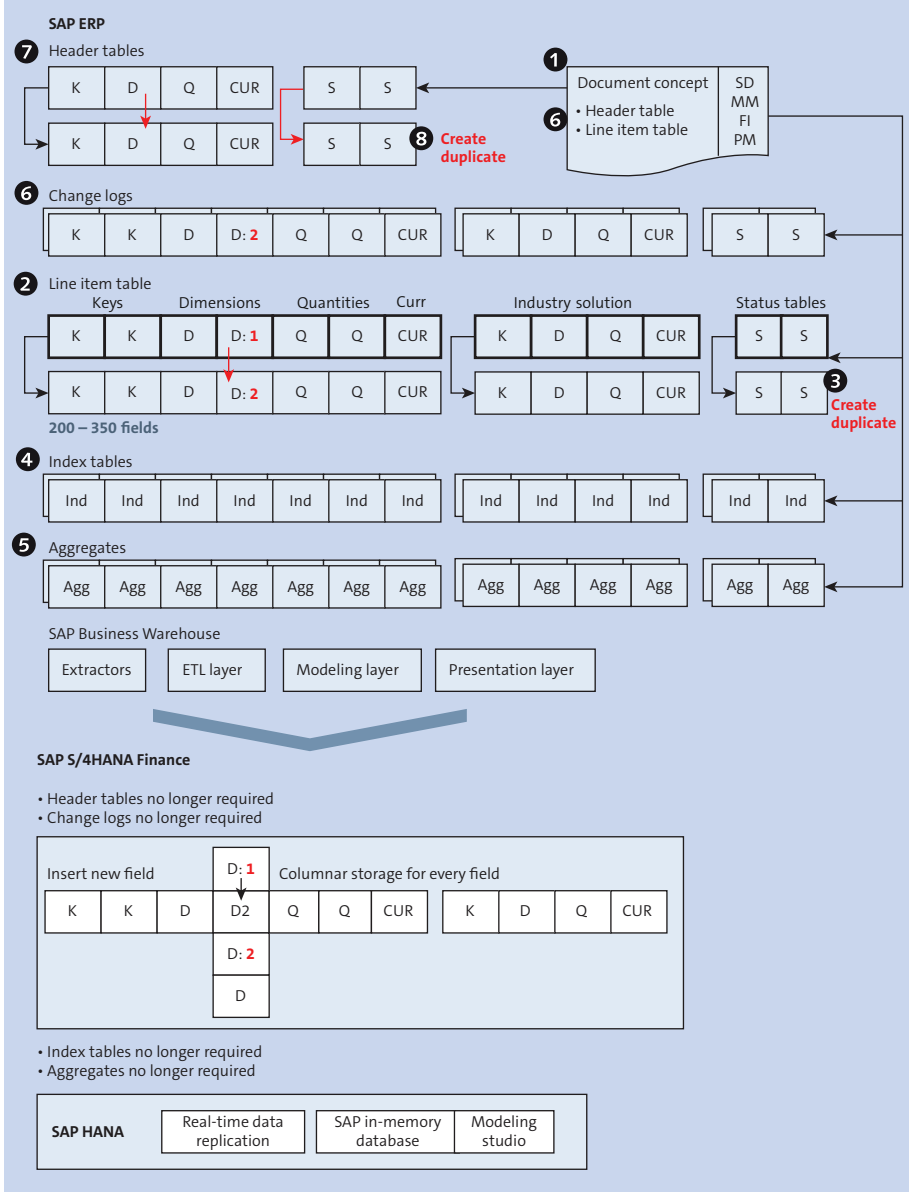


Figure 9.5 SAP S/4HANA: Changes in Tables

Another example of data model simplification in the finance area is for the Universal Journal entry in accounting. The new Universal Journal table ACDOCA provides real-time data from this single journal.

Note

For more information on the Universal Journal, see Chapter 2, Section 2.2.1.

The data model simplification is possible because of the SAP HANA database capabilities. Figure 9.5 shows the table simplification from SAP ERP to SAP S/4HANA.

There is an evolving roadmap (available at the SAP Service Marketplace under **Improvements & Innovations • SAP Roadmaps • Cross Topics • SAP S/4HANA**) that SAP has provided to show how the different pieces of the SAP Business Suite will be integrated together gradually to optimize data usage and minimize data replication across various products. The core of this innovation is the SAP HANA platform, which we'll cover in detail in Section 9.2.

9.1.2 SAP S/4HANA as the Digital Core

Chapter 1 talked about how SAP S/4HANA forms an integral part of the IT digitalization agenda for many clients. To understand how SAP S/4HANA acts as the digital core, let's discuss what IT capabilities are needed by any product to form the digital core:

- Superlative UX
- Analytics at the point of interaction
- Real-time visibility of the enterprise to help with decision-making
- Support for various types of structured and unstructured data, as well as big data from various sources, including IoT and social media
- Integration of best-of-breed solutions across boundaries

SAP S/4HANA has all these capabilities, qualifying it to be the digital core of your business, as detailed here:

- **Frontend**
  With the advent of SAP Fiori Cloud the frontend components required include SAP Fiori launchpad and SAP Gateway services, which are available on SAP Cloud Platform. The SAP Fiori apps can have the SAP S/4HANA core component as the backend system. Thus, the backend is untouched by the changes to any of the frontend components.

- **Analytics**
  The type of agility required by a business today—in which customers expect personalized services, delivered now—can be supported only by the power of SAP S/4HANA as the digital core of the company.

  With the SAP HANA platform supporting both OLAP and OLTP data, SAP S/4HANA provides advanced analytical capabilities that weren't possible with traditional SAP ERP. SAP S/4HANA can perform real-time analytics on transactional data at the time of the data entry itself. This is powered by the high speed of the SAP HANA database, which uses the VDMs through CDS views on the required data for its analysis. Primarily, operational reporting can be used with this setup.

  Other means of analysis are also available to SAP S/4HANA, depending on the scenario and availability of the tools. For example, SAP S/4HANA has built-in hybrid transactional and analytical applications, such as SAP Smart Business Cockpits, multidimensional reports and analytical SAP Fiori apps, and embedded analytics, which include the Query Browser and Query Designer tools. For other types of enterprise-wide analytics, SAP S/4HANA supports SAP BW and SAP BW/4HANA for data extraction.
- **Business components**
  SAP S/4HANA Enterprise Management serves as the foundational solution of the SAP S/4HANA business suite. This solution is built on the SAP HANA platform with user interactions via the SAP Fiori apps, forming the core of the business processes of the digital enterprise.

Some other solutions are being integrated into this core to make use of the common data model and reduce data replication across system components. Let's discuss a few of these changes.

The SAP roadmap now includes adding the industry solutions back into this core. Already in SAP S/4HANA 1511, several industry solutions became part of the SAP S/4HANA core (e.g., Consumer Products, Mill Products, Utilities, etc.). In SAP S/4HANA 1610, most functions of the industry solutions for Retail and for Oil & Gas are also included. With version 1709, more functions for these industries are included, along with several SAP Fiori apps and CDS views. Also, completely new functionality for agricultural contract management is now included in the core.

Moving forward, SAP will integrate full or partial solutions in the SAP S/4HANA core; for example, SAP Extended Warehouse Management (SAP EWM) is part of SAP S/4HANA 1610. SAP Advanced Planning and Optimization (SAP APO) will be completely replaced by multiple solutions. The Production Planning and Demand Sched-

uling (PP/DS) and Global Available to Promise (GATP; now known as advanced ATP [AATP]) functions are available and integrated with the SAP S/4HANA core in the 1610 release. Also, IS-CWM (catch weight management in the Consumer Products industry solution) was made available in SAP S/4HANA 1610. However, the solution is not exactly the same, nor is a conversion possible from an earlier IS-CWM solution to SAP S/4HANA (see SAP Note 2358928).This feature has now been enhanced in 1709 release to remove some of the constraints which were in the solution in the earlier version.

With the 1709 release, some of the features in these line of business (LOB) solutions have been enhanced or newly included, as follows:

- Breakdown analysis and report and repair malfunction in SAP Enterprise Asset Management, including related SAP Fiori apps.
- SAP Commercial Project Management, now delivered as part of SAP S/4HANA and no longer as an add-on.
- SAP Transportation Management is now embedded in SAP S/4HANA and the order integration with SAP TM has been simplified. Thus, delivery creation happens according to the results of transportation planning, and creation and update of transportation requirements happen based on delivery documents.
- SAP Extended Warehouse Management (SAP EWM) enhancements with load planning integrated with SAP TM, optimized pallet planning, stock consolidation, and other functions.
- Embedded compliance in SAP S/4HANA from a governance, risk, and compliance (GRC) perspective, with some basic functions.
- Many SAP Fiori apps in the procurement and finance areas.
- For SAP Hybris Billing, SAP Fiori apps added for several functions and improved support for digital payments through customer financial integration with payment service providers via SAP Cloud Platform.
- Variant configuration, covered in detail in Chapter 15.
- Enhancements in functions in environment, health, and safety (EHS) and quality management.
- For SAP Product Lifestyle Management (SAP PLM), several changes, as covered in Chapter 15.
- SAP Master Data Governance (SAP MDG) now comes as embedded SAP MDG in SAP S/4HANA. These changes are covered in Chapter 15.
- SAP Customer Relationship Management (SAP CRM): The details of the features available are mentioned in the feature scope description at the SAP Help Portal (*http://help.sap.com/s4hana*).

Other cloud-based solutions—SAP Ariba, SAP SuccessFactors, SAP Fieldglass, Concur, SAP Hybris, SAP Hybris Cloud for Customer, SAP Financial Services Network, and third-party solutions such as Vertex for tax calculation—can be integrated with the SAP S/4HANA core through various middleware products such as SAP Cloud Platform Integration, SAP Process Orchestration (SAP PO), SAP Cloud Platform Integration, or web services. SAP S/4HANA 1610 provides built-in support for some of these cloud solutions (e.g., SAP SuccessFactors and Concur). More interfaces are being made available in subsequent releases, such as version 1709; for example, exchange rates, a band master interface for Employee Central in SAP SuccessFactors, and order data replication between SAP Hybris and SAP S/4HANA. Also, in-built integration is being provided in 1709 for SAP Ariba.

More details on SAP S/4HANA Cloud are covered in Chapter 11.

9.1.3 The Roadmap to SAP S/4HANA and Innovations

For the IT department of an enterprise, the roadmap for SAP S/4HANA adoption depends heavily on the status of the IT landscape, especially the SAP footprint, and the short-term and medium-term focus areas. Let's discuss how the roadmap can be designed with a few example scenarios.

Triggers

Certain events trigger the evaluation of SAP HANA in its different forms, but here we'll talk only about those events that directly affect SAP S/4HANA considerations. You might begin considering the implementation of SAP S/4HANA under the following circumstances:

- **Business needs**
  Businesses may need functionalities that are available only in SAP S/4HANA—for example, a real-time operational report that influences business decisions. Businesses also may have certain pain points that can be solved by migrating to or implementing SAP S/4HANA. For example, there may be a consolidation scenario in which several large ERP systems need to be consolidated into a single large ERP system where all the business processes are aligned to the standard processes and are supported by a cutting-edge technology platform. This could be an existing system consolidation exercise or the result of a merger and acquisition. It could even be a divestiture in which part of the functions and data are removed and the business wants to align the remaining solution with the latest SAP solution, which is SAP S/4HANA Enterprise Management.

- **Greenfield implementation**
  Many clients implementing or reimplementing SAP ERP tend to start with the latest version of SAP S/4HANA Finance (e.g., 1605) or SAP S/4HANA Enterprise Management (e.g., 1709 or 1610). For more information, see Chapter 13.
- **Technology drivers**
  There can be several technology drivers for an SAP S/4HANA adoption evaluation, including TCO reduction through infrastructure footprint reduction or landscape simplification.
- **Hardware considerations**
  For many clients, the SAP HANA roadmap evaluation is triggered by a hardware refresh cycle. Instead of keeping the traditional hardware, they select hardware to support the SAP HANA platform so that they don't need to invest in the hardware for a reasonably longer period. Thus, they get the latest innovations of the database and, at the same time, have a future-proof solution. Many such clients like to go step by step and opt to migrate to an SAP Business Suite on SAP HANA solution to start.
- **Future-proofing**
  The SAP technology platform and making it ready for innovations is a driver for customers who need the platform to enable their business process innovation.
- **End of life (EOL)**
  EOL issues for SAP ERP versions can be drivers to cause some SAP customers to think about the latest product versions of SAP S/4HANA.
- **Upgrades**
  Upgrades can be important trigger points for many clients because they can be such cumbersome IT projects.

Inhibitors

Just as there are several triggers for an SAP S/4HANA adoption, there are some deterrents to a fast adoption of SAP S/4HANA. Some companies have decided to adopt only the SAP S/4HANA Finance functionalities, whereas others opt for the whole scope of the SAP S/4HANA solution.

Behind these choices, the most important consideration is that SAP S/4HANA is a new product that is still evolving. The end state in terms of the functionality for SAP ERP and industry solutions support is yet to be reached for the SAP S/4HANA Enterprise Management solution.

The other factor is that some large clients want to see how other companies of similar size and industry are faring with their SAP S/4HANA solutions before taking the plunge. Because SAP S/4HANA has only made the foray into the market as of Q1 2015, few companies have completed the SAP S/4HANA implementation and are reaping the benefits already.

For some SAP customers that have huge databases, the hardware size limitations and the high costs for the large size can also act as deterrents. Typically, the existing uncompressed OLTP database (non-SAP HANA platform) is reduced by a factor of 5 to 10 when moved to SAP HANA. Even then, however, the existing database size and its rate of growth may be prohibitive, considering the current constraint in the scale-up and scale-out architecture and hardware availability. Some of these SAP customers are also considering archiving solutions, which take time to implement.

Some clients have an IT strategy to move completely into the cloud and are contemplating a SaaS solution such as SAP S/4HANA Cloud. However, SAP S/4HANA Cloud doesn't have all possible functionalities yet.

Thus, several clients are playing a "wait and watch" game—waiting for more success stories, waiting for the SAP S/4HANA product to stabilize or at least have a clearly defined roadmap, or waiting for the entire simplification to be completed—before they embark on the SAP S/4HANA journey. Some clients are also adopting interim steps to prepare for the SAP S/4HANA journey, such as performing the SAP S/4HANA impact assessment on their existing solution and archiving projects. The SAP Business Suite on SAP HANA migration might also be a stepping-stone for some businesses.

That said, most clients are building up their digital transformation roadmaps with SAP S/4HANA as the digital core and are at least assessing their current investments and the current state of their SAP ERP systems and other SAP products, while considering that some of these SAP products would be merged into the SAP S/4HANA core or moved to a cloud-based solution.

Decision Factors

When a client wants to evaluate its SAP S/4HANA roadmap, there are major factors to consider, as shown in Table 9.1. The table shows a sample for a greenfield implementation scenario in which the SAP customer is evaluating three options: SAP Business Suite on any database, SAP Business Suite on SAP HANA, and SAP S/4HANA. (*High*, *Medium*, and *Low* designate the degree to which the product matches with the customer's high-level requirements.)

Decision Factors	SAP Business Suite on Any Database	SAP Business Suite on SAP HANA	SAP S/4HANA
Functionality requirement	High	High	Medium
Solution stability	High	High	Medium
Costs (implementation, licensing, etc.)	Medium	Medium	High
Infrastructure costs	Medium	Medium	Medium
Innovation (big data analytics, IoT, etc.)	Low	Medium	High
Data volumes handling	Low	High	High
Speed of implementation	Medium	Medium	High

Table 9.1 Sample Set of Factors for Evaluation of SAP S/4HANA Adoption

This table, of course, provides only a simplistic view. In practice, the evaluation will be very different for different clients, and the weighting of different factors will vary with the client's focus or the primary driver for such an evaluation. Some clients want to be at the leading edge of innovation in their IT strategy, and they are more willing to take risks, whereas others want to have a more balanced strategy. This also can drive the weight placed on different factors under consideration.

The migration scenarios are even more complex, because there needs to be detailed evaluation of the existing solution impact and the impact on the business processes subsequent to the migration to SAP S/4HANA. Details of the migration scenarios are covered in Chapter 13.

Finally, we need to consider that with SAP S/4HANA, the functions of the transactional and analytical systems are being blurred, and there will be a similar impact on the different IT departments supporting the solutions. Thus, an enterprise needs to have an overall SAP HANA adoption strategy, including SAP S/4HANA and other products on SAP HANA based on their landscapes or requirements—for example, SAP BW on SAP HANA, native SAP HANA, SAP Leonardo for support of IoT, or solution extensions for SAP SuccessFactors or SAP Hybris; the list is long. One thing is clear, however: SAP HANA adoption isn't a question of *if*, but *when*.

9.2 SAP HANA Platform

The SAP HANA platform for real-time analytics and applications makes it possible to combine the OLAP and OLTP worlds. This platform provides various capabilities or services and is the core that several SAP products leverage, including SAP S/4HANA. Before expanding into these capabilities, let's spend a little more time discussing the SAP HANA database.

9.2.1 SAP HANA Database

At the core of the SAP HANA platform is the SAP HANA database. The features that make this database the core for other products to leverage are discussed in the following subsections.

In-Memory Storage

The capacity of main memory in servers has been increasing in leaps and bounds over the past few years, and such high memory is also becoming much more affordable. The advantage of in-memory operations on data is the huge speed difference when compared to accessing data from the drive. As an example, in-memory data can be accessed 100,000 times faster than data can be accessed from a spinning hard disk. In addition, the main memory is connected to the CPU through a high-speed bus, whereas the hard drives are connected through a chain of buses and controllers.

Columnar Storage and Row Storage

Relational databases organize data in tables that can store the data records in rows or columns. In SAP HANA, most tables are *columnar*, except for the system tables. Traditional row databases store data in a row as one "bundle." Although this leads to very good performance during write operations, its efficiency is lower during read operations. If the table has too many columns and you need to extract the data only from some of those columns, classical row databases still need to read complete rows and then discard the unnecessary data. Because columnar databases store data for each column separately, they can retrieve only data from columns that were really required to deliver the response, avoiding unnecessary read operations.

In summary, the advantages for data selection are as follows:

- Only the relevant columns of the table need to be accessed when a query is run.
- Projections are efficient.

- Any column can be an index. Thus, a single-column index isn't persisted on the disk; instead, it's generated when the table loads. If it's a multicolumn index, this is persisted on the disk, so manual maintenance of secondary indices is no longer required.

There are certain disadvantages of a column-store table (e.g., insert-updates aren't easy), but these can be circumvented. For example, insert-updates are accelerated using a special table structure with a delta mechanism that minimizes the impact of write performance on columnar tables. However, delta operations such as the delta merge are memory- and CPU-intensive, with spurts of disk I/O load (while persisting the data). When tables become huge, the performance can be impacted. Hence, table sizes need to be kept under control through partitioning.

Note

More details about delta merge operations are available at *http://bit.ly/2y8HpZ0*.

Compressed Data

In SAP HANA, columnar storage makes different types of data compression possible. For example, table data is massively *compressed* in such a way that the data movements are minimized without increasing the CPU load for decompressing the data. Each column of the table undergoes this compression, which involves allocating consecutive numbers to distinct column values.

This is known as the *dictionary* for each of the distinct columns. Hence, storage of such numbers is typically much smaller and helps to compress the data. A simple example is shown in Figure 9.6 to illustrate a column table and its dictionary.

Other advanced compression algorithms are also applied on each column. The SAP HANA database determines the suitable algorithm to be applied to each of the columns and reevaluates this algorithm based on the data in the table. Columnar storage together with data compression makes database querying many times faster.

The data requirements of modern-day enterprise applications or data warehouse solutions may be much greater than those of single systems provided by hardware vendors. Parallel processing and partitioning overcomes this limitation.

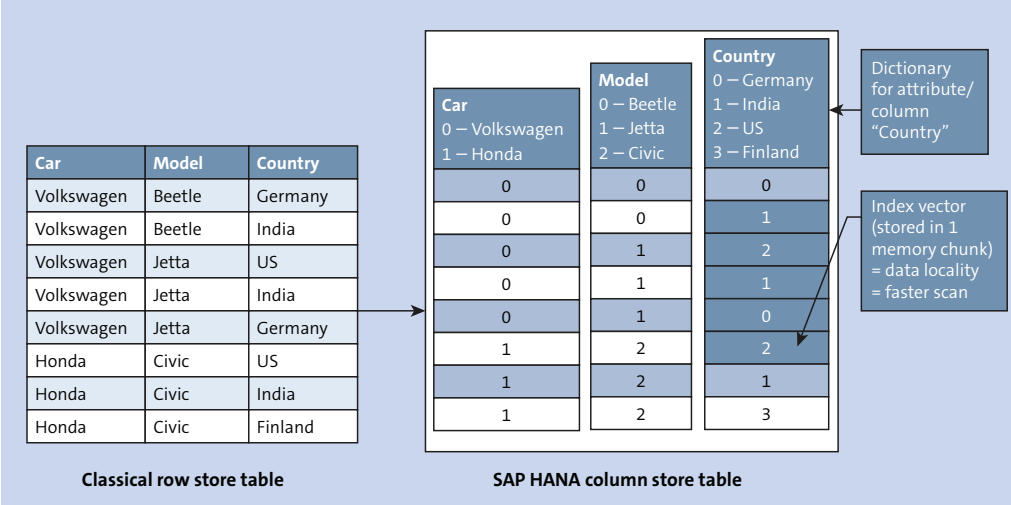


Figure 9.6 Example of Columnar Data Store

Leverage Massively Parallel Processing

A single processor now has multiple cores or processing units, which increases the processor performance through parallel processing of its different cores. Each core can process each column, and this makes parallel processing simpler and more effective. Systems can be multiprocessors, thereby making more parallel operations possible. This again increases the overall system performance massively.

Leverage Partitioning

Partitioning normally is used in a scale-out architecture environment, but it can be used for a single-host environment as well. The data can be divided and placed into clusters of servers, forming a distributed database. Alternatively, the individual database tables can be placed on different servers within the cluster. If some of the tables are larger than a single server can hold, it can be split into several partitions with a group of rows per partition (horizontal), while each partition resides on a separate server within the cluster. This feature helps in quickly analyzing large amounts of data and handling complex calculations.

The column tables in the SAP HANA database are restricted to two billion records in an unpartitioned table. If a table crosses this limit, the entire database can fail, as we've witnessed firsthand for one client. In such cases, partitioning is the only way

out, unless of course the table contents can be truncated (e.g., log tables of which older data isn't required). The table can be split into partitions containing a set of rows determined by algorithms such as hash partitioning or partitioning by a range (e.g., by year). Partitioning, directly and indirectly, helps to increase the performance of the database for reading as well as writing through delta merge operations.

For optimizing queries on partitioned tables in SAP HANA, static partition pruning is used. To do so, the query optimizer analyzes the `WHERE` clause of queries to determine whether the filters match the given partitioning specification of a table. Because this partitioning specification didn't change in SAP HANA SPS 02, static partition pruning was used. SPS 02 uses dynamic partition pruning, which is content-based and takes place at run time based on the existence of statistics; it helps avoid the need to access and load into memory partitions, which aren't required.

SAP HANA's performance depends on the innovations produced by processors and hardware vendors. Columnar structure allows the database to deploy a dedicated processor core for each column (or column partition). This enables databases to use massive parallel processing for individual queries and leads to significant acceleration compared to processing a query with a single core.

For example, as of September 2017, the Cisco, Fujitsu, Hitachi, and Lenovo servers can support up to 6 TB of scale-up for SAP Business Suite powered by SAP HANA or SAP S/4HANA, and HP supports up to 20 TB of scale-up, as well as scale-out in the appliance models. Cisco, Fujitsu, Hitachi, and Huawei provide 8 TB of scale-out for SAP S/4HANA.

With the Intel Skylake processor, Fujitsu and Lenovo can support 12 TB of scale-up for SAP S/4HANA/SAP Business Suite on SAP HANA; other hardware providers, like Cisco, Dell, and HP, have also adopted this processor.

Note

Some examples of SAP HANA on IBM Power systems are available at *https://sapon-power.wordpress.com*. The performance outcome for the Haswell CPU from Intel and how it's been used in servers is explained in a blog at *https://blogs.saphana.com/2015/06/29/impact-of-haswell-on-hana/*, and details about the newly released Broadwell servers are explained in a blog at *https://blogs.saphana.com/2016/06/06/new-intel-xeon-broadwell-processor-boosts-sap-hana-scalability-performance-new-highs/*.

9.2.2 Virtualization

The SAP HANA platform (from SPS 05 onward) has supported virtualization technology to host multiple separated SAP HANA instances that run on separate virtual machines (VMs). This virtualization of the underlying server(s) can be performed for SAP S/4HANA. This helps to abstract the hardware layer and increase use of the hardware, thereby reducing TCO.

Figure 9.7 shows a configuration for Multitenant Database Containers (MDCs; explained in Section 9.2.6) on a virtualized environment.

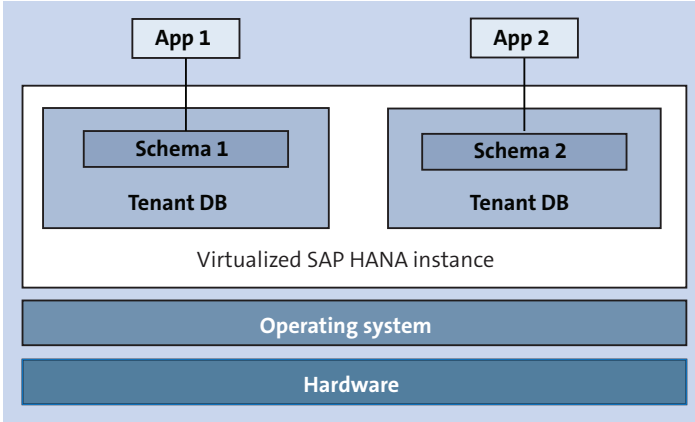


Figure 9.7 Virtualized SAP HANA System

Note

For any virtualization, SAP provides guidelines that can be found at *http://archive.sap.com/documents/docs/DOC-60312*.

These guidelines should be followed along with the best practices/recommendations of the hypervisor vendor.

The current virtualization options are as follows, as of September 2017, per SAP Note 1788665:

- Software-level virtualization options (hardware vendor–independent options):
  - VMware vSphere 5.1 (nonproduction only)
  - VMware vSphere 5.5 (also for production)
    - VM limits: 64 vCPU, 1TB RAM

    - Single-VM only—General Availability (GA; refer to SAP Note 1995460)
    - Multi-VM support—GA (refer to SAP Note 2024433)
    - SAP BW on SAP HANA scale-out—GA (refer to SAP Note 2157587; included only for the sake of completeness)
  - VMware vSphere 6.0 (also for production)
    - VM limits: 128 vCPU, 4TB RAM
    - SAP HANA SPS 11/12 (or later releases) for production single-VM and multi-VM use cases (refer to SAP Note 2315348)
  - KVM or XEN (nonproduction only)
  - VMware vSphere 6.0
    - In GA with SAP HANA SPS 09 or later for all deployment scenarios for non-production use
    - In GA with SAP HANA SPS 11/12 (or later releases) for production single-VM use (HSW, BDW) and multi-VM on full and half-sockets (HSW) use cases
  - VMware vSphere 6.5
    - In GA with SAP HANA SPS 12 (or later releases) for production single-VM and multi-VM use cases for up to 4 TB of main memory (BDW)
    - Hitachi LPAR 2
    - SAP HANA SPS 07 (or later releases) for production and nonproduction use cases
    - Single and multi-VM scenarios (see SAP Note 2063057)
  - In Controlled Availability (CA) for single-VM scenarios on certified four-socket Huawei hardware
  - Huawei FusionSphere 5.1/6.0 with SAP HANA SPS 10/11 (or later releases) for production and nonproduction use cases—for single-VM, multi-VM, and scale-out scenarios
  - In CA for all use cases on Ivy Bridge and Haswell hardware up to 1 TB
  - XEN with SAP HANA SPS 09 (or later releases) for nonproduction use cases
  - KVM with SAP HANA SPS 09 (or later releases) for nonproduction use cases
- Hardware vendor-dependent options:
  - SAP HANA on Power—GA (refer to SAP Note 2230704)
  - In GA for single-VM and multi-VM scenarios with up to eight LPARs on one server
  - Hardware-based partitioning

    - HP nPartitions—GA (refer to SAP Note 2103848)
    - Fujitsu PPARs (physical partitioning)—GA (refer to SAP Note 2111714)
    - Lenovo FlexNode—GA (refer to SAP Note 2232700)
  - Others
    - Hitachi LPAR 2.0—GA (refer to SAP Note 2063057); in CA for single- and multi-VM scenarios on full and half-sockets (HSW, BDW)
    - Huawei FusionSphere 3.1, 5.1—CA (refer to SAP Notes 2186187 and 2279020)
    - Huawei FusionSphere 3.1 with SAP HANA SPS 09 (or later releases) for production and nonproduction

Keep the following in mind for virtualization:

- As part of GA, SAP supported only scale-up scenarios for SAP S/4HANA, not scale-out. However, this has changed with SAP HANA 2.0 SP 00 and SAP S/4HANA 1610 FPS 01, for which scale-out is also supported.
- Sizing guidelines from SAP and vendor recommendations need to be followed for each VM, with no CPU/memory overprovisioning.
- The SAP HANA Guidelines for Running Virtualized file and the vendor-specific best practices document need to be followed for configuration and overall setup of the virtualized environment.
- There is a performance impact on the virtualized SAP HANA environment compared to a nonvirtualized environment. For example, SAP has mentioned a performance benchmark of less than 12 percent degradation for most tests in a virtual environment against a bare metal deployment, but there were outliers as well.

Note

The byte order in SAP HANA 1.0 on IBM Power is Big Endian; in SAP HANA 2.0 on IBM Power, the byte order is Little Endian.

For your choice of SUSE Linux distribution, SUSE Linux Enterprise Server 12 SPS 01 and above exclusively support Little Endian byte order on the IBM Power platform.

It's important to check the SAP guidelines for virtualization and the features and constraints available for the specific products used for virtualization; these are constantly evolving.

Note

Regarding restrictions when migrating SAP NetWeaver systems from SAP HANA 1.0 to SAP HANA 2.0 on IBM Power, see SAP Note 2429277 (Migrating an SAP NetWeaver-based System from an SAP HANA 1.0 Database to an SAP HANA 2.0 Database on IBM Power). When upgrading from SAP HANA 1.0 on Power to SAP HANA 2.0 on Power, a full data migration is required. Backups from SAP HANA 1.0 on Power are not compatible with SAP HANA 2.0 on Power (see the *What's New* release notes for SAP HANA 2.0 at *http://bit.ly/2wYirxx*).

For details on guidance and tools available for the migration, see the SAP_HANA_System_Migration_en.pdf document attached to SAP Note 2380257 (SAP HANA Platform 2.0 SPS 00 Release Note).

The concept of virtualization can be applied to the hardware for SAP HANA, which is available as an appliance or through the SAP HANA tailored data center integration (TDI) approach. The SAP HANA journey started with the appliance delivery model, in which the entire product was delivered as a preconfigured set of software components on top of preconfigured hardware components supplied by SAP-certified hardware partners. However, with the TDI approach, which again evolved over the years, you have the flexibility of using different hardware components (e.g., storage, network, and servers) from different vendors to integrate SAP HANA into the client's data center (on-premise or cloud). The components used in a TDI approach are shown in Figure 9.8. Restrictions are applicable, including the requirements to use SAP-certified hardware, storage, and configurations.

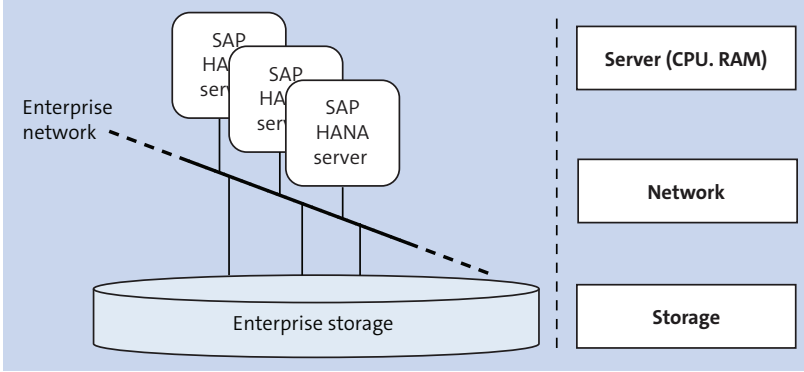


Figure 9.8 Tailored Data Center Integration Components

The TDI model was delivered in the following four phases:

1. **Shared enterprise storage**
   Customers can reuse their enterprise storage solutions for their SAP HANA deployments, but they need to choose from the list of certified storage vendors (found at *http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/enterprise-storage.html*).
2. **Network**
   A customer can reuse its existing network solution in its enterprise. For example, the customer can include its networking infrastructure and network components in its data center, such as routers, bridges, and switches for SAP HANA cluster internode and cross-site communication. For network solution guidelines, see SAP Note 1943937 and see SAP HANA TDI—Network Requirements at *https://scn.sap.com/docs/DOC-63221*.
3. **Entry-level SAP HANA E5 systems**
   Customer can choose the following cheaper CPU model: Intel Xeon E5 v2/v3 with more flexibility (restrictions: max. two sockets, single-node only, with no support for scale-out).
4. **SAP HANA on IBM Power**
   Whereas the preceding option provides support to customers considering alternative hardware with its own processors, SAP HANA on IBM Power is supported only under the TDI model. Currently, the maximum memory (RAM) supported for production for scale-up for IBM Power models is 16 TB RAM/LPAR (logical partition).

Note

Refer to SAP Notes 2399995 and 2235581 for hardware requirements for SAP HANA 2.0 and for operating systems. More details on the different options and the corresponding features can be found at *https://scn.sap.com/docs/DOC-63140* and in the webinar session recording at *http://bit.ly/2wc5bpJ*. For a complete FAQ, visit *http://bit.ly/2p1JzZu*.

9.2.3 Scalability

The SAP HANA database can be scaled up or scaled out, and the technique to apply depends on whether SAP S/4HANA, SAP BW on SAP HANA, or native SAP HANA is running. We'll talk more about this after we explain the underlying concepts.

SAP HANA systems require a specific CPU-to-RAM ratio. For SAP Business Suite or SAP S/4HANA, it's 768 GB per socket for the production environment. For the latest CPU model (Broadwell, released by Intel in June 2016), it's 1 TB of RAM per socket, allowing you to reach 8 TB of RAM on an eight-socket server. The CPU-to-RAM ratio for older CPU generations is much lower. The CPU-to-memory ratio as of September 2017 has increased to 1.5 for SAP Business Suite on SAP HANA per socket. Now, the recommendation is to configure 28 cores per socket on SAP HANA-certified Skylake processors 8180(M) and 8176(M).

Scale-up has a single-host architecture in which a single system is built up from as many resources as feasible.

Specific hardware vendors support specific maximum levels of memory. For example, multiple vendors at the time of writing of this book support different levels of scale-up memory, such as IBM, Lenovo, Cisco, HP, SGI, Fujitsu, and Hitachi.

The scale-out architecture is created by clustering together smaller SAP HANA systems into a cluster database with shared storage. Thus, it's a multihost environment. This architecture is supported in GA for SAP BW on SAP HANA, which supports a different CPU-to-RAM ratio. Because the size of a single server is limited to 4 TB, this was used for SAP Business Suite or SAP S/4HANA applications only for a high-availability configuration until SAP HANA 1.0. However, with SAP HANA 2.0, scale-out is supported in SAP HANA for transaction systems, so this constraint is no longer applicable. High-availability configuration details are covered in the next section.

The scalability of the SAP HANA architecture continues to improve with innovations from vendors such as IBM with IBM Power Systems and its own processors, other hardware companies using Intel processors, and the evolution of the processors themselves. The recommendation is to first scale-up to increase the memory in the single server up to its physical limits and then, for larger systems, scale-out; that is, add more servers in the SAP HANA system.

With SAP HANA 2.0 SPS 00, the scale-out option is now supported for SAP S/4HANA 1610 FPS 01 and beyond for memory scale-out.

Some important recommendations SAP has provided (see SAP Note 2408419) should be followed for the scale-out architecture. These recommendations are as follows:

- Dedicate the scale-out hardware to exactly one SAP HANA instance; that is, don't make use of MCOS setups in which multiple SAP HANA database instances are installed on the same hardware. The reason for this recommendation is that compared to scale-up, the performance of scale-out systems is even more dependent

on the behavior and load on all hardware components, including the storage and internal network components.

- When operating the SAP HANA database in MDC mode, you should only operate a single-tenant database. The reason for this is the same as for the previous recommendation.
- Do not operate multiple SAP applications within one SAP HANA database or within one tenant database (MCOD). The methodology for table grouping and table distribution has been designed for running a single SAP application within the database. If you operate multiple applications within one database, this produces less favorable table grouping/distribution results.

The hardware configurations for the scale-out depends on the vendor and should be checked against the right notes; for example, an IBM Power-based node needs greater than or equal to 64 cores per LPAR with greater than or equal to 6 TB memory per LPAR, and the LPAR needs to be configured according to SAP Note 2188482.

Note

A list of SAP-certified SAP HANA hardware is maintained in the directory at *http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html#categories=SoH*.

You can find further information in SAP Notes 2075461 and 1950470.

9.2.4 Recoverability

Recoverability of a database means that in the event of a database failure, the extent to which the deployment is restored to the point at which the failure occurred. This is one of the most important considerations for a transactional system such as SAP S/4HANA and must be planned for properly.

Because the SAP HANA platform uses most data in-memory for best performance, in the case of a power failure, this data may be lost. However, there is persistent storage as well to protect against such failures. During normal operations, data is stored from the memory to the disk at regular intervals. This creates a *savepoint* (see Figure 9.9). In addition, logs are written for any change in data after each operation. The log data is also saved to the disk after each transaction commit. Therefore, in the case of a power failure, the database can be restarted like any other database and takes into account this log data after the last savepoint. This helps to maintain the database consistency.

Recoverability, in turn, is closely linked to the term *availability*. Availability indicates the operational continuity of the system and is measured as a reverse function of system downtime, expressed as a percentage. There are two other aspects that may be needed for the SAP HANA database in the case of a disk or data center failure: *high availability (HA)* and *disaster recovery (DR)*.

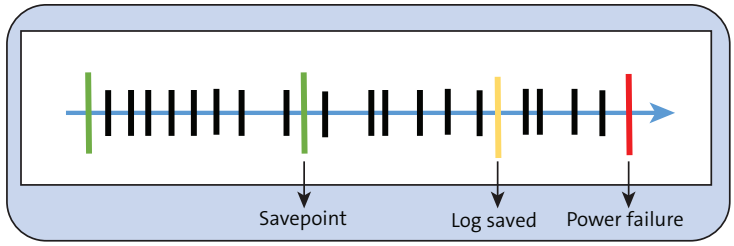


Figure 9.9 Persistence in SAP HANA

SAP states that HA "increases the failure tolerance within one data center by providing a fast switch over to an operational state of the SAP HANA database." HA indicates a set of techniques and plans for business continuity in case of server failure. DR is the process of recovering operations after a server failure that is due to a site or data center failure.

There are two KPIs associated with recovery:

- **Recovery point objective (RPO)**
  RPO refers to the maximum permissible period during which data may be lost between the last backup and the system crash.
- **Recovery time objective (RTO)**
  RTO refers to the maximum possible time elapsed between the system unavailability and the system being operative again.

The following subsections describe the various options for making a system HA and/or DR. These options have different RPOs, RTOs, and costs.

Backup and Recovery (Disaster Recovery)

Backups are necessary for database restoration in case of disk failures, to restore the database to an earlier point in time, or for database copy. Backups need to be made for data and log volumes and can be manual or automated. SAP HANA also synchronizes the data backup across multiple nodes and services without manual intervention. All services that require data to be persisted are backed up. Data backup happens

when the database is running, and transactions are stopped only for a very short time when the backup is initiated. There are various options to perform a data and log backup, which can be configured through SAP HANA Studio:

- Backing up to file systems—for example, to a Network File System (NFS) share (SAP Note 1820529)
- Backing up to a third-party backup server through implementation of the Backint for SAP HANA application programming interface (API) by an SAP-certified third-party agent
- Backing up as a storage snapshot to external storage

Recovery from these backup options is possible with the following alternatives:

- Recovery to the most recent state using data backup or storage snapshot and using the log backups post for that backup point and entries if still available in the log area
- Recovery to a specific point in time by using the data backup or storage snapshot from that point in time and the log backups post for that backup point and entries if still available in the log area
- Recovery using data backup or a storage snapshot at a specific time but without log backups for the time thereafter and without any log entries beyond that point

During recovery, the SAP HANA database is shut down. The progress and the actions can be initiated and checked using SAP HANA Studio. For this option, the costs are comparatively lower, but it has RPO greater than zero and a high RTO.

SAP HANA Storage Replication (Disaster Recovery)

This option enables continuous replication of all persisted data, including the data and the redo log of every committed transaction to a remote, networked storage system on a secondary site (see Figure 9.10). Several vendors offer this storage replication option. In some of these SAP-certified solutions, the SAP HANA transaction at the primary site is completed only when the SAP HANA transaction log at the primary site is replicated in the backup site. This is known as *synchronous storage replication* and can occur only if the two sites are within 100 kilometers of each other with a fraction of a millisecond round trip latency.

If a full system failover is needed, the system administrator attaches a passive system to the secondary storage and ensures that there is no data corruption from both systems writing to the same storage. The SAP HANA system is then restarted to complete the restore process. This mechanism has an advantage over the backup-restore

mechanism because RPO is much lower in this case, although there is an additional requirement in terms of network bandwidth and decreased latency between the primary and secondary storage sites. This option has medium costs associated with it with near zero RPO (zero RPO for synchronous replication) and medium RTO.

The disadvantage of storage replication is that if there is any corruption to persistence for any reason, the corruption is also replicated.

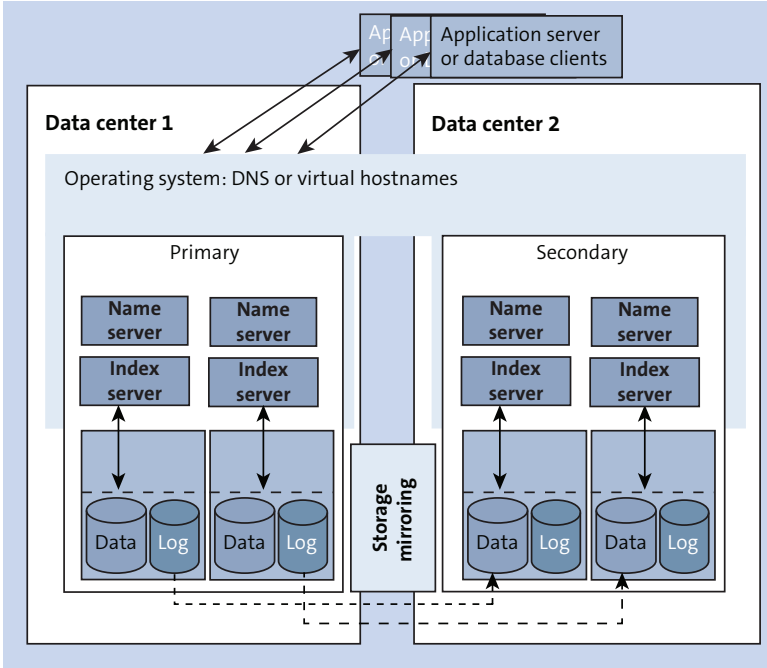


Figure 9.10 Storage Replication

SAP HANA Host Autofailover (High Availability)

In this scenario, an existing single-node or scale-out setup is extended by additional server nodes called *standby nodes*. Although SAP HANA supports multiple standby nodes, it's typical for only one additional node to be used. This standby server can take over in case one or more regular hosts become unavailable. If one host fails, the standby host automatically takes over by gaining access to the data and log volumes of the failed host. Thus, the standby server needs access to all the database volumes, which is accomplished by a shared network storage server. Figure 9.11 shows a configuration for host autofailover.

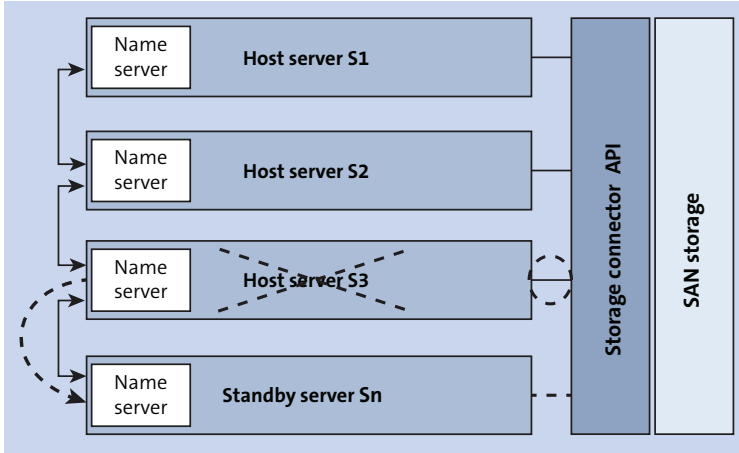


Figure 9.11 SAP HANA Host Autofailover

The standby host is connected to this storage either through a distributed file system or by using vendor-specific solutions via the SAP storage connector API to dynamically detach and mount networked storage when the failure occurs. Note that all services are moved to the standby server when the failover happens at the host server level. This failover happens automatically without any external cluster manager but doesn't happen in the case of a single service failure.

There are some useful techniques to maintain data consistency and to ensure that the primary and standby hosts aren't active at the same time and thus avoid allowing the recovered host and the standby servers to write to the data in parallel.

This option for HA has medium associated costs; zero RPO on committed transactions, while in-flight transactions are lost; and medium RTO. RTO depends on the database size as the data needs to be loaded into memory. It's a good option for scale-out systems as it keeps the costs down; only one additional server (or VM) is required.

SAP HANA System Replication (High Availability/Disaster Recovery)

System replication uses the N+N mode. For every SAP HANA server with N nodes, there is another similar server with the same number of nodes as the secondary. In this setup, the two databases (primary and secondary) can be located close to each other. Alternatively, the secondary database can be at a remote location as a DR option as well, but a reliable link is required between the two sites. The configuration is shown in Figure 9.12.

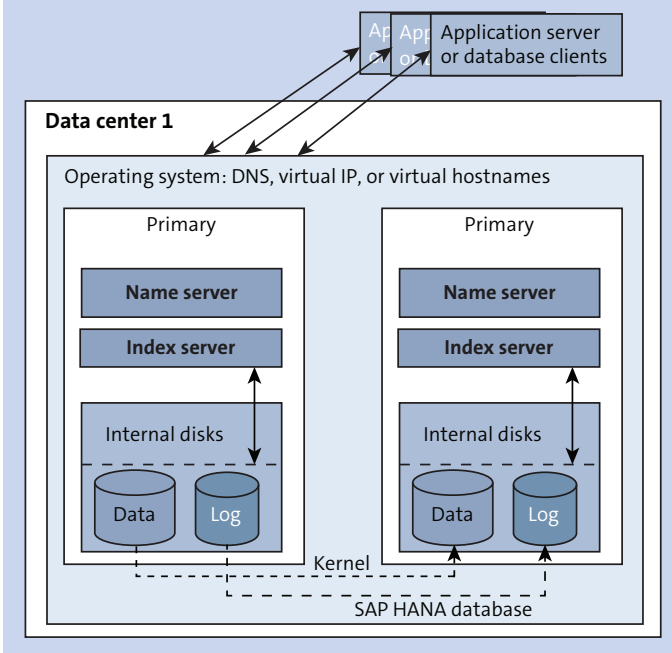


Figure 9.12 SAP HANA System Replication

This option employs the live replication mode. In this mode, the services of the secondary SAP HANA system constantly communicate with that of the primary system, and all the data and logs of every transaction from the primary system are replicated and typically stored in the database in the secondary system with the same system identifier (SID) and instance number. The data commit in the primary system even can be set up to be complete only on persisting this replication log in the secondary system.

There are a few options for how the data commit in the primary system can be set up depending on the log transmission and its writing to memory or persisting in storage to be synchronous or asynchronous. The replication modes are as follows:

- **Synchronous**
  The secondary system sends an acknowledgment only after saving/persisting the data. This mode can run with a full sync option, which means that log write is successful when the log buffer has been written to the log file of the primary and the secondary instance. In addition, when the secondary system is disconnected (e.g., because of network failure), the primary system suspends transaction processing

until the connection to the secondary system is reestablished. No data loss occurs in this scenario.

- **Synchronous in-memory**
  The secondary system sends an acknowledgement as soon as it receives the data.
- **Asynchronous**
  The primary system doesn't wait for acknowledgement from the secondary system.

Note that synchronous modes are very much dependent on latency. Thus, high latency can seriously impact the performance and therefore should be used only when both databases are connected by low-latency networking.

There are two operation modes for system replication:

1. **Delta shipping**
   To avoid ever-growing logs, data snapshots are shared from the primary system to the secondary system at regular intervals. In addition, the primary system shares status information about the column tables stored in the main memory. The secondary system loads these tables into memory. This is called a preload. In the case of a failure, the cluster manager initiates live replication mode in full operation for the secondary server. The secondary system, with preloaded column tables, will only load the row tables and replay the last transaction logs to operate as the primary system.
2. **Log replay**
   The secondary system can instantly replay the log, thereby diminishing the delay in takeover to near zero.

The other consideration in this option is about the connections from the database client that are configured to reach the primary server. There are two options for diverting these connections to the secondary server after the failover. SAP NetWeaver connects to SAP HANA via the Database Shared Library (DBSL). One option is to use a virtual IP address to access the database host and the database instance on that host. Alternatively, the Domain Names Service (DNS) can offer virtual hostnames. This HA option has the highest cost but the lowest RTO and RPO.

The main difference between delta shipping and log replay is internal mechanics: Delta shipping sends logs to be saved to disk (not applied to data) and at regular intervals sends deltas of all block changes that happened since the last delta. For recovery, logs need to be replayed. The advantage is the low memory consumption; secondary can be used for nonproduction (QA). In log replay, this is different; all logs are applied

to the secondary database, thus requiring reduced network traffic between the systems and reducing RTO. However, it doesn't allow the secondary system to be used for nonproduction.

For DR, the secondary system or storage must be in a remote location.

For SAP HANA 2.0, this option has received a boost with faster initial load from primary to secondary systems through multiple streaming (up to 32 streams). It also has faster disk to memory with up to 32 threads in parallel load and can have continuous access to business data while the primary system is in restart mode.

Databases with SAP HANA 1.0 SPS 11 and 12 can upgrade to SAP HANA 2.0 directly. However, keep in mind that SAP HANA 1.0 on IBM Power needs to be converted from Little Endian to Big Endian.

An interesting load-balance feature SAP HANA 2.0 brings to the fore is the ability to enable read-intensive operations (say, from an operational report or an analytics dashboard) between a primary and secondary instance of SAP HANA with the active/active-read-enabled mode. There is also now a consolidated log backup file to make it easier for third-party tools to backup data.

Note

All the options for HA/DR have their advantages and disadvantages. More information can be found in SAP Note 2057595 (FAQ: SAP HANA High Availability) at *http://service.sap.com/sap/support/notes/2057595* and at *http://scn.sap.com/docs/DOC-59918*.

More details on operations mode and the constraints are found in the SAP HANA Admin Guide under **Availability & Scalability • Configuring SAP HANA System Replication**.

On-premise deployments of SAP S/4HANA use the standard SAP NetWeaver HA/DR functions. The SAP HANA HA mechanisms along with the SAP NetWeaver ABAP stack's latest features are evolving to provide a zero-downtime maintenance approach.

Note

The detailed steps of the SAP HANA database backup or recovery process are described in the Technical Operations for SAP NetWeaver found on SAP's website. For SAP S/4HANA release information, go to *http://help.sap.com/s4hana*.

9.2.5 SAP HANA Operations

SAP provides different tools for performing SAP HANA operations such as installation, ongoing maintenance, monitoring, and lifecycle management. Because these tools are for the SAP HANA database, they are applicable for the SAP S/4HANA landscape as well. The main tools are listed here:

- **SAP HANA Studio**
  This tool is used for SAP HANA development and administration and is a favorite of system administrator experts. In future SAP roadmaps, the other web-based tools are more likely to be continued. Currently, however, SAP HANA Studio complements some of the other tools, such as the SAP HANA Cockpit.
- **SAP HANA Cockpit**
  A single SAP HANA database is administered and monitored from this web-based cockpit. This cockpit provides an SAP Fiori-like UI that has all the relevant activities or alerts grouped together nicely, as shown in Figure 9.13. This cockpit can be accessed via *http://<host>:<port>/sap/hana/admin/cockpit*.

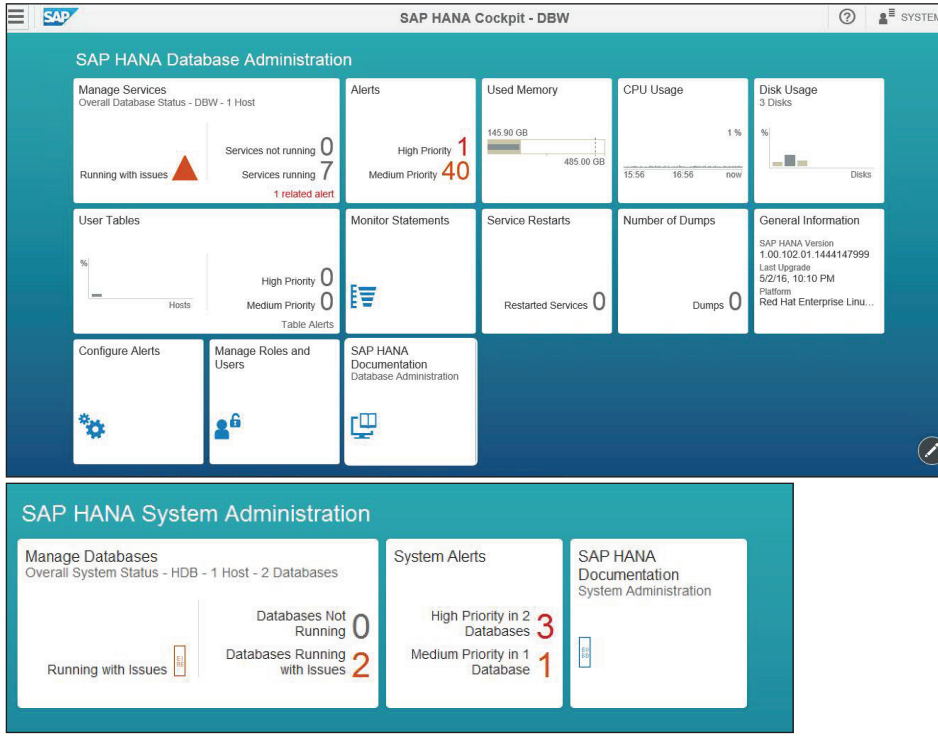


Figure 9.13 SAP HANA Cockpit

This cockpit provides basic administration and monitoring capabilities but also provides additional capabilities in terms of managing multitenant instances, including availability, resource usage, and performance for tenant databases. Each tenant database can be started, stopped, and deleted, and information about usage and alerts is also provided. The cockpit enables you to analyze the database status, including CPU usage and memory consumption for each service, as well as analysis of crash dumps. You can also configure and monitor various alerts as part of the Alerts SAP Fiori apps in the SAP Fiori launchpad.

The cockpit also provides options to perform additional activities if optional components are installed, such as SAP DB Control Center.

- **SAP DB Control Center**
  This web-based tool is used for monitoring the entire landscape of databases, including SAP HANA. This provides an overall status for the different databases in terms of their health, performance, availability, and capacity. It provides alert mechanisms as well for each system. As mentioned earlier, this tool can be accessed from the SAP HANA Cockpit also.

- **SAP Solution Manager**
  SAP Solution Manager is now an essential part of the SAP landscape in all project phases. SAP Solution Manager provides a multitude of functions in the entire system landscape management and monitoring area. There are several resources for usage and configuration of SAP Solution Manager available from SAP. SAP Solution Manager 7.2 provides support for the SAP Activate methodology (covered in Chapter 4) for the SAP S/4HANA solution implementation.

  SAP Solution Manager 7.1 and beyond provides specific monitoring for SAP HANA. Various support packs have added functionality around SAP HANA monitoring as well. The big jump, of course, is in SAP Solution Manager 7.2, which is required for the proper usage of the SAP Activate methodology (see Chapter 14 for more details) for an SAP S/4HANA implementation. SAP Solution Manager 7.2 provides an SAP Fiori UX, following SAP's uniform UI strategy.

  SAP Solution Manager supports SAP HANA in all phases of the application management lifecycle (depending on the SAP Solution Manager version), including the following major functions:

  - **Build SAP Like a Factory**
    - Central transport mechanism and change control
    - End-to-end test management with a central test plan
    - End-to-end solution documentation, including support for SAP Activate

- **Run SAP Like a Factory**
  - Database administration
  - End-to-end root-cause analysis
  - System monitoring
  - Monitoring of all core operations entities
- **Continuous quality checks**
  - During build, implementation, and configuration checks
  - During run and SAP EarlyWatch Alert
  - Best practices—for example, configuration, performance/sizing, and troubleshooting

Figure 9.14 and Figure 9.15 show how SAP HANA system monitoring can be performed from SAP Solution Manager and an SAP EarlyWatch Report generated from SAP Solution Manager. After you open the SAP Solution Manager work centers (run Transaction SM_Workcenter in SAP Solution Manager, in which all the technical monitoring has been configured), and go to the **Technical Monitoring** tab, you'll see the Alert Inbox, from which you can choose different types of alerts. In this case, the **Database Alerts** have been chosen. Similarly, from the **Technical Monitoring** tab, you can choose **Automated Reporting** to see the SAP EarlyWatch Alert report. You can choose the report for a solution run for a date or date range and see the detailed report as shown in Figure 9.15.

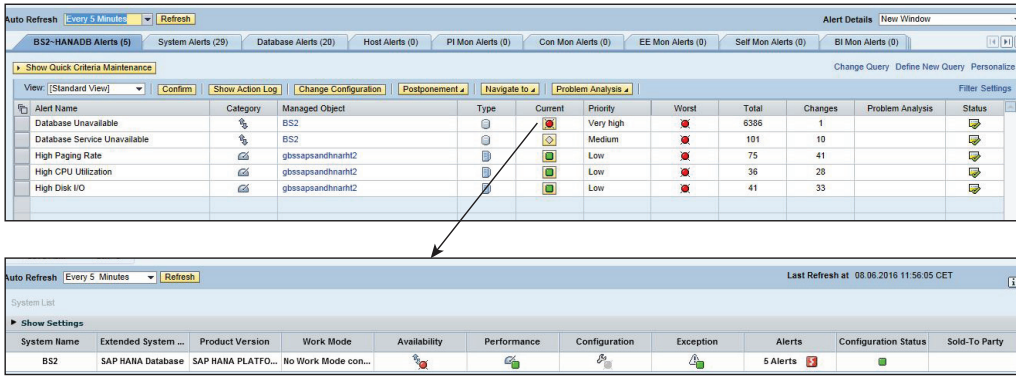


Figure 9.14 Alert Status in SAP Solution Manager

EarlyWatch Alert-EP - Business Monitoring

1 Service Summary

This EarlyWatch Alert session detected issues that could potentially affect your system. Take corrective action as soon as possible.

Alert Overview

Based on the data size and growth rate, problems regarding Data Volume Management are expected.
There are aborted postings (errors in UPDATE). Reprocess them to ensure consistent data.
We found more than 30 ABAP dumps in your system.
Hardware resources may have been exhausted with the risk of performance degradation.
Expensive SQL statements cause load on the database server.
Standard users have default password.
Secure password policy is not sufficiently enforced.
A high number of users has critical authorizations
Protection of Passwords in Database Connections

Perform the following Guided Self Services.

Guided Self Service	FAQ SAP Note
SQL Statement Tuning	1601951
Security Optimization Service	696478
Data Volume Management	1904491

Figure 9.15 Sample SAP EarlyWatch Report

Technical monitoring is used during the run phase, for which SAP has provided many configurable KPIs for each of the SAP HANA databases in the landscape. Some examples are shown in Figure 9.16. In the SAP Solution Manager work centers, under the **Technical Monitoring** tab, choose **System Monitoring** to see a list of databases you can monitor. Choose the SAP HANA database to monitor, and it will show up on the following monitoring screen, along with the details, based on the KPIs configured.

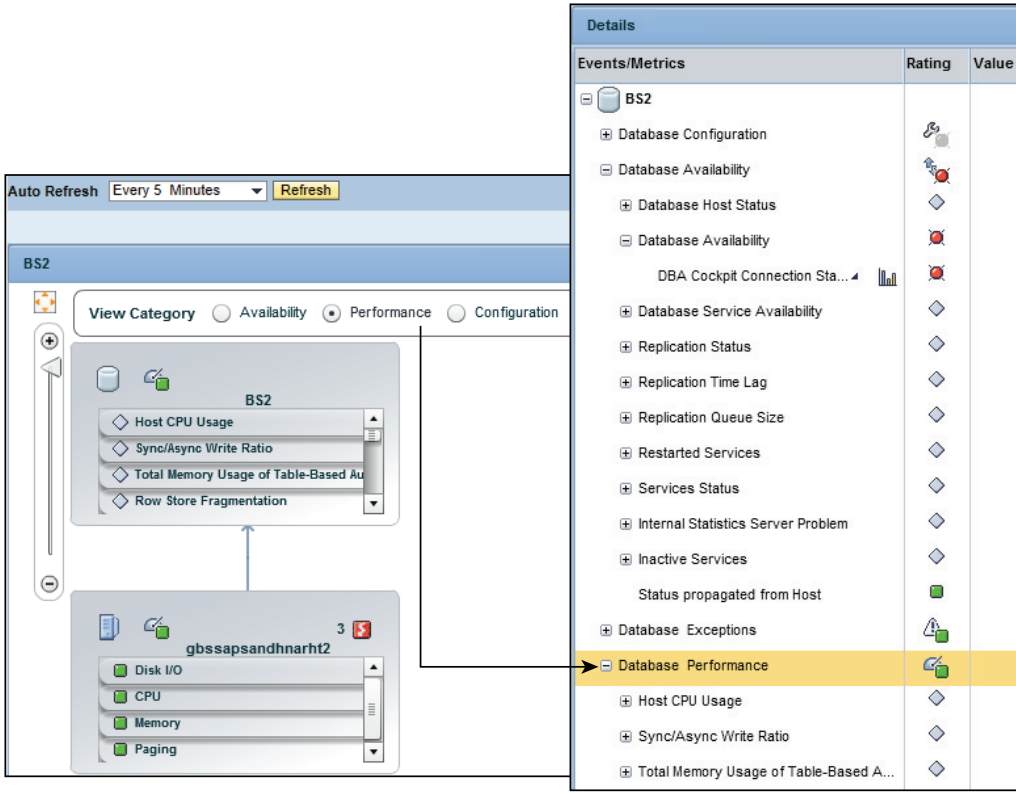


Figure 9.16 Technical Monitoring: SAP HANA Technical KPIs

- **SAP Landscape Management (previously known as SAP Landscape Virtualization Management)**
  This tool, which is used to simplify and automate centralized management and operations of SAP systems in both the physical and virtualized infrastructures, supports SAP S/4HANA provisioning and management (SAP Landscape Management 2.1). You can access the SAP DB Control Center and cockpit via SAP Landscape Management. Mass operations for multiple systems/instances can be performed through SAP Landscape Management, including support for system dependencies. In a future release (potentially 3.0), the tool will also support setting up system replication.

Companies that provide virtualization capabilities use similar tools for fast provisioning of instances and operations.

With SAP HANA 2.0, SAP HANA Cockpit has become the most important tool for simplified enterprise-wide administration and monitoring for multiple SAP HANA databases because it can monitor multiple KPIs in one view. It also has simplified configuration of HA/DR options, like the system replication setup. Other improved functions include detailed information about system crashes and thread execution and better user and role administration.

9.2.6 SAP HANA Logical Deployment Options

There are several logical deployment options for the SAP HANA database, such as the Multiple Components in One Database (MCOD), Multiple Components on One System (MCOS), and Multitenant Database Containers (MDCs) scenarios. The steps for choosing the right deployment option need to be planned in advance for any SAP HANA implementation and need to take into account the support scenarios for that option as described in the various relevant SAP notes.

In the following list, we'll look at each scenario in turn:

- **MCOD**
  This option entails multiple SAP HANA applications running on a single SAP HANA database, as shown in Figure 9.17. SAP supports this option in the productive environment for those packaged applications and scenarios listed in the whitelist for SAP S/4HANA included in SAP Note 2248291. For example, SAP Master Data Governance (SAP MDG) can be deployed with SAP S/4HANA 1511 (for SAP S/4HANA 1610, SAP MDG is embedded in SAP S/4HANA) in the same schema and supporting access to the same data sources.

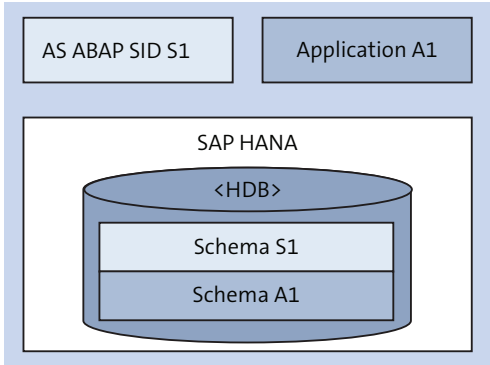


Figure 9.17 MCOD Scenario

The disadvantages in this scenario are as follows:

- SAP HANA can't execute backup on a smaller than database-level scale. Thus, it's not possible to backup data sets separately for each of the applications deployed. If data restoration is required, both data sets must be recovered to the same point.
- It's not possible to control performance on the data set level.

These same features can be advantageous for the following scenarios:

- If two data sets are closely related and consistency between the two data sets is a must, this consistency is enforced implicitly; thus, the first point in the preceding list becomes an advantage.
- If there are "intensive" joins between the two data sets, then MCOD might lead to much better performance because both data sets are sharing the same processes and no cross-process data transfers are required.

- **MCOS**

  In this option, multiple SIDs are on a single SAP HANA hardware unit, as shown in Figure 9.18. Per SAP Note 1681092, this deployment is supported for production systems only for a single host or scale-up scenario. It does support nonproductive systems, such as development, test, and so on, in both single-node and scale-out scenarios (as mentioned earlier, the scale-out scenario isn't supported for SAP S/4HANA).

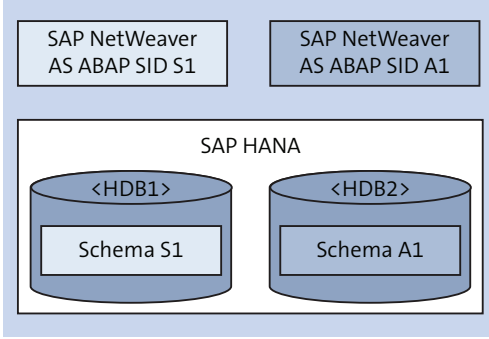


Figure 9.18 MCOS Scenario

- **MDC**

  This feature has been available in SAP HANA since SPS 09 and allows multiple, isolated instances of the application to be hosted in a single SAP HANA system. In this scenario, there is a central database used for system administration and one or

more MDCs, called *tenant databases*. These tenant databases have their own parameters, backup/restore setups, and separate user management and application data. This configuration is illustrated in Figure 9.19.

The administration layer for the central database or system database contains the landscape topology information, system-wide parameter settings, and resource management for all tenant databases, including CPU and memory, as well as owning the complete backup of all databases. Although MDC supports the tenant databases being spread across multiple nodes in a scale-out scenario (refer to Section 9.2.3), current constraints make it possible for SAP S/4HANA to be deployed only in a single node in an MDC system. The key relevant SAP Notes for this feature are SAP Notes 2096000 and 2104291.

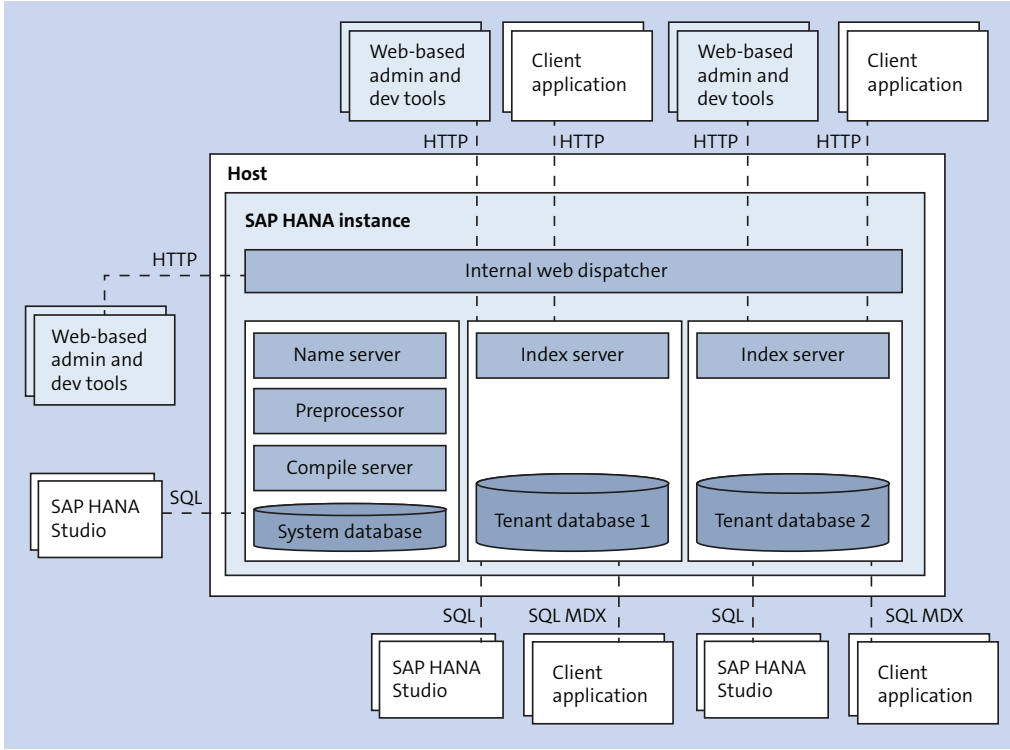


Figure 9.19 MDC Scenario

In all these options, there are certain considerations with respect to the sizing of the overall hardware. For MDC, for example, the recommendation is to size each of the

applications and then use additive sizing for the overall system. MDC is a new technology, so a practical approach needs to be taken by installing a few applications and carefully monitoring their resource utilization and performance before proceeding to further deployments. The same additive sizing approach needs to be taken for other scenarios as well, such as MCOD.

Furthermore, the potential impact on performance of applications on each other needs to be taken into consideration while planning. Plans for proper stress and volume testing need to be made before going live to monitor performance in each of these scenarios. For an MCOS scenario, SAP recommends using the resource management features of SAP HANA, such as parameters controlling memory limits, influencing CPU utilization, and so on.

With SAP HANA 2.0, MDC has become the only standard and only operation mode (see SAP Note 2423367), so you can't use a single-container system. For a new installation or an upgrade, the multicontainer mode will have one default tenant database (for an upgrade, this tenant database corresponds to the single container of the earlier version).

9.2.7 SAP HANA Platform Services

The SAP HANA platform provides several built-in services, as depicted in Figure 9.20.

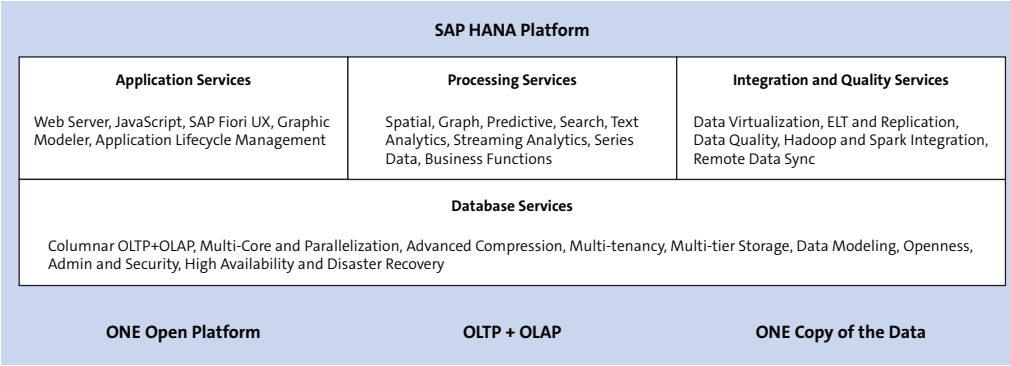


Figure 9.20 SAP HANA Platform Capabilities

Let's walk through each of the categories of the SAP HANA platform services:

- **Application services**
  One of the remarkable aspects of the SAP HANA platform services is that they

enable coexistence of the web server and the database in the same system, reducing data movements. These services provide built-in tools to develop, version control, bundle, transport, and install applications. In addition, there are options to use application servers and web servers with JavaScript support and HTML5 UI libraries, which enables deployment of SAPUI5-based UIs. These application services support several open development standards such as SQL, HTML5, JavaScript, Java Database Connectivity (JDBC), Open Database Connectivity (ODBC), and JavaScript Object Notation (JSON) using Eclipse-based or web-based development environments. They also support OData services, which are RESTful APIs following open protocols.

- **Processing services**
  These services enable applications dealing with different data types and vastly differing data characteristics. The services can include text analytics, predictive analytics using the Predictive Analytics Library or integrating with R, search, and so on. They have a spatial engine that stores spatial data in ways like for other data types, works on the different types of spatial data with spatial functions such as area, leverages geo content such as maps, and integrates with external geo-coding services because they support open standards compliance (Open Geospatial Consortium).
- **Integration and quality services**
  These services support data replication and data access from various types of database and file systems, both on-premise and in the cloud. Live data streams can be captured to help in adopting IoT scenarios and for analysis of IoT data. Connection to Hadoop through various means (e.g., Spark, Hive, HDFS, and MapReduce) is possible through the integration services. In addition, the integration services enable querying any other data sources such as IBM DB2, Netezza, Oracle, Microsoft SQL Server, Teradata, SAP HANA, SAP Adaptive Server Enterprise (SAP ASE), and SAP IQ through SAP HANA smart data integration (SDI) or SAP HANA smart data access (SDA).
- **Database services**
  These services leverage the capabilities of the SAP HANA database's following core features:
  - As an RDBMS database, it supports atomicity, consistency, isolation, and durability (ACID) transactions.
  - OLTP and OLAP data handling enables running transactions and real-time operational reporting on the same set of data on the same system.

- Complex query handling is possible for huge amounts of data without the need for database tuning or aggregation.
- Queries are handled at high speeds without the need for indices.
- Multiprocessing of data allows the same operation to be performed across multiple data points.
- The database supports nonuniform memory access (NUMA), which means that the CPU processes its own memory faster than remote memory. This optimization helps support large nodes and supports several types of deployment models, as was covered in Section 9.2.6.
- Data modeling is supported.
- Data is accessible through open standards such as JDBC, ODBC, JSON, and ODATA.
- The standard security model is supported.
- Third-party administration tools can be used.
- The SAP HANA database supports various kinds of data lifecycle management. One is dynamic tiering of data in which data is stored based on usage, in memory, in disk, or in an archiving tool such as SAP IQ. The other is data aging. Data aging is available at an application level for SAP ERP Financials (FI) documents, Universal Journal entries, and material documents in SAP S/4HANA 1511. More information on data lifecycle management is provided in Section 9.6.

There have been some changes to the development features or tools of the SAP HANA platform. Some of the key changes are as follows:

- **SAP Enterprise Architecture Designer**
  This is a new tool available as of SAP HANA 2.0 SP 00. It can be used to create business process diagrams (via BPMN 2.0 notation), physical data models representing database and generation, enterprise architecture diagrams, process map, requirements list. This helps system architects capture, analyze, and present the organization's landscapes, strategies, requirements, processes, data, and other artifacts in a shared environment.
- **SAP Web IDE**
  This web-based IDE now supports GitHub features, HTML5-based module templates, and several enhanced SAP HANA tools.

- **Hierarchy functions under SAP HANA, spatial edition**
  SAP HANA provides a public hierarchy SQL interface with table functions of hierarchy generation and navigation.
- **Search, text analysis, and text mining**
  There are several functions newly available from SAP HANA 2.0 in these areas. For example, search rules can run in batch-processing mode, with functions to perform comparisons between two sets of data, dynamic search rule sets, data filtration on date-type fields, and similarity calculation with fuzzy search. The Text Analysis SQL API enables text analysis functions to be performed on any inputs, even beyond data stored in the SAP HANA database.
- **SAP HANA External Machine Learning (EML) Library**
  This is a new application function library (AFL) introduced in SAP HANA 2.0 SPS 02 to support the integration of Google TensorFlow with SAP HANA. The EML Library makes use of the open-source gRPC remote procedure call package to remotely call predefined TensorFlow models that have pen-source libraries for machine learning.

Note

Dynamic tiering isn't generally supported for SAP Business Suite on SAP HANA or for SAP S/4HANA as of SAP HANA SPS 12 (see SAP Note 2140959).

9.3 SAP S/4HANA Security

The security strategy for SAP S/4HANA should be part of the overall landscape security strategy, including authentication and authorization. This includes user provisioning with the correct roles so that the right users can perform their relevant tasks and have the option to access systems through single sign-on (SSO). There also needs to be audit logging so that a trace is available for critical user actions. Other aspects of security include encryption, network security, data center security certifications, and more.

The SAP HANA platform provides unified security options from both the database perspective and the analytics engine perspective, as shown in Figure 9.21.

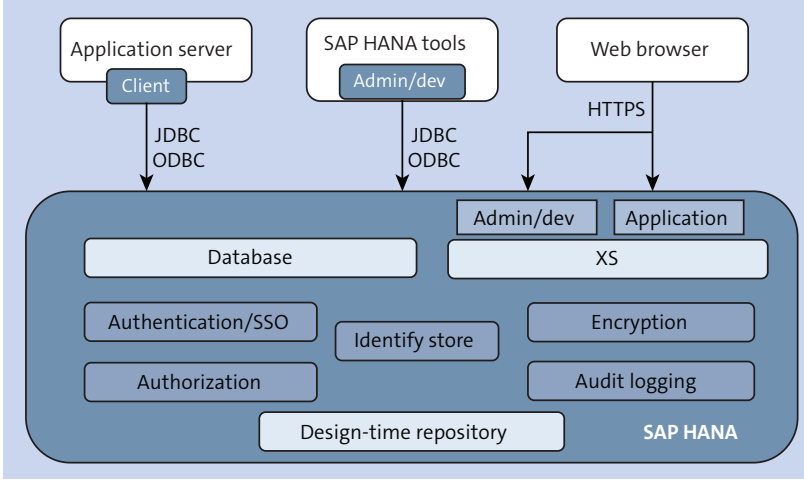


Figure 9.21 SAP HANA Security Model

The key security functions of the SAP HANA database are as follows:

- **Authentication and SSO**
  SAP HANA supports basic authentication using a username and password for both types of access, either through JDBC/ODBC access from the application server to the SAP HANA database or through HTTP access used by web clients directly talking to the SAP HANA XS engine.

  SSO can be set using various means that are typically used in SAP environments, such as Kerberos, Security Assertion Markup Language (SAML), SAP Logon and assertion tickets, and security certificates (e.g., X.509), depending on the access through web clients, GUI clients, and so on.
- **User and role management through the identity store**
  - For logon, users must exist in the identity store of the SAP HANA database.
  - Roles and privileges can be assigned to users and can be catalog or repository roles.
- **SAP HANA authorization**
  This can include the following privileges:
  - Database access privileges
  - Application privileges
  - Repository privileges

- **Encryption**
  Encryption can be at the communication, data, or data backup level:
  - Data volume encryption is used to encrypt the data persisted in the database. However, when data is loaded in memory, it's decrypted. Thus, the data in memory isn't encrypted.
  - For certain applications that need encryption as part of security from an application perspective, the internal encryption service is available—for example, for storing credentials used by SAP HANA for outbound interfaces.
  - A Secure Store in File System (SSFS) instance is used to securely store internal root keys in the file systems.
  - With SAP HANA 2.0, there is additional encryption capability provided for full native data at rest, including redo logs, dynamic tiering data, and more. There is also enhanced encryption key management, which enables changing the root key of the application encryption service used.
- **Audit logging**
  This includes logging of critical events for security and compliance—for example:
  - User, role, and privilege changes and configuration changes
  - Data access logging
  - Read and write access (tables, views) and execution of procedures
  - Firefighter logging—for example, for support cases

On-premise deployments of SAP S/4HANA generally rely on the user management and authentication mechanisms provided with the SAP NetWeaver platform—specifically, SAP NetWeaver AS ABAP and the SAP HANA platform. Therefore, the security recommendations and guidelines for user administration and authentication as described in the SAP NetWeaver AS ABAP Security Guide and SAP HANA platform also apply to SAP S/4HANA.

A few example scenarios and the type of permissions required in each case are shown in Figure 9.22.

The following are some examples of user provisioning for the different layers of the application:

- **SAP Fiori apps—usability layer**
  These apps require user provisioning in the frontend server as well as the backend server. User provisioning for the SAP Fiori apps is performed manually in SAP Gateway, and the corresponding frontend roles are assigned. Depending on the

type of SAP Fiori apps used, the roles need to be assigned in the ABAP frontend, ABAP backend, and SAP HANA database.

- **SAP S/4HANA—application layer**
  User master data and roles are created in SAP S/4HANA for the end users and IT team. Role assignment needs to be performed for the users. Authorizations will be provided to users based on the job roles they'll perform in the organization.
- **SAP HANA database—database layer**
  The user provisioning for the SAP HANA database will be carried out manually. As for the SAP Fiori apps (analytical app and fact sheets app), users may need access (privileges) in the SAP HANA database, depending on the configuration requirements of the specific SAP Fiori apps.

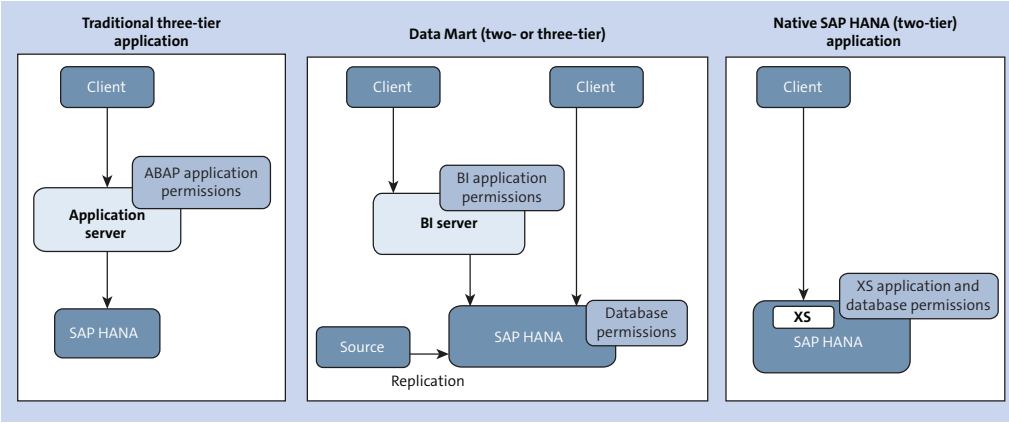


Figure 9.22 SAP HANA User Scenarios

With SAP HANA 2.0, there is now a provision to manage authorization through LDAP groups. Also, there are additional authentication and user-management capabilities for SAP HANA XSA scenarios like application-to-application SSO.

9.4 SAP S/4HANA Core Data Models

When SAP S/4HANA was first introduced, it included the SAP S/4HANA Finance (then known as SAP Simple Finance) module with a new code base. With SAP S/4HANA 1511, the new code base has extended to cover several business processes in logistics and operations. The new code base was on top of the simplified data models, which had

removed the redundant data in terms of the aggregate tables. This simplification of the data models has continued with SAP S/4HANA 1610, including changes in the Sales and Distribution (SD) area.

Before SAP HANA came into the picture, aggregate tables such as table BSEG and table BKPF were required to have faster reporting. Database operations were more complex because every time the transactional tables (headers, items, and sometimes sub-items) were updated, these aggregate tables had to be updated, too. The design of the data model was to boost the performance of the reports while aggregating this data during reporting, which could leverage the aggregate tables instead of the detailed transactional tables.

Now, with the advent of SAP HANA, creating this aggregation in runtime is fast and easy. This simplification is leveraged in the data models that now do away with many of the tables and have a consolidated table for each major area, such as financials and logistics (see Chapter 2 through Chapter 7).

This simplified data model has quite an impact on the database size as the data volume to be persisted diminishes. There is an impact on custom code as well. The migration effects are discussed in Chapter 13. From an implementation perspective, when writing any custom code, you need to consider mapping the fields from the new combined table, such as table ACDOCA in finance or table MATDOC for material documents, instead of using multiple tables as were used earlier. There are additional considerations in terms of using CDS views or generating CDS views using the Business Function Library (BFL) for functions implemented on the SAP HANA database layer.

Note

For details about custom-coding aspects, visit *http://bit.ly/2k3H5I5*.

9.5 User Interface and User Experience

We've mentioned that SAP S/4HANA acts as the digital core for your business; one of the premises of being the digital core is to have processes be user-centric and accessible through intuitive UIs. This is made possible using *SAP Fiori apps*, which are SAPUI5 applications built on HTML5 technology (primarily) and which can be rendered in any browser on any device—mobile, tablet, or desktop. These applications provide an

intuitive UI and a seamless UX for business processes that otherwise would have required clicking through several screens of one or more transactions.

The focus of the SAP Fiori apps is to provide an improved UX through the following traits:

- Role-based UIs (the SAP Fiori launchpad can present apps as *tiles*, organized based on a user's role)
- Responsive framework (themes, personalized menus)
- Simplified UI for business processes
- Intuitive interactions

SAP provides a standard set of SAP Fiori apps on various platforms, but most require the SAP HANA database. SAP Fiori apps currently have three main business functions:

1. **Transactional apps**
   For transactional processing (for the SAP HANA database or any other database)
2. **Analytical apps**
   For analytical capabilities, including dashboards for KPI analytics (only for the SAP HANA database)
3. **Fact sheet apps**
   For searching structured or unstructured data, including contextual navigation between related objects (requires the SAP HANA database)

Consult SAP's website for a list of all the SAP Fiori apps currently available. SAP has also published a detailed SAP Fiori roadmap for SAP S/4HANA and for SAP S/4HANA Cloud.

Figure 9.23 shows how SAP Fiori apps can be accessed through the SAP Fiori apps reference library (*www.sap.com/fiori-apps-library*). The set of SAP Fiori apps can be filtered by different criteria, one of which is product version. Within the set of SAP Fiori apps for a product version, the apps are also grouped by user role, as shown in Figure 9.23.

The product features and the details of the technical implementation are provided for each SAP Fiori app selected, as shown in Figure 9.24.

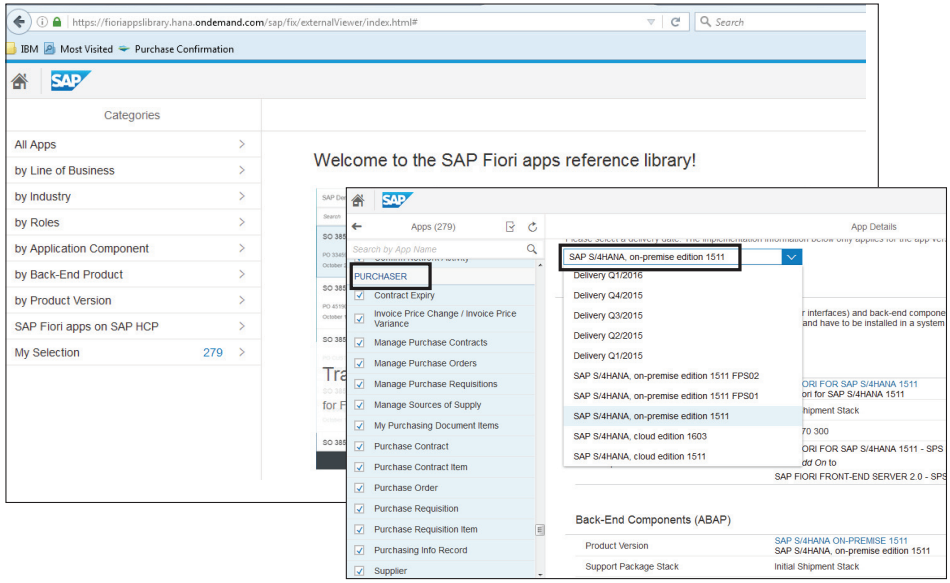


Figure 9.23 SAP Fiori Apps Reference Library

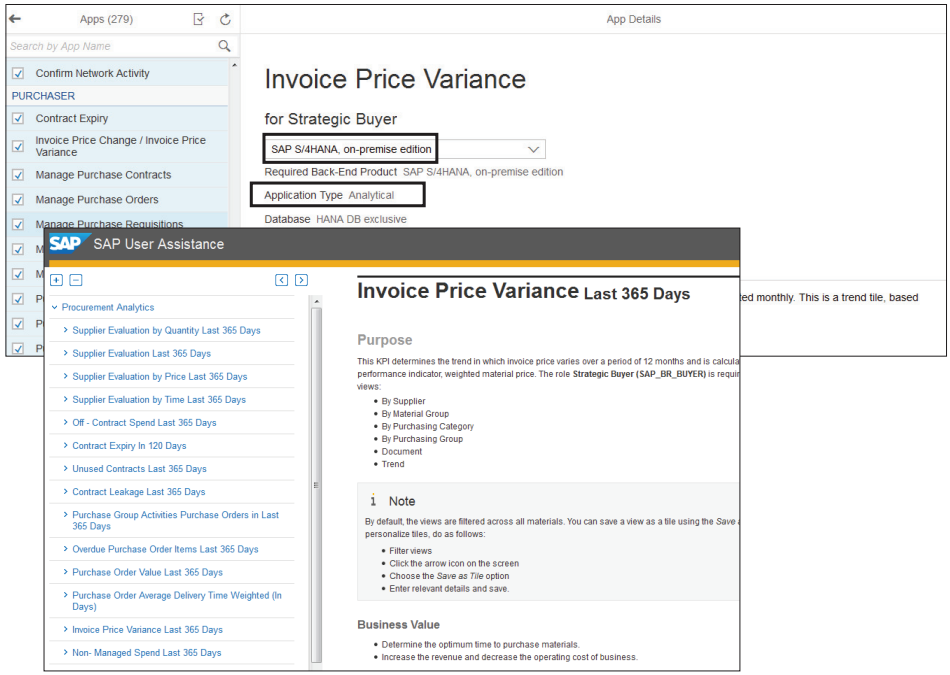


Figure 9.24 SAP Fiori App Details

SAP has created the standard SAP Fiori apps with user-centric designs, and they all can be accessed through the SAP Fiori launchpad. An SAP Fiori app, when accessed from the UI through the SAP Fiori launchpad or through a URL, retrieves data using OData services, which expose the backend data. The OData services are RESTful APIs generated by the SAP Gateway server from the backend BAPIs or function modules. A RESTful API is a web service API that follows the Representational State Transfer (REST) architectural style, which follows a few architectural constraints such as stateless, client/server-based, uniform interface, and so on.

Now, with the advent of SAP Fiori Cloud, the SAP Fiori launchpad and the frontend components can be hosted in the cloud on SAP Cloud Platform. Extensions to these standard SAP Fiori apps can be made through the SAP Cloud Platform. The SAP Gateway component can still be on-premise or hosted in the cloud via SAP Cloud Platform. A subset of SAP Fiori apps are currently available within SAP Fiori Cloud.

The architecture of an SAP Fiori app, with SAP S/4HANA as the underlying application layer, is shown in Figure 9.25.

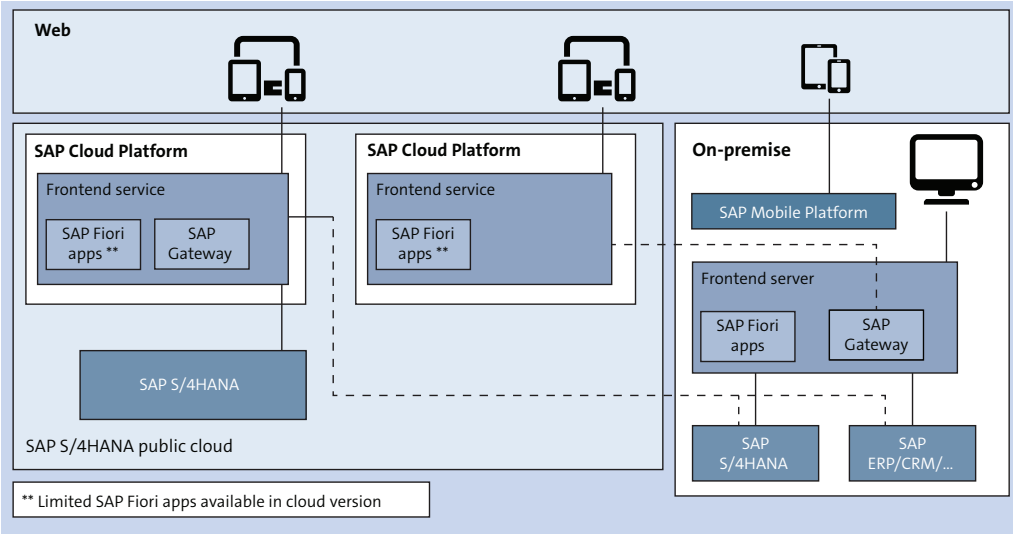


Figure 9.25 SAP Fiori Architecture

With SAP Fiori 2.0, the UX has been improved further. The user can see three areas on the screen after logging in to the SAP Fiori launchpad:

1. **Notifications**
   Action items pertaining to that user in that specific role are displayed.

2. **Me area**
   User details are provided, including favorites or commonly used apps/app finder.
3. **Viewport**
   The main content is displayed in the middle of the screen.

9.6 Data Lifecycle Management

Managing data well now plays an even more important part than before, because SAP HANA database costs are higher and scalability has limitations, as mentioned earlier. In addition, business requirements don't call for availability of all data for all time periods in the main memory of SAP HANA.

There are three options for data management:

1. To minimize data in SAP HANA through archiving, move data to an external store that can serve as an archiving solution, such as SAP IQ.
2. For certain use cases, the data need not be stored in SAP HANA at all but can be stored in other solutions, such as Hadoop, and then accessed through SDA into SAP HANA.
3. For data in SAP HANA, the options for data management are as follows:
   - *Data aging*: This is a concept in SAP HANA that governs data through aging via two concepts—data resident time and business rules. Although this option is available to several technical objects, such as IDocs, application logs, workflows, and so on, few business objects in SAP S/4HANA Finance support this feature. Data aging is achieved through horizontal table partitioning and is used to separate hot data (current) from cold data (old). To understand how the business rules play a part in this partitioning, think of finance documents that are more than three months old but are still open. If the resident time is set to three months for these documents, because the business rule states that the document status can't be open, these documents can't be moved to the "cold" area. From a data-access perspective, this division is transparent to the user when viewed from an SAP Fiori app, for instance.
   - *Dynamic data tiering*: This is more relevant for the business warehousing or analytical use cases. Here, data is again divided based on usage into the following:
     - Hot data in memory.
     - Warm data stored in/accessed from disk.

- Extended disk-based columnar tables.
- Multistore tables. With SAP HANA 2.0, there is another type of database table, apart from the extended table—the multistore table. This table is a multipartitioned SAP HANA columnar table in which one part of the data remains in SAP HANA memory while the other part resides in the extended storage for the dynamic tiering.

For SAP Business Suite on SAP HANA or SAP S/4HANA, data aging is expected to play an important role as the number of business objects supported gradually increases.

Dynamic tiering requires an additional license. There are some interesting features that have been released with SAP HANA 2.0. For example, with in the system replication modes (synchronous/asynchronous), certain configurations are supported for two- or three-tier replications. Two-tier system replication has one secondary system per one primary system. For backup/recovery, a certain portion of the memory is reserved for log threshold. In the virtualization, SAP HANA dynamic tiering can also be virtualized by codeploying in the same VM. The query performance for cross-store datasets has been enhanced by caching the dataset resulting from the join between the data from the in-memory and dynamic tiering tables and reusing this cached data. See SAP Note 2394124 for more details.

9.7 DevOps

Because SAP S/4HANA is quickly becoming the digital core of a modern enterprise, leveraging DevOps (a term coined to signify *development and operations*) is a key imperative. The key tenets behind the philosophy of DevOps, as represented in Figure 9.26, are as follows:

- Breaking down the silos between different teams and functions (e.g., LOBs, development teams, infrastructure teams, quality teams, etc.) so as to minimize handoffs among them, thereby improving efficiency, reducing loss of information, and increasing speed of delivery
- Increasing automation of activities across the software development lifecycle to increase speed and reduce errors
- Gathering and acting on feedback from both internal and external stakeholders to continuously improve and adapt rapidly to changes

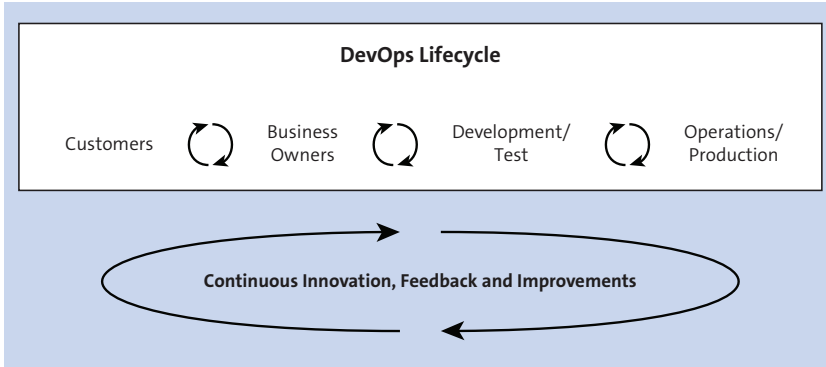


Figure 9.26 How DevOps Operates

Figure 9.27 shows that continuous business process planning results in new requirements, continuous development and testing, releasing/deployment, monitoring, and feedback, which again triggers business process planning, all running in continuous cycles.

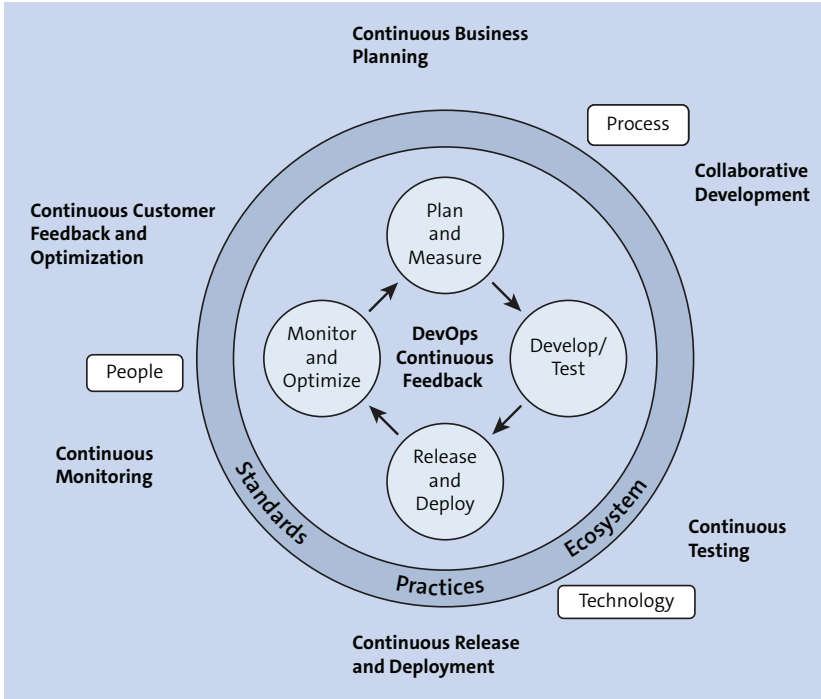


Figure 9.27 Continuity among Processes

If we translate this to the SAP S/4HANA world, the process model ideally should be generated automatically from requirements. From the process models, there can be automated creation of business process hierarchies, automation in coding, and automatic generation of test scenarios and test scripts. Finally, there should be automated monitoring of the business process once it's live and the feedback for any additional requirements should flow back to the original requirements—and the cycle starts again. Thus, there's a need to have continuous *everything* and as much automation as possible in each of the phases. In the ABAP world, not all these processes and automations are seamless, and a single tool cannot provide all solutions. SAP Solution Manager and its new component, Focused Build, helps with many of the steps, including integration with testing tools or process model–generation tools.

Like all new products, SAP has an SAP Fioriibased interface for Focused Build, which is role-based and hence shows the relevant information in the tiles depending on the user's role. A sample cockpit is shown in Figure 9.28, along with the Readiness Dashboard, which provides real-time information about the status of every aspect of the project.

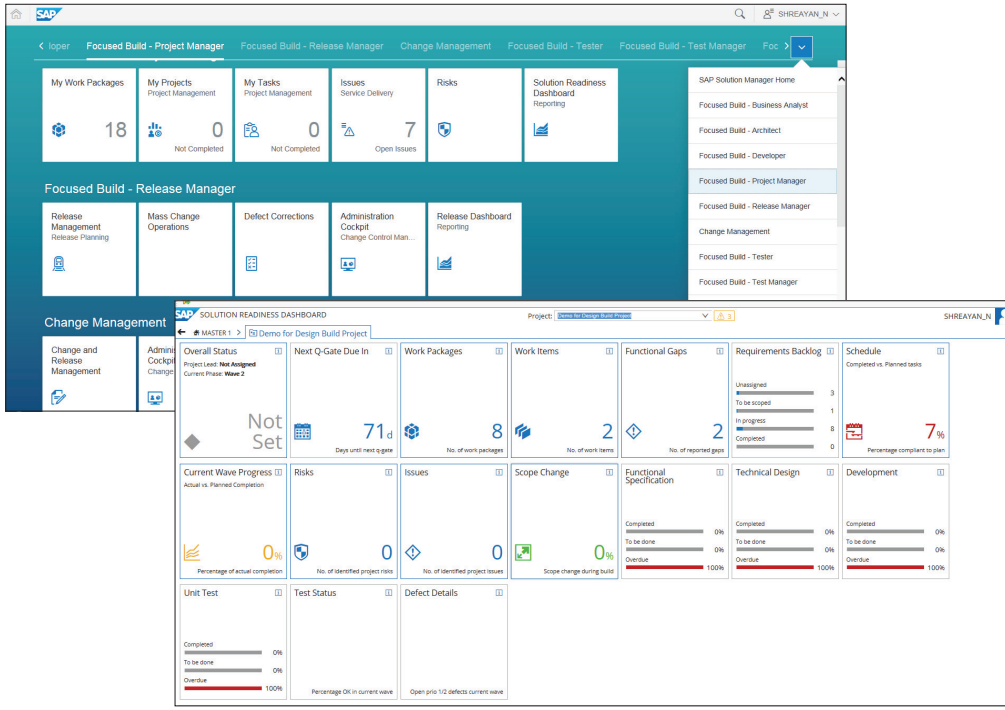


Figure 9.28 Focused Build Cockpit on SAP Solution Manager 7.2

Now, let's describe briefly how the DevOps phases mentioned in Figure 9.27 are supported in SAP Solution Manager:

- **Continuous business planning**
  SAP Solution Manager 7.2-based Requirements Management or SAP Solution Manager 7.2's Focused Build Project Management for agile methodology caters to this need (see Figure 9.29). At this phase of the project, the SAP Activate methodology, with its prebuilt content, acts as an accelerator.

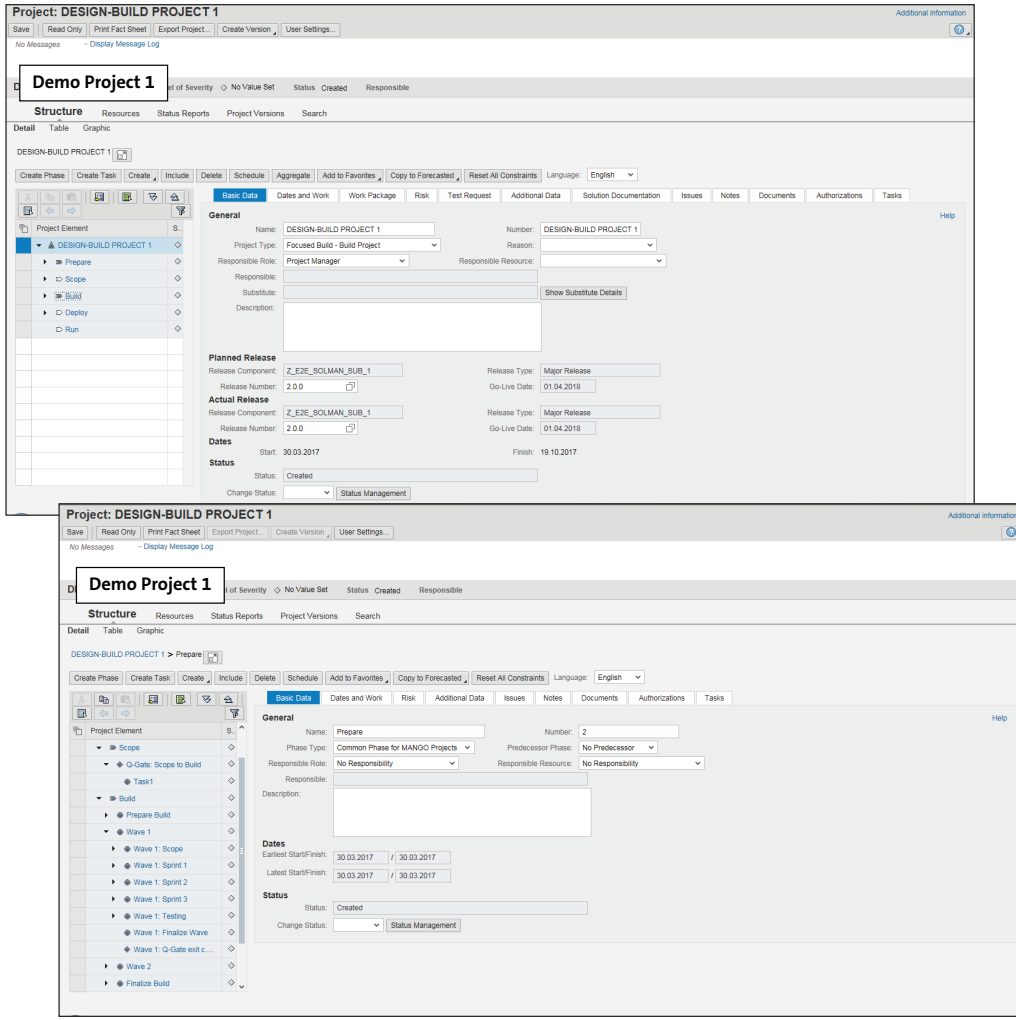


Figure 9.29 Focused Build: Sample Agile Project (Leveraging Standard Template)

- **Collaborative development**
  This is possible through SAP Solution Manager's custom code lifecycle management or through SAP Cloud Platform, which provides a collaborative environment. One of the key areas for SAP S/4HANA is to use SAP Cloud Platform as the platform for extension. This is covered in Chapter 12.
- **Continuous testing**
  There are several tools for continuous testing, including SAP Solution Manager–based automated testing and third-party tools like Worksoft, Panaya, and smartShift. Defect management can be handled through SAP Solution Manager or through other tools, like HP Quality Center.
- **Continuous release and deployment**
  SAP Solution Manager's Change Request Management (ChaRM) tool can be configured to handle this. ChaRM can be integrated with the work packages defined in Focused Build, if it's been set up for the requirements-gathering phase. Some automation in deployment can be achieved through advanced functions in the SAP HANA Cockpit, as well as through various virtualization tools for environment provisioning.
- **Continuous monitoring**
  This is addressed through SAP Solution Manager's KPI monitoring, and through technical monitoring and business process monitoring (as explained in Chapter 9).
- **Continuous customer feedback and optimization**
  This also can be handled through standard SAP Solution Manager features, including Incident Management and business KPI monitoring through Business Processing Monitoring.

Now, let's look at how SAP Cloud Platform supports DevOps through its features, functions, and integrations. There are some services in SAP Cloud Platform that serve as extension platforms for SAP S/4HANA and for SAP SaaS solutions such as SAP SuccessFactors (discussed further in Chapter 12). These services and tools provide support for DevOps in this platform (see Figure 9.30). The GitHub repository serves as a source code versioning tool for Java, SAP HANA XS, SAPUI5, and SAP HANA models. Users will use the SAP Web IDE to set up a project and add its code to the GitHub repository. Tools such as Maven are used for unit-testing Java applications. More details about the Cloud Foundry, which now forms the basis of SAP Cloud Platform, are provided in Chapter 12. The solutions lifecycle management (SLM) service helps to bundle different components of a solution based on different technologies into an archive called a *multitarget application archive* and then deploy them.

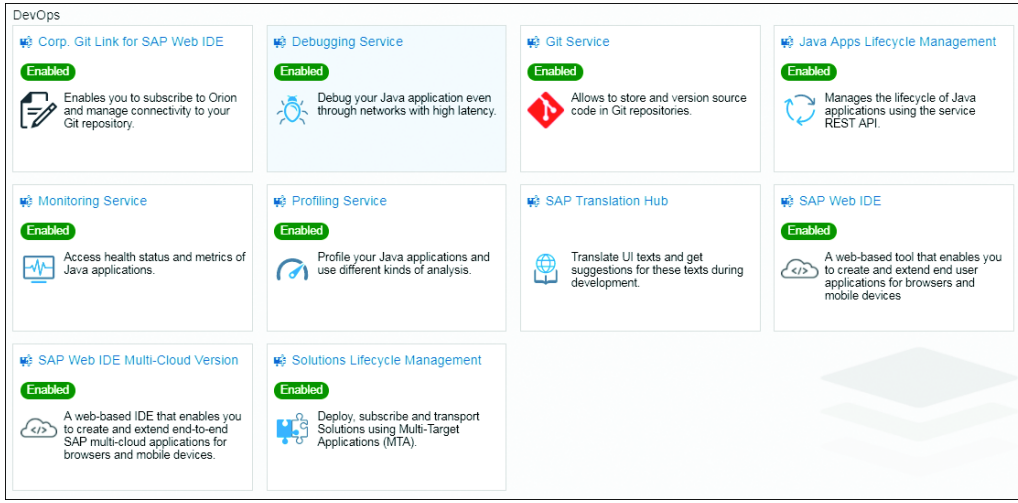


Figure 9.30 SAP Cloud Platform Services Supporting DevOps

There are still gaps in terms of end-to-end support of DevOps through a single platform in SAP. Several products and IT services companies are trying ways to bridge the existing gaps related to the automation in various and to break the silos, and often a DevOps initiative will run in parallel to an SAP S/4HANA project.

9.8 Summary

In this chapter, we touched on the drivers for the SAP S/4HANA evolution, all the major technical concepts, and the architecture behind the SAP S/4HANA solution, including the SAP HANA platform services and the SAP HANA database, and the various logical deployment options. We also covered SAP S/4HANA as the digital core, including the SAP Fiori frontend and the roadmap to SAP S/4HANA.

In the following chapter, we will take a look at your deployment options for SAP S/4HANA and SAP S/4HANA Cloud.

Chapter 10
Deployment Options

This chapter introduces the SAP S/4HANA deployment options—on-premise, public cloud, and private cloud—and outlines their relative merits and demerits to help you choose the right deployment model and the right cloud/cloud service providers.

In this chapter, we'll take a closer look at the different deployments options for SAP S/4HANA. Currently there are two main options:

1. On-premise SAP S/4HANA
2. SAP S/4HANA Cloud

For both SAP S/4HANA and SAP S/4HANA Cloud, there are various options to deploy the solution. This chapter discusses each of the deployment options available as of September 2017.

To choose the SAP S/4HANA version and deployment that is best for your organization, it's important to know about these options so you can optimize the overall IT landscape, minimize the initial costs of the SAP S/4HANA deployment, and have a balanced cost structure throughout the lifecycle of the landscape.

Before we go deep into the options and highlight the advantages and disadvantages of each, let's take a quick look at the cloud concepts and why they're important today. This will help you interpret the different terms correctly when we discuss the deployment options for the cloud.

10.1 Cloud Concepts

We'll refer to the IBM Cloud Computing Reference Architecture (CCRA; currently at version 4.0) to help navigate through the common adoption patterns for cloud. Figure 10.1 provides the overview of this reference architecture.

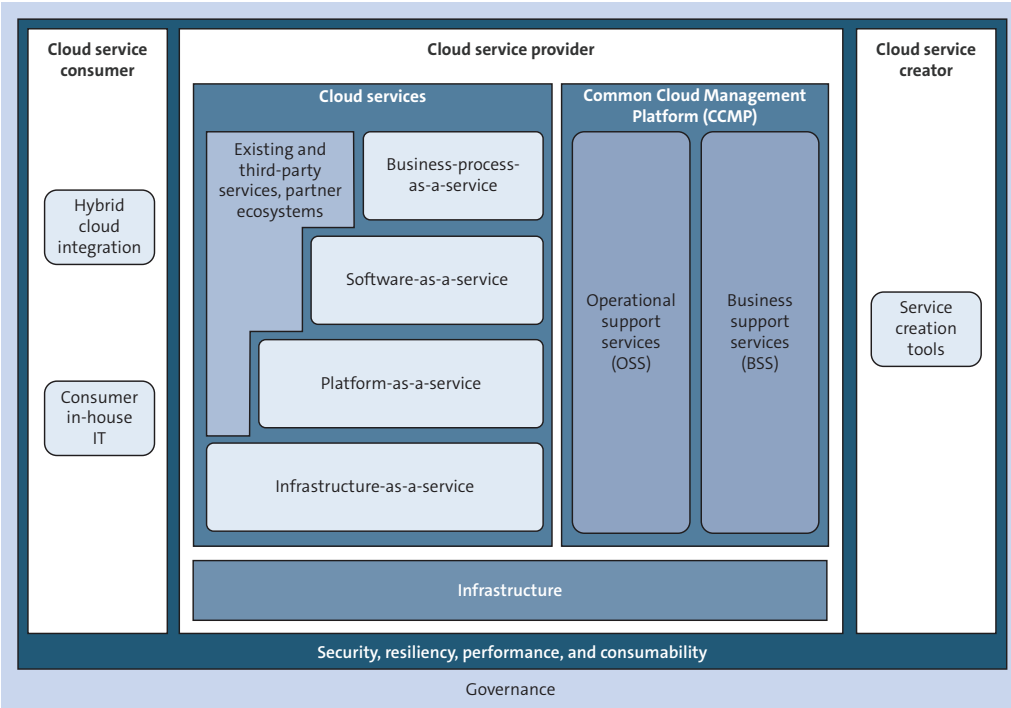


Figure 10.1 Cloud Computing Reference Architecture Overview

In Chapter 1, Section 1.1, we introduced the following concepts:

- **Infrastructure as a service (IaaS)**
  With IaaS offerings, IT landscapes can be hosted in the cloud using computational resources such as servers as well as storage and networks owned by service providers. Customers can get their needed infrastructure provisioned very fast and on-demand. Typically, there are web-based UIs via which customers enter their requirements and self-provision their infrastructure. API access to the infrastructure may also be offered as an option. Simply speaking, this service provides a place to run the customer's applications. For example, many customers' IT landscapes use IBM data centers.
- **Platform as a service (PaaS)**
  PaaS includes a composable and integrated application development platform that allows you to model multitiered application infrastructure (middleware) patterns, expose them as services in a self-service catalog, automate their deployment, and meter the resources used by this service. This service typically includes

application platform, integration, business process management, and database services. Thus, PaaS provides a place for customers to build their applications without the cost of procuring infrastructure or installing/upgrading the latest product suite needed for the application. On PaaS example is the SAP Cloud Platform.

- **Software as a service (SaaS)**
  SaaS is software that is owned, delivered, and managed remotely by one or more providers. The software provider delivers standard software based on a set of common code and data definitions. This software has components that are configurable to suit customers' requirements and typically will have some enhancement points and some APIs to connect with other solutions. The software is provisioned for the contracted customers at any time on a pay-for-use basis or as a subscription based on usage metrics. There are several SaaS solutions today, including SAP SuccessFactors, Concur, and the SAP S/4HANA Cloud, public option.
- **Business process as a service (BPaaS)**
  Gartner defines BPaaS as "the delivery of business process outsourcing (BPO) services that are sourced from the cloud and constructed for multitenancy." These services are often automated and include human intervention, which is catered to by a shared pool of human resources. The pricing models are consumption-based or subscription-based commercial terms. As a cloud service, the BPaaS model is accessed via web-based interfaces.

After choosing to put their infrastructure in the cloud, customers need to choose whether they want a private cloud, a public cloud, or a hybrid option:

- **Private cloud**
  This cloud infrastructure provides options for scalability, flexibility, provisioning, automation, and monitoring but is dedicated to a specific customer. The cloud vendor provides the infrastructure dedicated to the customer either on the client's premises or in the cloud vendor's data center, but it's dedicated to the specific customer and behind the company's firewall.
- **Public cloud**
  Cloud computing services are provided outside the organization via the Internet, so IT resources are available and accessible through the Internet in the public domain.
- **Hybrid cloud**
  This is a combination of the other options—for example, private cloud and public cloud deployments or a public cloud and on-premise deployments linked together. There are several use cases for the hybrid cloud scenario.

There are also variants in the IaaS space with different kinds of management services on top of the infrastructure. More details about the types of service are covered in Section 10.2.1 and Section 10.3 of this chapter.

10.2 SAP S/4HANA Versions

You have three main options for deployment: SAP S/4HANA, SAP S/4HANA Cloud, and a hybrid of the two, which can contain a two-tiered ERP model. In the following sections, we'll provide criteria for choosing among your different deployment options.

10.2.1 On-Premise SAP S/4HANA

SAP S/4HANA contains the entire SAP ERP scope with simplifications in several core areas. When we talk about the entire SAP ERP core, there are some differences from the SAP ERP solution and these are highlighted in the simplification lists for every release. There may be some functions which are completely deprecated and have no substitute solutions, or there may be substitute solutions outside the core of SAP S/4HANA. The details for these functions are provided in the simplification list for each version of SAP S/4HANA released. There are several additional functionalities which have been incorporated into the SAP S/4HANA core, including the industry solutions and the major parts of the LOB solutions, like SAP Extended Warehouse Management (SAP EWM) or SAP Transportation Management. This has already been covered in earlier chapters in detail. For SAP S/4HANA, the release cycle for new functionality is annual and can be deployed on-premise or in the cloud with the IaaS model.

Your first decision is to choose the right SAP S/4HANA product version: SAP S/4HANA or SAP S/4HANA Cloud. When making this decision, you should consider the following primary aspects:

- **Licensing model**
  SAP S/4HANA follows the traditional licensing model. For SAP S/4HANA Cloud, the pricing follows subscription-based licensing, per the SaaS model.
- **Range of functionality**
  So far, on-premise SAP S/4HANA has the complete set of functions from SAP Business Suite/SAP ERP, although not all of them use simplified code or the SAP Fiori frontend (refer to the simplification list for deviations from SAP ERP functions). SAP S/4HANA Cloud supports core functionality including finance, procure-to-pay,

order-to-cash, and connectivity to HR (time recording). The scope of functions for SAP S/4HANA Cloud will be enhanced on a quarterly basis.

Therefore, a customer who needs the full-blown SAP ERP functionality for its business beyond what's provided by SAP S/4HANA Cloud needs to opt for the on-premise version or wait for SAP S/4HANA Cloud to reach a state at which it can cater to these functionalities. In fact, some major clients with significant SAP footprints are waiting for this to happen so that they can adopt the cloud version.

- **Standardization versus flexibility**
  SAP S/4HANA provides complete flexibility to perform any customization to the standard solution as required by the customer's business processes. SAP S/4HANA Cloud, on the other hand, provides limited ability for customization. Thus, SAP S/4HANA Cloud is suited to those organizations that have the strategy to adopt standardized processes. They can adhere to the functionalities provided by SAP S/4HANA Cloud.
- **IT strategy in terms of usage of SaaS**
  The IT strategy for some major organizations is to adopt a SaaS model for all their IT solutions, even their ERP solutions. This might potentially drive them to adopt SAP S/4HANA, as long as it has the functionality they need..
- **Infrastructure and operations**
  For SAP S/4HANA, the client has complete control of the infrastructure, deployment, and maintenance schedule. For SAP S/4HANA Cloud, SAP provides the system and any service-level agreements for the nonfunctional requirements. SAP also must test the delta functions every quarter for a fixed number of days before updates are applied. Thus, the customer has no control over accepting version upgrades. This has some advantage in terms of reduced maintenance, but companies must plan for the resources and effort needed for this continuous testing every quarter.
- **Implementation approach and time lines**
  The implementation for SAP S/4HANA Cloud is much faster due to the standardized process configurations, which include SAP Best Practices for implementation. Both new and existing SAP ERP customers only need to perform data migration, which is aided by migration tools and templates for different data objects. Deep technical skills aren't needed. For the on-premise implementation—both for the migration scenario and the new implementation scenario—technical knowledge and skills are mandatory for the team, because there will be customer-specific scenarios and considerable customization. The timelines for the SAP S/4HANA adoption are also longer.

- **Costs**
  Costs are affected by several factors, including the reduced implementation time lines. However, because SAP S/4HANA Cloud is a SaaS model, the product licensing costs and the infrastructure and operational costs decrease. Because SAP S/4HANA Cloud has fewer customization capabilities, it also has the advantage of less maintenance overhead. Apart from the licensing model, the infrastructure investment and maintenance overhead can also be tackled through an IaaS adopted for SAP S/4HANA.

There can be certain constraints in terms of SAP S/4HANA Cloud adoption as well—for example:

- Regulatory compliance might compel the data to be on-premise, or the data might not be able to be taken outside the country, requiring in-country hosting of the data center.
- Organizations might have security concerns about the data being in the cloud, in the public domain, beyond the organization's firewall.
- The size of the database may be too large for the currently available cloud options for SAP HANA.

The second concern is gradually changing due to the knowledge that there are certain precautionary steps the customer should take and, of course, that cloud providers must follow standard security processes to be certified for productive usage by customers. Beyond the standard security features related to user authorization and authentication, data security and privacy controls in SAP products are available irrespective of being on-premise or in the cloud. From a physical security perspective, SAP data centers comply with the latest telecommunications industry standards, such as ANSI/TIA/EIA-942 Tier III or higher.

Table 10.1 provides a summary of what the SaaS, PaaS, and IaaS offerings mean for the customer.

	IaaS	PaaS	SaaS
Applications	N/A	**N/A**	X
Operating system and middleware runtime	**N/A**	**X**	X

Table 10.1 SaaS, PaaS, and IaaS Options Summary

	IaaS	PaaS	SaaS
Server, storage, and network	X	X	X
Service model	Computing resources available at lowest infrastructure component level	Application deployed on managed services	Consumed by end user, delivered through the Internet
Control over cloud service	■ Control over application, operating system, and updates ■ Limited control over network ■ No control over underlying physical infrastructure	■ Control over application deployed ■ Control over application-specific configuration on hosting environment ■ No control over underlying infrastructure	■ Limited user-specific configuration and customization ■ No control over software release and update ■ No control over underlying platform and infrastructure

Table 10.1 SaaS, PaaS, and IaaS Options Summary (Cont.)

After choosing the relevant product version, there are more decisions to be made. The on-premise version can be deployed in the cloud or on-premise, with options for multiple deployment models (the following terms were explained in greater detail in Chapter 9):

- **Multiple components on one system (MCOS)**
  In the same SAP HANA server, multiple SAP HANA databases along with the system ID (SID) can be configured (e.g., development and quality environments).
- **Multiple components in one database (MCOD)**
  Multiple SAP components run on the same SAP HANA database.
- **SAP HANA multitenant database containers (MDC)**
  Multiple tenant databases are isolated in the same SAP HANA system.
- **Virtualization using smaller virtual machines (VMs)**
  Smaller VMs are used within the SAP HANA system, or logical partitioning is used.

Figure 10.2 shows the decision tree for choosing an SAP S/4HANA deployment.

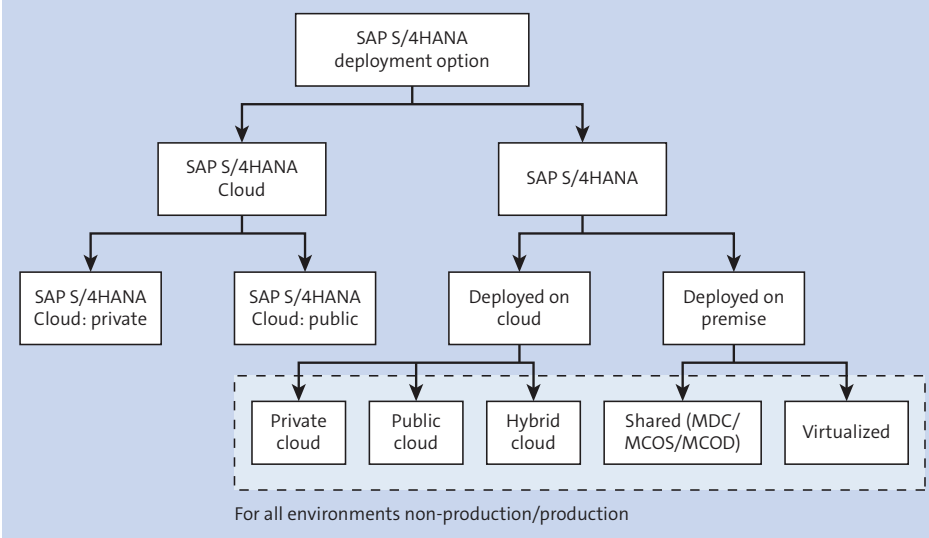


Figure 10.2 Decision Tree for SAP S/4HANA Deployment

There can even be a combination or a stacking option for these deployment models. Some options are provided by the specific hardware, including the processor. For example, IBM Power machines with their proprietary processors can provide an MDC on top of a VM.

The customer's SAP HANA-related existing infrastructure setup, the database size requirements, and the nonfunctional requirements all affect the choice of deployment models for SAP S/4HANA. For example, your choice may be influenced by the following:

- If there are other applications that use the SAP HANA database, you might look at combining and sharing infrastructure to minimize costs.
- If the database size is too large, then the resource sharing options won't work out, at least for the productive environment. You might look at sharing the nonproductive environments, using one of the available options (e.g., MDC/MCOD/MCOS) and virtualization or a combination of these options. The restrictions for such deployment options must be adhered to, as explained in Chapter 9. For example, there are products that can be deployed as MCOD for production, as per the whitelist provided in SAP Note 1661202. These restrictions don't apply if each application is deployed on its own tenant database, but they do apply to deployments inside a given tenant database (in an MDC scenario).

Note

There are additional SAP notes for the different deployment scenarios (e.g., SAP Notes 2096000, 1681092, 2248291, and 2423367). SAP Note 2426339 (Support for SAP HANA 2 in SAP S/4HANA) is another important SAP Note, and the SAP HANA Master Guide (*http://help.sap.com/hana/SAP_HANA_Master_Guide_en.pdf*) should be referenced while deciding on the right deployment option for a combination of applications.

The deployment option can also be chosen based on SAP recommendations and considerations for the advantages and disadvantages of a given option. For example, SAP recommends using MDC for all the MCOS scenarios it fits and for MCOD, because MDC supports most of the MCOD scenarios. On the other hand, all the SAP HANA applications deployed using MDC will share the same SAP HANA database. As a result, any SAP HANA database upgrade will impact all the applications at the same time. In addition, the high availability/disaster recovery (HA/DR) configuration will impact all tenant databases because they're part of the same SAP HANA database.

With SAP HANA 2.0, using MDCs will be the only operational mode for SAP HANA systems. This means that you will no longer be able to operate a single-container system. Refer to SAP Note 2423367 (Multitenant database containers will become the standard and only operation mode) for more information.

As another example, SAP supports multiple SAP HANA databases on the same system (the MCOS scenario), even for the production environment, but only for scale-up or single-host scenarios. For this option, sizing must be performed carefully, and proper volume testing is important before going live, because contention for the system resources by the different components using the same system may lead to poor performance in production (see SAP Note 1681092). Your choice may also be influenced by the following:

- The underlying infrastructure from existing vendors and the scalability options for that hardware. Depending on the maximum available size, the workload can be virtualized so that proper resource sharing happens.
- Nonfunctional requirements play an important role in the choice of deployment model—for example:
  - *Responsiveness*: This may determine whether any cloud deployment is an option for the productive environment. For high responsiveness, on-premise is the preferred option.

- *High availability/recovery time objective/recovery point objective*: Certain options are better from a HA requirement point of view. If cloud providers can't cater to availability—say, more than 99.5 percent—or if such service-level agreements (SLAs) could have a high cost impact, then having the system on-premise might be the best choice. Another example of a cost-optimized HA option occurs when the system on which the secondary server is running can be shared with the nonproductive instances.
- *Disaster recovery*: The option to have the DR set up in the cloud while the workload runs on-premise is a cost-effective one. Alternatively, your cloud partner should be able to provide and maintain a DR solution, if the actual solution is also hosted on cloud.

For an organization that wants to use IaaS for the on-premise deployment of SAP S/4HANA, there are several options along with the management functions on top of these infrastructure services. The cloud vendors normally offer unmanaged IaaS, managed IaaS, or managed PaaS. The different types of services are shown in Figure 10.3.

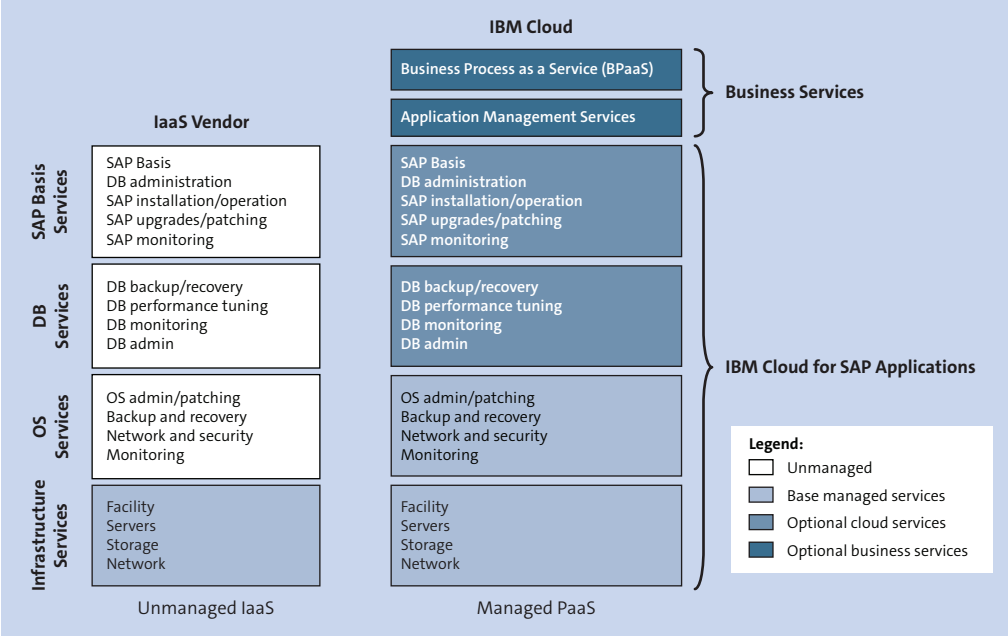


Figure 10.3 Service Options for IaaS and PaaS: Managed and Unmanaged

10.2.2 SAP S/4HANA Cloud

SAP S/4HANA Cloud uses an SaaS model and is maintained and operated by SAP in SAP's infrastructure. SAP S/4HANA Cloud is again available in two flavors: public and private.

SAP S/4HANA Cloud, public option has limited flexibility in terms of customization. It doesn't allow modification of standard objects but allows limited extension. SAP S/4HANA Cloud, private option allows a similar level of modification but more flexibility in terms of usage. For example, for the public version, the processes are only accessible through SAP Fiori apps. Thus, the challenge lies in the fact that functionalities available on simplified code without an SAP Fiori app won't be available on the public cloud. However, for the private version of the same product, these other processes are accessible through the SAP GUI.

For more details about the latest releases and the major processes available in SAP S/4HANA Cloud, see Chapter 11.

Note

More details about the features of each release can be found at *http://help.sap.com/s4hana*.

Before we discuss the private and public cloud options in detail, let's first look at some items you should consider before deciding if your landscape and your business are ready for SAP S/4HANA Cloud.

Initial Considerations

You may start by asking yourself the following questions:

- Are all types of workload cloud-ready?
- How do we analyze the workload to check for cloud readiness?

There are methods to analyze the workload that cloud providers such as IBM or Microsoft can use to help organizations determine the feasibility. Some examples of the workload traits that determine their readiness for cloud adoption are listed in Table 10.2.

Not Ready for Cloud	Possibly Ready for Cloud	Ready for Cloud
■ Sensitive data ■ High degree of customization ■ Not virtualized software ■ Complex processes and transactions ■ Regulatory constraints ■ Complex software licensing ■ Tight integration with other on-premise systems	■ Information-intensive ■ Isolated workloads ■ Mature workloads ■ Nonproduction systems ■ Batch processing	■ Analytics ■ Infrastructure storage ■ Industry applications ■ Disaster recovery ■ Development, test, and training environments ■ Infrastructure compute ■ Business processes (e.g., CRM, HR, etc.) ■ Industry vertical application ■ Web-hosted apps ■ Collaboration ■ Office applications

Table 10.2 Workload Cloud Readiness Analysis Sample

What about cloud adoption for SAP ERP, which is for many organizations the core transactional system supporting mission-critical business processes? Enterprise software such as SAP ERP is often at the core of the organization's business processes, and today SAP S/4HANA forms the digital core of the organization. Although these solutions don't see the type of seasonal variability experienced by other solutions, such as e-commerce sites, there are still demands for periodic scalability (e.g., testing environment for a project duration). Many other business drivers also hold true for these ERP solutions. There are some additional factors shown in Figure 10.4 that show how the standard nondifferentiating processes can be moved to the cloud while differentiating solutions requiring heavy customization stay on-premise or in a private cloud. The other influencing factor is the regulatory compliance applicable for the organization, including country-specific rules.

The trend shows quite a move toward a hybrid adoption pattern for solutions such as SAP ERP. Before we discuss the hybrid model, however, we need to look at both the private and public cloud.

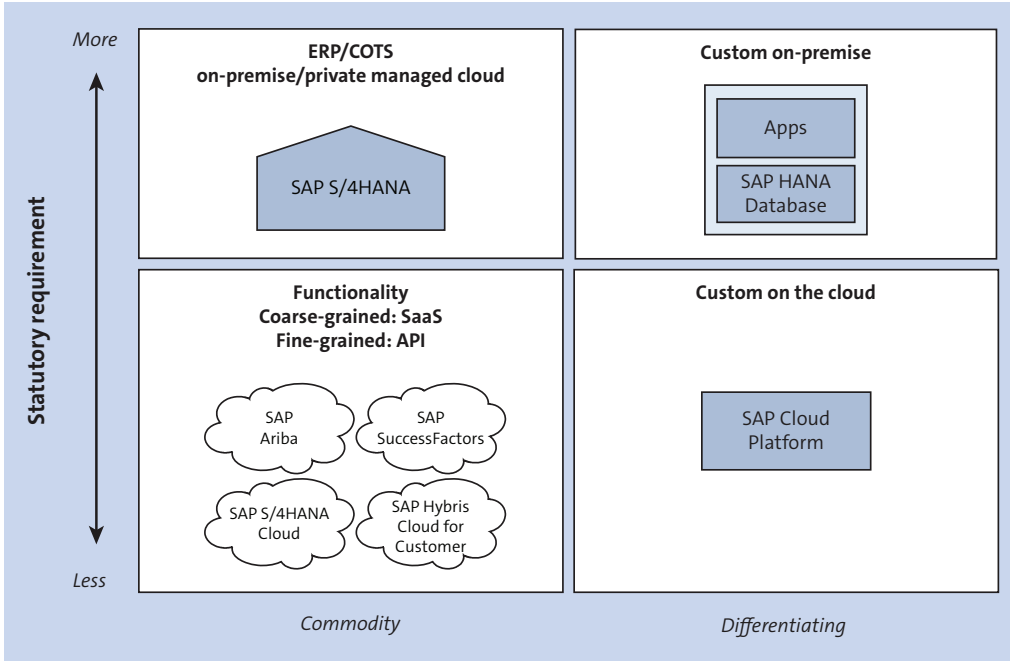


Figure 10.4 Cloud Decision Influencers for SAP ERP Solutions

Private Cloud

The advantages of private cloud deployment are as follows:

- The same level of security is used as for on-premise deployments because the environment is set up only for one customer and isn't shared.
- An initial investment is required to build the infrastructure, but the advantage is in the ability to effectively use that infrastructure (e.g., rapid provisioning, etc.) and reuse existing hardware.
- This is an especially good option for an IT landscape that has several systems and requires high-volume transactions with close integration with other systems.
- A few partners, such as IBM and HP, offer services to build a private cloud environment.

From an SAP S/4HANA perspective, this is just different model, but the same rules apply as for on-premise. In addition, the private cloud needs to use SAP-supported hardware and supported virtualization techniques.

Public Cloud

The advantages of a public cloud deployment are as follows:

- Cost savings is one of the major advantages for the public cloud option. There's no need to invest in infrastructure, and no upfront initial investment for capital expenditure (capex) is required; instead, it's a pay-for-usage model.
- This is a good model for all customers (even startups or individuals) unless there are other concerns or constraints, as mentioned earlier.
- Many public cloud offerings are available for SAP S/4HANA from SAP, as well as from partners such as IBM, Amazon Web Services (AWS), and Microsoft Azure.

From the SAP S/4HANA point of view, the cloud service needs to have official support status from SAP. From an overall perspective, however, the management requirement for the cloud infrastructure, the customer's responsibility, and the cloud vendor's responsibility should be clearly determined.

10.2.3 Hybrid Model

As mentioned earlier, not all workloads are the right fit for the cloud. Often, organizations must take a middle path and choose a hybrid model to optimize the cost and time benefits versus other considerations. In addition, though an organization can have a roadmap in place to move all applications to the cloud, this can be a multiyear journey.

For SAP S/4HANA, some organizations want to have nonproduction applications in the cloud but production on-premise. Some others want SAP BW on the SAP HANA system in the cloud but want SAP S/4HANA either on-premise or in a private cloud, because critical business processes may have responsiveness requirements that need a data center in a physically closer location or may require a high-bandwidth connectivity. This will have a cost implication and may act as a deterrent to be in the cloud. Figure 10.5 shows examples of the different scenarios in which the environments of an SAP solution can be deployed all on-premise, in the cloud, or using a hybrid model.

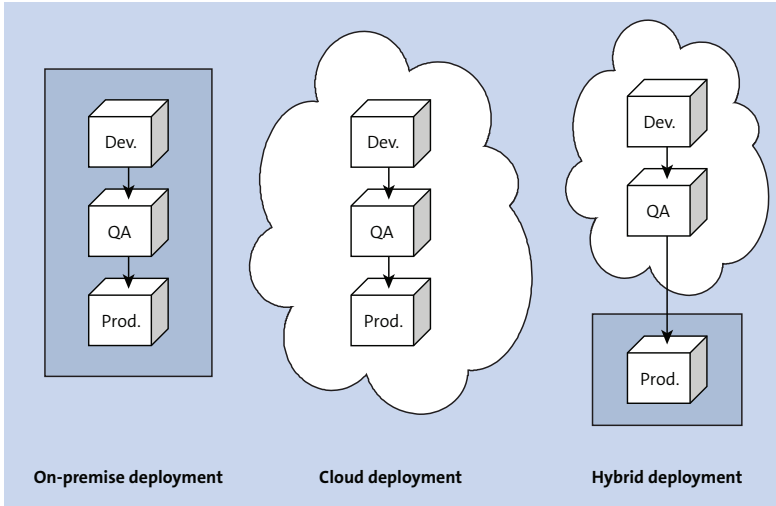


Figure 10.5 Hybrid Cloud Scenario Example

There can be several other use cases for hybrid cloud scenarios. The following list is a representative set and not exhaustive:

- Integration of legacy and new landscape.
- Systems of engagement located in the cloud, while the system of record remains on-premise—for example, SAP Fiori or SAP Gateway on SAP Cloud Platform, which connects to a backend on-premise SAP S/4HANA.
- Offload the variable load—for example, a testing server or an upgrade project requiring a parallel landscape in the cloud.
- For an IT landscape with multiple SAP instances, the smaller instances (which should be closer to standard SAP solutions) can move to SAP S/4HANA Cloud, while larger ones with more customization can be on-premise. There can be several such combinations of the two-tier ERP landscape, including the possibility to combine SAP S/4HANA solutions and non-SAP HANA or non-SAP ERP solutions.

10.3 Cloud Vendor

The IT division of an organization adopting SAP S/4HANA needs to have an overall understanding of its business requirements. This understanding will lead to choosing the type of cloud adoption (private, public, or hybrid with cloud and on-premise) and the SAP HANA–based products that need to be deployed together with SAP S/4HANA,

now or in the near future. These decisions will give the IT department an idea of what to look for in a cloud vendor. A single service provider might offer a business-centric SLA that is flexible, simple, and cost-effective, with an ability to respond to growth opportunities. Some of the major factors that must be kept in mind while choosing a cloud vendor are as follows:

- **Security, privacy, and compliance**
  Infrastructure should meet industry compliance standards, such as ISO 20000, 270001, and 9001; TIA Tier III; SOC1 (SSAE-16); and PCI DSS. You should feel confident that you can trust a cloud provider with your data.
- **Global presence**
  Look for data centers and network points of presence (POPs) for the cloud vendor across the globe for full control over data sovereignty and to minimize latency.
- **Scalability**
  Aim for a more scalable environment designed specifically for enterprise use with the ability to help better secure client-customized images and instances. The provider should have a robust portfolio of time-tested, enterprise-class solutions, including software, hardware, and services.
- **Reliability and high availability**
  Infrastructure should have redundancy and reliability built in, meaning that you're protected from the most common causes of application outage.
- **Support and service**
  You should find out what support and services are offered before selecting a vendor. If you need extra support and services from vendors to ensure your enterprise technology solutions run well, this should be taken into consideration.
- **Cost-effective**
  Cloud services as OPEX makes infrastructure costs more predictable and offers organizations better cost control. Look for cost-effective, always-on instances, with the flexibility to spin up more as and when need.
- **Thought leadership**
  The cloud vendor should architect and provide offerings based on IT Infrastructure Library (ITIL) best practices and industry-leading migration services to facilitate client transformation to the cloud. The vendor should have expertise in and best practices for managing and operating security-rich enterprise data centers around the world.

There are some additional aspects that can be considered as well. Accelerators will help provide required instances faster. For example, SAP HANA Enterprise Cloud, SAP's private cloud solution, has APIs and other integration adapters that help connect with

on-premise SAP systems. SAP also has System Landscape Optimization (SLO) services for data migration to the cloud.

IBM has startup bundles/packages for SAP S/4HANA that enable clients to quickly get SAP HANA proof-of-concept (POC) and test environments up and running in the IBM Cloud. The POC instance can be set up quickly, in as little as three days. SAP also provides POC environments on SAP's public cloud for an SAP S/4HANA trial or demo through the SAP Cloud Appliance Library (*https://cal.sap.com/*).

10.4 Integration

The IT landscape with SAP HANA is typically a hybrid, with some components in the cloud, possibly some cloud-based SaaS solutions, and some on-premise components. There might be different deployment options for the different environments as well. Business processes can run between the SAP S/4HANA core and other solutions, such as SaaS-based SAP SuccessFactors, SAP Hybris, SAP Hybris Cloud for Customer, and so on.

Thus, one of the challenges in this kind of environment is the integration aspect. Depending on the use case, multiple integration technology requirements might be in use. The different integration scenarios in a typical hybrid cloud landscape are shown in Figure 10.6.

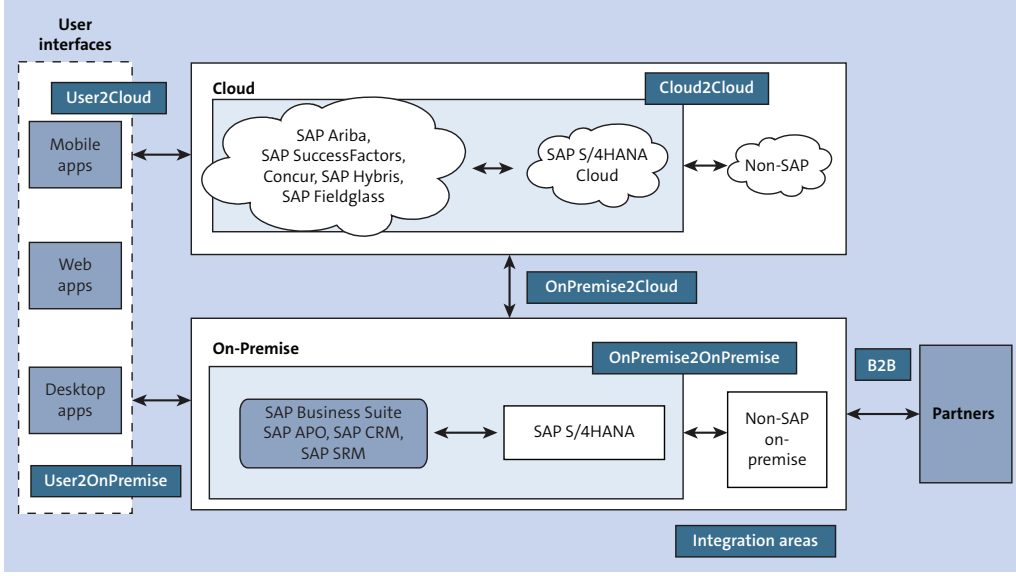


Figure 10.6 Integration Scenarios for SAP S/4HANA

For SAP S/4HANA Cloud, the required customer integration scenarios are deployed, configured, and activated in the cloud instances provisioned by SAP, or SAP provides self-configuration UIs so that customers can configure the solution. The content is integrated with SAP cloud solutions such as SAP SuccessFactors Employee Central, SAP Ariba, SAP Hybris Marketing Cloud, SAP Jam, and SAP Financial Services Network, as well as third-party integration with Vertex for tax calculation. If there is a requirement to build new integration scenarios, SAP Cloud Platform provides the extension platform for SAP S/4HANA, in which new integration capabilities can be created using whitelisted APIs.

SAP S/4HANA hosted on-premise or on a cloud platform such as the SAP HANA Enterprise Cloud can be integrated with SAP's cloud solutions through standard integration content delivered by SAP either through SAP Process Orchestration (SAP PO) or SAP Cloud Platform Integration. SAP Cloud Platform Integration is SAP's cloud integration middleware and is a SaaS product. Any other integration tool provided by a third party can also be used if it has the right kind of connectors for on-premise-to-cloud and cloud-to-cloud integration. For example, Dell Boomi can connect to several SaaS products, such as SAP SuccessFactors or Salesforce. Prior to SAP S/4HANA 1511, the integration components required for the SAP S/4HANA system had to be installed as add-ons. By 1709, SAP S/4HANA included native integration components for most cloud solutions, like SAP Ariba, Concur, SAP Fieldglass, SAP Hybris, SAP SuccessFactors, and SAP Hybris Cloud for Customer.

Web services or OData services enabled through SAP Gateway can also be used for integration. Some of the integration can use REST API calls from SAP S/4HANA to cloud solutions like Concur so that both getting data from that solution and getting it into the solution is initiated from SAP S/4HANA. For data movements, SAP Data Services, SAP Landscape Transformation (SAP LT), or SAP HANA smart data integration (SDI) can be used.

10.5 Summary

In this chapter, we talked about the cloud imperatives and how they are applied to the SAP environment. We covered the various deployment options for SAP S/4HANA and SAP S/4HANA Cloud.

On-premise SAP S/4HANA can be deployed either on-premise or in a private or public cloud, and SAP S/4HANA Cloud also has private or public cloud options.

When deciding on a flavor of SAP S/4HANA, especially for cloud deployment, you must keep in mind how it relates to the greater scheme of the IT landscape and IT strategy, as well as how it relates to the other SAP HANA products already in the landscape or in the adoption roadmap. Migration services to facilitate client movement to the cloud also need to be considered to migrate current landscapes seamlessly in the cloud space. There are many variables to consider when choosing the right deployment strategy, but ideally this decision should be looked at from both a business perspective and an IT perspective to achieve immediate and long-term business goals.

In Chapter 11, we'll take a closer look at SAP S/4HANA Cloud.

Chapter 11
SAP S/4HANA Cloud

This chapter introduces SAP S/4HANA Cloud and outlines its relative merits and functional gaps to help you choose the right SAP S/4HANA version for your company.

SaaS is not a new concept: It has been proven, adopted, and successful over the past decade. SAP S/4HANA Cloud offers all the benefits of an SaaS offering, like low TCO, no hassle keeping up with upgrades, and limited liability. The highest value SAP S/4HANA brings is access to best practices and the agility that comes with its connection to the ecosystem around the SAP S/4HANA digital core. The SAP S/4HANA system contains core functionality like record-to-report, order-to-cash, and requisition-to-pay, but it also incorporates the latest innovations, like machine learning. The SAP Fiori UX is designed to make changes easy for users who've been working with SAP GUI for decades.

In this chapter, we'll provide an overview of SAP S/4HANA Cloud. We'll begin by discussing the value proposition of SAP S/4HANA Cloud before discussing the current scope of the solution. We'll also provide a high-level look at what an SAP S/4HANA Cloud deployment looks like, its extensibility options, and its content lifecycle management approach.

11.1 Value Proposition

When it comes to SAP S/4HANA Cloud, the first question to ask is which organizations are the best candidates for it. The obvious answer to this question seems to be small and medium enterprises (SMEs) with lean operations, but this is only partially true. SAP's official roadmap for SAP S/4HANA Cloud is aggressive, adding huge amounts of functionality in a short period of time, which may lead to bringing even large accounts with high complexities into the public cloud. There is ongoing innovation in terms of supporting additional country versions and languages. Currently, a good candidate for SAP S/4HANA Cloud is any firm that has more than 1,500 employees and is in the

process of reimplementing SAP or beginning a greenfield implementation. For larger firms, the two-tier model is recommended, in which complex or highly customized systems at the corporate level are either on-premise or in a private cloud, while subsidiaries can be in a public cloud. The subsidiaries in this case are at liberty to be more innovative and flexible—this can be particularly useful when subsidiaries are in a different country from their parent company.

The private cloud is hosted on a single tenant that provides flexibility similar to an on-premise option, and users have access to IMG activities. The private cloud also supports many industry solutions and has multiple country and language support options compared to the public cloud. The new release cycle is annual, compared to quarterly releases for the public cloud. In this chapter, we're focusing only on the public cloud variant.

Figure 11.1 and Figure 11.2 depict the decision process to choose a solution in the public cloud, in the private cloud, or on-premise. Figure 11.1 shows the process for new customers, while Figure 11.2 shows the process for existing SAP customers. In these figures, BYOL stands for bring your own license.

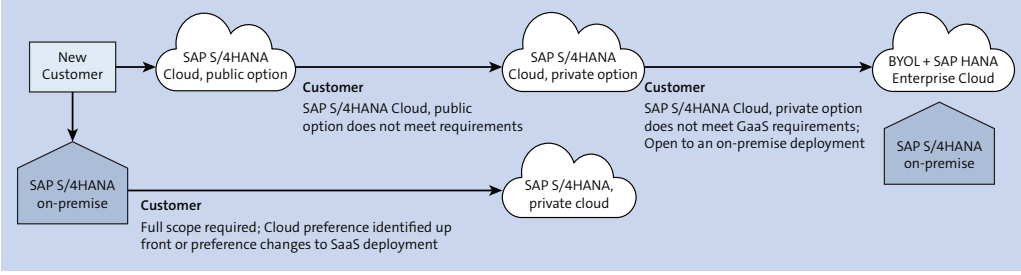


Figure 11.1 New Customer Deployment Options

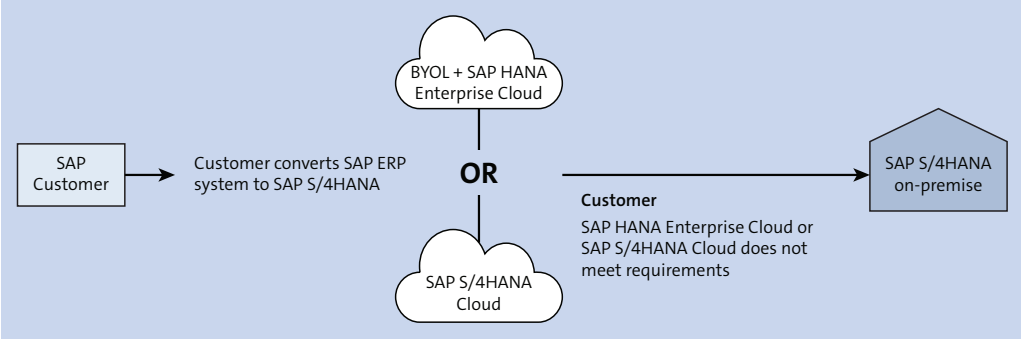


Figure 11.2 SAP Customer Deployment Options

The overall value proposition for SAP S/4HANA Cloud can be summarized as follows:

- Go-live in weeks
- Quarterly updates
- Fit-to-standard implementation approach
- Machine learning and artificial intelligence (AI) capabilities
- Digital assistant
- Predictive analytics
- In-memory database
- Real-time insights
- Native integration
- Available across all devices
- Reduces the complexity of the digital agenda using best practices

11.2 Current Scope of the Solution

Initially, SAP S/4HANA Cloud had multiple editions, including SAP S/4HANA Marketing Cloud (hybrid option), SAP S/4HANA Finance Cloud, SAP S/4HANA Professional Services Cloud, and SAP S/4HANA Manufacturing Cloud. These are now merged into a single offering: SAP S/4HANA Cloud. Along with core finance functionality, it also offers optimized order-to-cash, streamlined procure-to-pay, accelerated plan-to-product, project services, and integration with SAP SuccessFactors Employee Central for HR processes. It also provides functionality for data management. Figure 11.3 illustrates the scope of SAP S/4HANA Cloud.

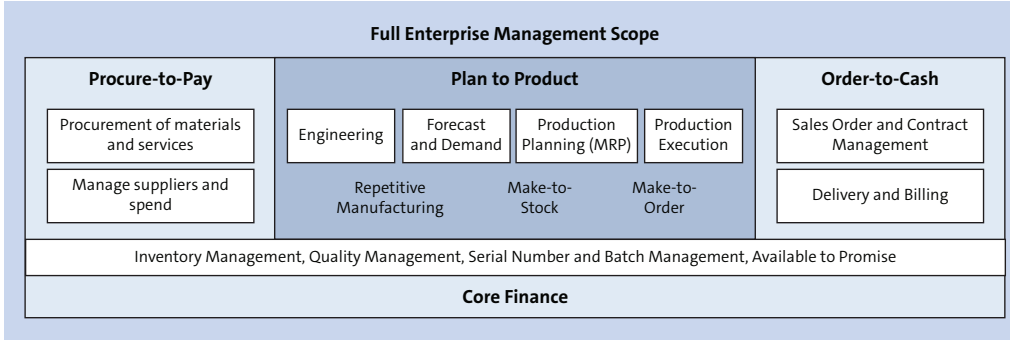


Figure 11.3 SAP S/4HANA Cloud Full Enterprise Management Scope

SAP S/4HANA Cloud doesn't have any add-ons or functionality for specific industries such as retail, oil and gas, utilities, and so on. Customers who require such functionality will need to keep using those functions in their existing ERP system while moving the core functions to SAP S/4HANA Cloud. As part of the future roadmap, SAP will be building some of these industry solutions on SAP Cloud Platform. SAP S/4HANA Cloud provides a basic set of functionalities; after evaluation, if this isn't sufficient, then customers would need to choose on-premise SAP S/4HANA.

As of the time of writing, SAP S/4HANA Cloud has been localized for the following countries: Australia, Belgium, Brazil (only partial scope as of the time of writing), Canada, China, France, Germany, Hong Kong, Hungary, Ireland, Italy, Japan, Luxembourg, Malaysia, Netherlands, New Zealand, the Philippines, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, UAE, the United Kingdom, and the United States.

In upcoming releases, SAP plans to add support for Austria, Denmark, India, Indonesia, Mexico, Norway, and South Korea.

Currently, SAP S/4HANA Cloud supports the following languages: Arabic, Chinese (simplified), Chinese (traditional). Dutch, English, French, German, Hungarian, Italian, Japanese, Korean, Portuguese, Russian, Spanish, Swedish, and. Support for Bahasa (Malaysia) and Danish are planned.

Note

More details about the features of each release can be found at *https://help.sap.com/viewer/product/SAP_S4HANA_CLOUD*.

11.3 Deployment

With the background in place, let's move on to discuss the available tools, processes, typical project lifecycle, content lifecycle management, and extensibility options that will keep the system robust under the quarterly innovation cycle and still provide flexibility where needed to customize.

The best place to start is with the SAP Activate Roadmap Viewer, which provides the structure in detail with an in-depth view of the project phases such as discover, explore, realize, and run.

It also provides over one hundred accelerator items, including templates for the project plan and communication plan, roles and responsibilities for various teams,

quality gate questionnaires to check readiness for the next phase, test scripts, data migration, presentations on understanding concepts and processes, and, last but most important, training aides. The second-most-important tool is the SAP Best Practices Explorer, which helps users understand the predefined processes. These are industry-agnostic but work for all core requirements in finance, order-to-cash, procurement, project services, and so on. Becoming familiar with these two tools is a mandatory exercise, and this preparation can be started at any time without any investment because these resources are available free of cost. The only prerequisite is to have an S-user ID for complete access to the accelerators.

11.3.1 Fit-to-Standard

With the new direction focusing purely on business processes rather than on configuration and respective transaction codes, it's important to know about the available business processes to scope the solution.

The lesson learned from various teams that worked on the SAP S/4HANA Cloud implementation is that the fit-to-standard approach is the key—but at the same time, it can become a bottleneck if not enough time is spent on the process. The fit-to-standard process (see Figure 11.4) starts in the discovery workshop and remains an important factor in the explore phase. The initial fit-to-standard workshop is crucial; customers need to be very sure that SAP S/4HANA Cloud is the best option and that the standard processes with limited extensibility will suffice for their business needs. This decision can't be made during the fit-to-standard exercise in the explore phase because the customer will have already committed to SAP S/4HANA Cloud at that point by signing up for a subscription.

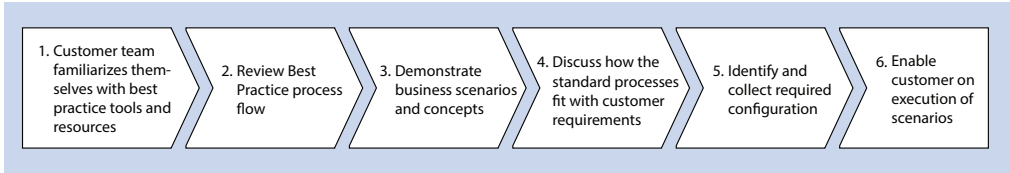


Figure 11.4 Fit-to-Standard Workshop Approach

Figure 11.5 shows that fit-to-standard doesn't become relevant only in the explore phase; it needs to be started in the discovery phase for successful implementation of the project.

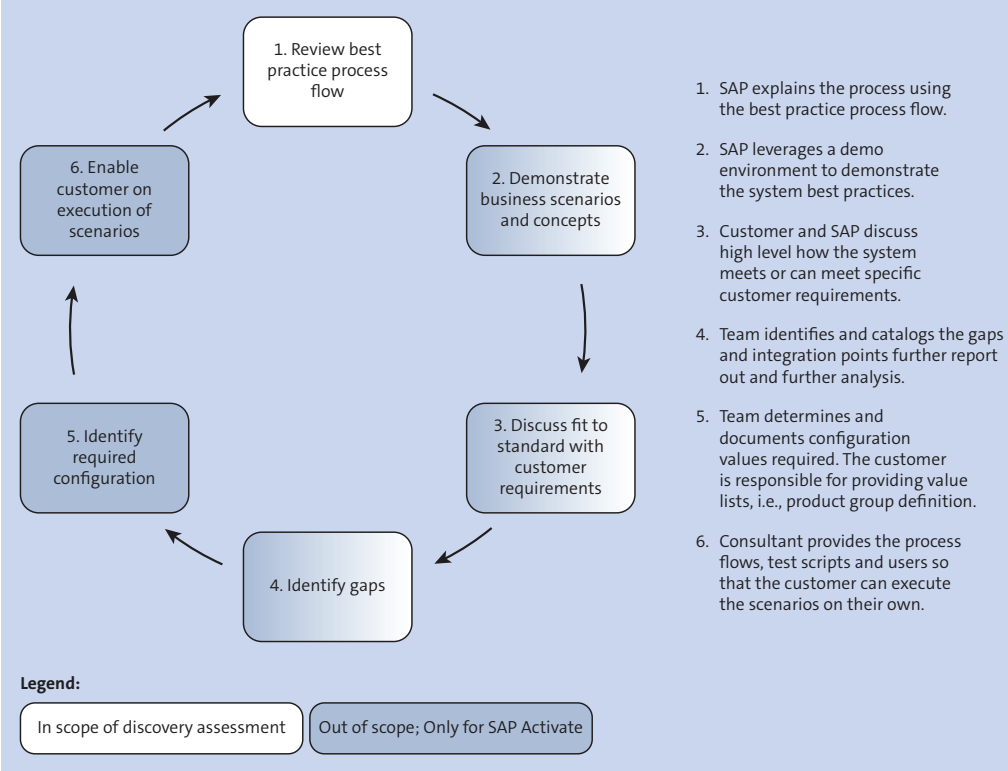


Figure 11.5 Fit-to-Standard Approach Phases

11.3.2 Deployment Resources

There are over 100 documents (templates/resource documents) available through the Roadmap Viewer. Table 11.1 describes of a few of the accelerators that can help during each phase of the SAP S/4HANA Cloud deployment.

Phase	Accelerator	Benefits
Discover	Enterprise support value map	Identify enterprise service options, tools, and expertise for business needs.

Table 11.1 Templates and Resources from SAP Activate Roadmap Viewer

Phase	Accelerator	Benefits
	Readiness Check	Analysis of software prerequisites, infrastructure requirements, custom code adaption, etc.
	SAP Roadmap	Solution and product roadmap to help customers design their own roadmaps.
	Simplification List	Understand business processes for simplification and the impact on current business processes.
Prepare	Agile team roles and responsibilities	Project org charts for functional, non-functional, and architecture teams.
	Project plan templates	Detailed sample project plan.
	Project status report	Useful for daily updates to go over schedules, scope, risks, budget, and issues.
	Quality gate checklists	Helps identify any risks or disturbances in the organizational and operational structure before moving to the next phase.
	Security baseline template	Security Operations map including Infrastructure security, code, setup and overall compliance for audit.
Explore	Automated data migration design template	Document the technical design of an automated data migration solution.
	Checklist—configuration and maintenance of storage infrastructure	Validation of technical architecture: technical performance optimization (TPO) and storage subsystem optimization service.
	Custom Development Management Cockpit	Custom guidelines for development.

Table 11.1 Templates and Resources from SAP Activate Roadmap Viewer (Cont.)

Phase	Accelerator	Benefits
	Data migration strategy and approach sample	Defines objectives of data migration, strategy, and approach, including deliverables.
	Data governance	Training documents on data governance.
	Model company	
	Functional test plan template	High-level functional test plan to make sure you meet all the business and technical requirements, including service levels.
	Functional and implementation design template	Design template for Automated Data Migration Solution.
	How to Approach: Fit/gap Workshop	Fit/gap analysis workshop process and preparation.
	Rapid data migration	Methodology and conversion scenarios.
	Scope and Effort Analyzer	SAP Solution Manager: understand change impact, test scope, and related efforts.
	Signoff template	Phase acceptance and closure: Make sure phase deliverables and expectations are met (approvals).
Realize	CQC OS/DB migration check	Continuous migration check.
	Documented Procedure for Integration Validation	Integration validation based on product, solution, and operations standards.
	Service component information	Company code transfer, client transfer, and system merge.
	Enhancement template	ABAP custom development (WRICEF).
	Workflows, reports, interfaces, conversions, enhancements, and forms (WRICEF) inventory template	WRICEF inventory with details about complexity for interfaces, report conversion, etc.

Table 11.1 Templates and Resources from SAP Activate Roadmap Viewer (Cont.)

Phase	Accelerator	Benefits
Deploy	CQC OS/DB migration check	Continuous quality check.
	CQC for implementation	Continuous migration check, other CQCs for implementation, TPO, and upgrade.
	Primary CCOE checklist	Primary certification (Customer Center of Expertise) checklist.

Table 11.1 Templates and Resources from SAP Activate Roadmap Viewer (Cont.)

A two-week trial is available at no cost to gain familiarity with the interface, scope items, and SAP Fiori apps. A starter system is available in the explore phase that's preconfigured and has required test data. The system is key to performing the fit-to-standard analysis and creating a list of backlog items. Also, note that at any given point only two systems (e.g., starter and Q systems or Q system and P system) are available. Although the scope items are determined in the starter system, the changes can't be moved to the Q-system. The Q-system isn't preconfigured, and the scope items must be selected and configured through the Self-Service Configuration User Interface (SSCUI) app. The users are defined in the SAP Cloud Identification Service and then imported into the starter system.

The landscape availability is shown in Figure 11.6. The provisioning of the starter system, activation of the Q-system, and transports to the P-systems are managed by SAP.

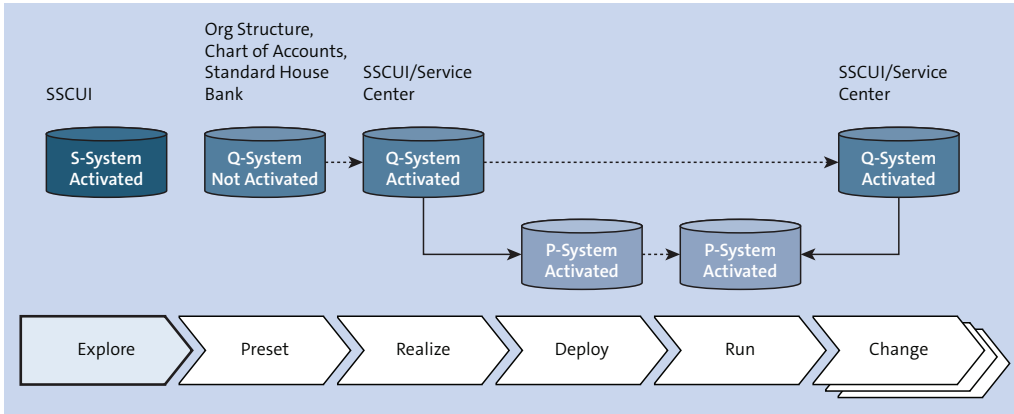


Figure 11.6 Starter System, Q-System, and P-System Landscape

Figure 11.7 illustrates the usage of the tools in different phases. The starter system has required test data. The Automated Test Tool app is an enhanced tool in which each step is executed and the results recorded, including screenshots. This expedites testing of the end-to-end processes and helps meet regression testing requirements.

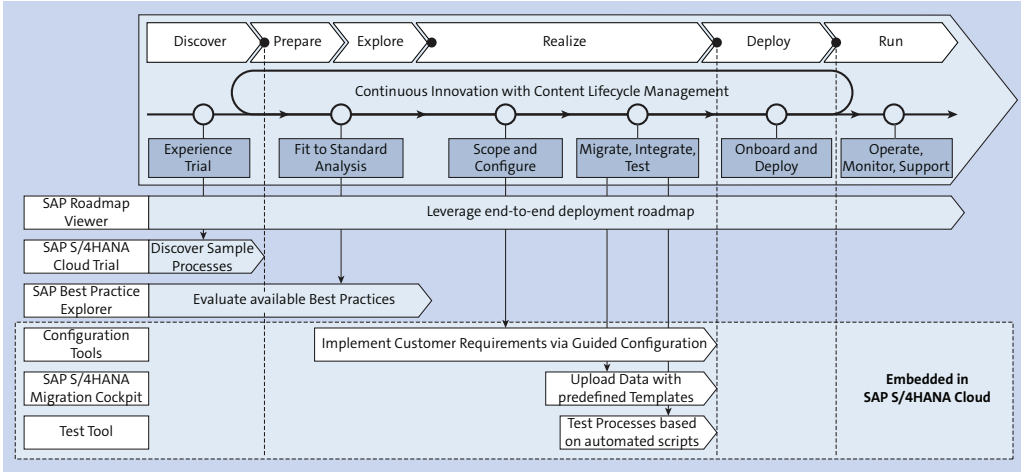


Figure 11.7 Tools and Their Usage in SAP Activate Phases

11.3.3 SAP Best Practices Explorer

The SAP Best Practices Explorer helps create faster time to value via best practices business processes that are robust and adhere to regulations and compliance. These are available for the entire scope of the solution and are classified in groups such as finance, application platform and infrastructure, asset management, database and data management, and so on. The full list is available in the content library. Detailed flow diagrams and test scripts are available for each process to help reduce the effort of documentation and aid consistency in testing.

A complete list of the best practices for SAP S/4HANA Cloud is available from the SAP Best Practices for SAP S/4HANA Cloud Content Library.

Note

SAP Best Practices are accessible on the web, but you may need an S-user ID to access and download them from *http://bit.ly/2frCb2o*.

11.3.4 Self-Service Configuration User Interface

The Manage Your Solution app provides easy access to configure your solution (scope), make changes, migrate data, and manage testing. It also provides access to training resources. Because there is no IMG or Transaction SPRO available in the public cloud, all the required configuration is performed through the guided configuration,

The guided configuration is available through the Manage Your Solution app, in which a user can scope/select business processes. Once the business processes are selected, the respective SAP Fiori apps are available to the user with the related assigned roles. It's possible to make preapproved changes using in-app accessibility and manage changes through the Extensibility Cockpit. The Manage Your Solution app also provides access to manage the test processes and run automatic test scripts. A data migration interface is also provided, and data migration is carried out with the templates provided as accelerators.

11.4 Extensibility

It's important to understand how gaps in functionality in SAP S/4HANA Cloud can be fulfilled through the extensibility options. The latest version (1708) has an Extensibility Cockpit to easily manage the in-app extensibility (forms, fields, business logic) and maintain the inventory of these changes. The SAP Business Hub API provides a detailed understanding of the interface development and available APIs for connecting to other cloud solutions like SAP Ariba, SAP Fieldglass, SAP SuccessFactors, Concur, SAP Hybris, and so on. SAP Cloud Platform is available to create new apps and to provide side-by-side extensibility. Finally, a Custom CDS Views app provides already-designed CDS views to create ad hoc reports and interface with other SAP and third-party solutions.

Note

For more information on extensibility, see Chapter 12.

11.5 Content Lifecycle Management

The SAP S/4HANA Cloud solution is managed and maintained by SAP. Releases are planned for each quarter starting in February of each year (Feb/May/Aug/Nov). At

present, releases are available in two upgrade cycles, or "waves." There's a two-week period between the releases for QA and production. The objects changed by in-app and side-by-side extensibility are managed efficiently, and there's no impact on such configuration after the releases. Figure 11.8 shows the SAP S/4HANA Cloud upgrade cycle.

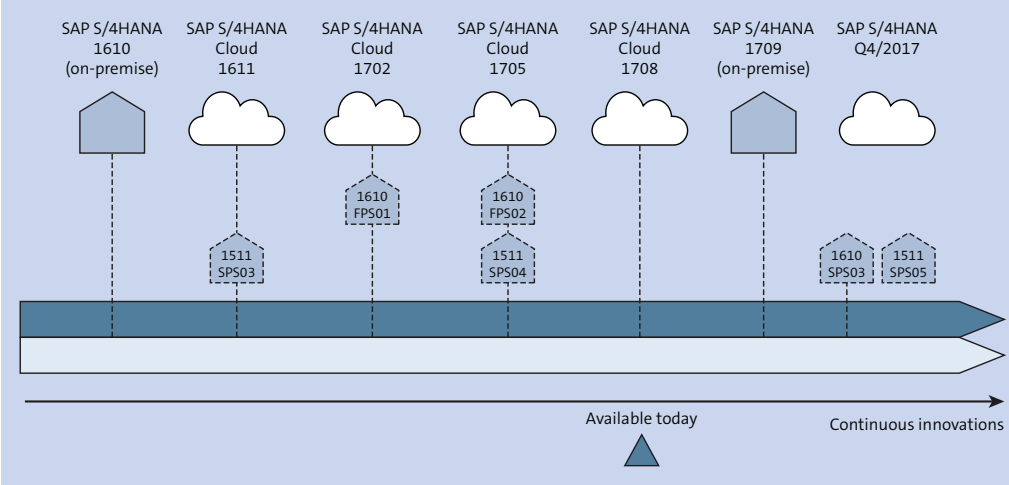


Figure 11.8 SAP S/4HANA Cloud Delivery Schedule

Once you sign up for a subscription, a customer engagement executive (CEE) is assigned by SAP to make sure the processes are followed and to provide support for the fit-to-standard workshops and provisioning of the systems. With the SAP Enterprise Support, a customer success manager (CSM) is assigned to provide support for extensibility, new releases, and any technical issues encountered during the project lifecycle. The key roles within the realm of content lifecycle management are as follows:

- **Customer engagement executive**
  - Post-sales relationship management
  - Strategic governance
  - Commercial management and renewals
  - Solution adoption/consumption measurement
  - Business outcomes and value delivery
- **Customer success manager**
  - Deployment success

  - Solution/release guidance
  - Mission-critical support
  - Engagement review
  - Quarterly scorecard delivery
- **SAP/partner expert services**
  - Consulting and implementation services
  - Technical expertise
  - Proactive service delivery
  - Key and end user knowledge transfer

Table 11.2 provides an overview of the timelines for content lifecycle management for SAP's new content for SAP S/4HANA Cloud.

Use Case	Description	When	User Interaction	Activation Mode
Implementation project	Initial implementation	Any time	On user demand (e.g., phase change)	Initial activation (full activation)
Change project	Change project			Delta activation via upgrade procedure
Updates	Content corrections	Every two weeks	Automatic transparent delta (without user interaction)	Delta activation via upgrade/ scope extension procedure
Improvements/ upgrades	Continuous content improvement and adaptation	Each quarter		
New scope	Additional scope items and countries		On user demand	

Table 11.2 SAP S/4HANA Cloud Content Consumption Use Case Schedules

The maintenance schedule for SAP S/4HANA Cloud for all customers is as follows:

- Quarterly upgrade is performed as follows:
  - (Q) quality system is upgraded to latest release during first weekend after RTC date.

  - (P) production system is upgraded during third weekend after RTC date.
  - (S) starter system for customers with no (P) system yet is upgraded during second weekend after RTC date.
- Each customer is notified six weeks prior to (Q) system upgrades.

There are no exceptions to this schedule; all customer instances are updated every quarter. Table 11.3 shows the current SAP S/4HANA Cloud upgrade schedule (these dates are subject to change).

SAP S/4HANA Cloud Upgrade	Major Milestone Dates					
Cloud quarterly release name	1708	1711	1802	1805	1808	1811
Release to customer (RTC)	August 7	November 6	February 5	May 7	August 6	November 5
(Q) Quality system	August 12/13	November 11/12	February 10/11	May 12/13	August 11/12	November 10/11
(P) Production system	August 26/27	November 25/26	February 24/25	May 26/27	August 25/26	November 24/25
(S) Starter system	August 19/20	November 18/19	February 17/18	May 19/20	August 18/19	November 17/18

Table 11.3 SAP S/4HANA Cloud Upgrade Schedule

11.6 Summary

In this chapter, we looked at the features of SAP S/4HANA Cloud. Although adopting SAP S/4HANA Cloud provides value in terms of using cutting-edge technology as well as providing the capability to interface seamlessly with other SAP and non-SAP cloud offerings, its greatest value lies in opportunity to rethink your business and turn business ideas into reality with SAP S/4HANA as the center of digital transformation and support from the ecosystem built around it.

When deciding whether to implement SAP S/4HANA Cloud, keep in mind how it relates to the greater scheme of the IT landscape and IT strategy, as well as how it relates to other SAP HANA products already in the landscape or in the adoption roadmap. Migration services to facilitate client transformation to the cloud also need to

be considered to migrate seamlessly into the cloud space. There are many variables to consider when choosing the right strategy, but this decision ideally should be looked at from both a business perspective and an IT perspective to achieve immediate and long-term business goals.

In Chapter 12, we'll look at extensions for SAP S/4HANA.

Chapter 12
Extending SAP S/4HANA

This chapter provides an overview of SAP's extension approaches, a cloud-first extension strategy, and SAP Cloud Platform capabilities. We also discuss leveraging emerging technologies for future SAP solutions.

Customization underpins our world. Everyone has different techniques and preferences, and businesses are no different. The very first IT systems were specifically tailored to how businesses operated, at a high cost and risk. Later came out-of-the-box products to increase success and decrease costs and risk by using best practices to encourage businesses to adopt the standard processes and use customization for unique business processes.

Software as a service (SaaS) encourages best practices even more, providing robust functionality with less customization, which businesses are willing to sacrifice for agility, faster deployments, regular feature updates, and reduced costs. However, the inescapable truth is that customization can't be removed fully from the technology that supports businesses. Because each business is different, there will always be some custom application code and software parameters configuration. Best practices may enable businesses to upgrade functionality with less prep time, effort, and risk, which is good for software companies that want happy clients, but businesses require technology to enable their uniqueness, too.

The answer to this dilemma lies in a computing concept that's both logical and old; separate the application from the customization by creating extensions.

In the past, the customization and extension of SAP functionality focused mainly on ABAP application development as part of the SAP ERP solution. Later, Java application development was added with the introduction of SAP NetWeaver and service-oriented architecture to create a composition environment. Building in the runtime environments of SAP NetWeaver AS ABAP or SAP NetWeaver AS Java were the two methods to enhance the SAP ERP core.

With the move to cloud-based "X as a service" solutions, there's a need for strong governance to maintain the solution and therefore restrict options to extend or customize

SAP S/4HANA. The same is true for other cloud-based line of business (LOB) solutions, such as SAP SuccessFactors, SAP Hybris Cloud for Customer, SAP Ariba, SAP Fieldglass, and Concur.

SAP's approach for SAP S/4HANA is to keep a stable solution running the business and to use extensions to provide custom functionality without implications for maintenance. The previous methods and tools are still available for SAP S/4HANA, but the recommendation is to adopt the approach and tools available for SAP S/4HANA Cloud to prepare for the future and to leverage their benefits.

Separating all custom development into extensions is a fundamental business architecture and technology architecture decision with an impact on SAP S/4HANA design and implementation, and which will have an impact for the next decade or more.

In the following sections, we'll detail the various extension approaches.

12.1 Extensions for SAP

In the following subsections, we'll begin with an overview of the two extensibility approaches available for SAP S/4HANA, then we'll jump in to their specifics.

12.1.1 Overview

SAP has defined two approaches for going forward: in-app extensibility and side-by-side extensibility. These two approaches are illustrated in Figure 12.1.

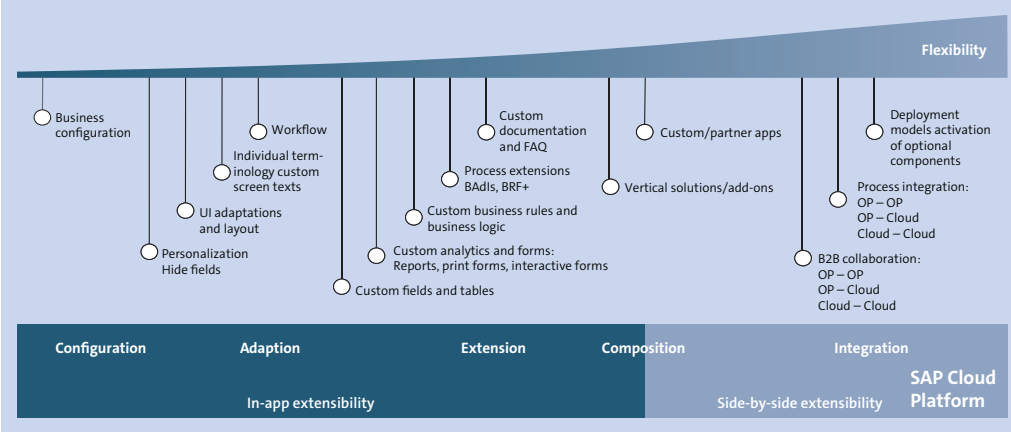


Figure 12.1 Overview of In-App Extensibility and Side-by-Side Extensibility Approaches

In the *in-app extensibility* approach, customization occurs in the SAP application. This approach uses the same methods and tools as in past SAP ERP releases to create capabilities built into SAP S/4HANA across data (SAP HANA database) and application (ABAP) layers. These have been classified into two subtypes:

- Key user in-app extensibility, in which a key user (e.g., a super user or functional consultant) performs configuration changes via SAP Fiori–based tools to customize the SAP S/4HANA ABAP backend and SAPUI5/JavaScript SAP Fiori frontend. As a key feature of SAP S/4HANA using SaaS principles, this option is available for all SAP S/4HANA editions.
- Classic in-app extensibility, in which developers have full access to the SAP S/4HANA ABAP backend, SAP HANA database backend, and SAPUI5/JavaScript SAP Fiori frontend. This is a continuation of the customization available in previous SAP ERP suites and is only available for on-premise SAP S/4HANA.

In the *side-by-side extensibility* approach, customization occurs on an adjacent application layer. This approach uses the latest development advantages from cloud technologies and tools to create capabilities on an adjacent application layer with decoupled feature update timelines for parallel delivery. Using side-by-side extensions is the next method to provide the business with a value-add for SAP products.

An overview of the differences between the two extensibility approaches and their use is provided in Figure 12.2.

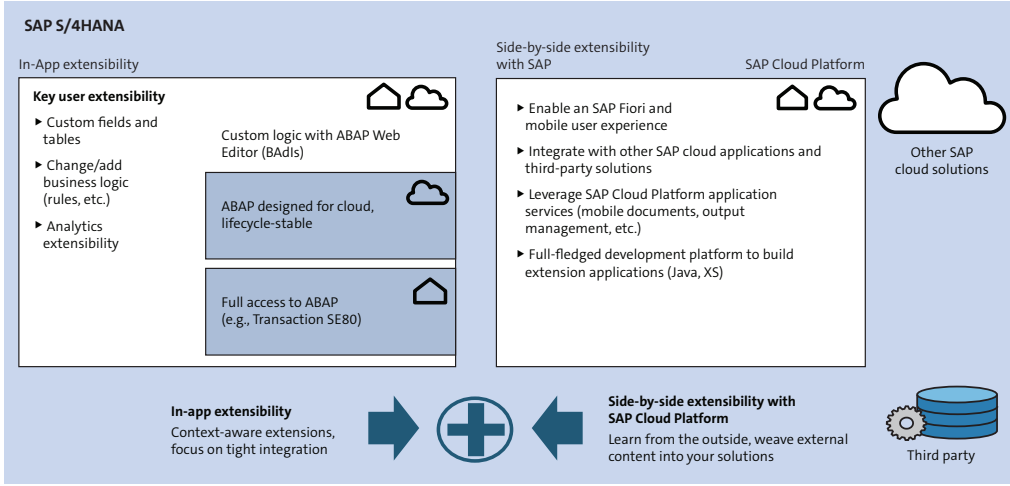


Figure 12.2 Comparison of In-App Extensibility and Side-by-Side Extensibility Approaches

The extensibility approaches available are different from what you may have experienced with SAP, as shown in Figure 12.3, which depicts extensibility approaches for SAP S/4HANA compared to SAP Business Suite (SAP ERP 6.0).

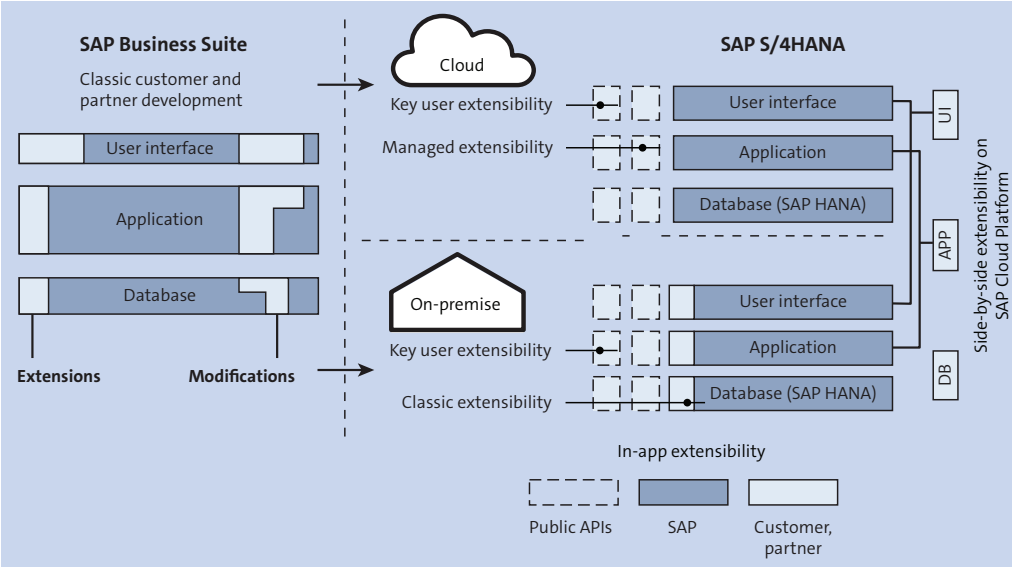


Figure 12.3 Extensibility Approaches for SAP Business Suite versus SAP S/4HANA

The key consideration when comparing in-app extensibility, which is very similar to the approach that's been used for many years, and the cloud computing–based side-by-side extensibility approach is the technologies introduced and therefore the impact on skills availability, best practices, and methodologies. The new approach considerations are discussed in Section 12.1.3.

Figure 12.4 summarizes the key technologies from both approaches for customization, and the following sections will discuss the approaches and their implications in detail.

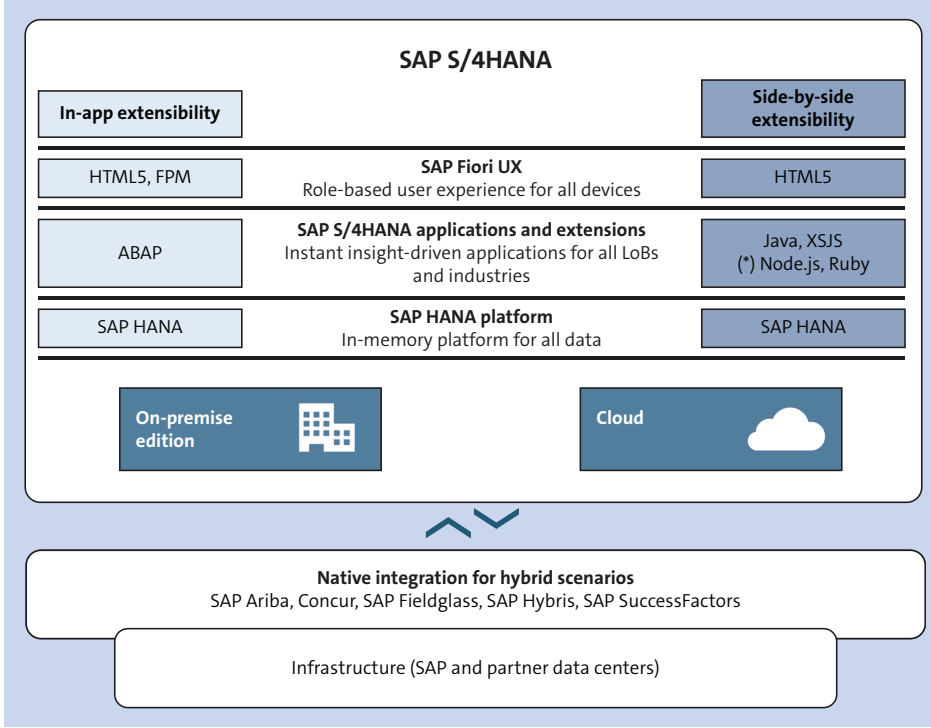


Figure 12.4 Possible Technologies to Adopt or Extend Business Applications

12.1.2 In-App Extensibility

In the in-app extensibility approach, customization occurs in the SAP application. The following subsections briefly describe the additional knowledge required for SAP S/4HANA, as this approach uses the same methods and tools from past SAP ERP releases.

Key User In-App Extensibility

This approach provides SAP Fiori–based tools to customize SAP S/4HANA and is designed for smaller changes made directly to the application (SAP S/4HANA) or data (SAP HANA database) layer.

The approach is named the *key user* approach because it relies on a super user or functional consultant who has been empowered to perform these customization changes as part of the design. It's a key provision of SAP S/4HANA and critical for the

public cloud edition; this feature has been adapted from the principles of other SaaS offerings in the marketplace.

The tools used for key user in-app extensibility in SAP S/4HANA are as follows:

- UI Adaptation Mode
- Custom Analytical Queries app
- Custom Catalog Extensions app
- Custom CDS View app
- Custom Communication Scenarios app
- Custom Fields and Logic app
- Custom Business Objects app
- Adobe Forms Designer and the Maintain Form Template app
- KPI Design app
- Manage Software Collection app
- Cloud ABAP Web Editor (high restrictions)

These SAP Fiori-based tools empower key users with the following tools and advantages:

- UI tools to customize the application simply and within restrictions
- Stable lifecycle due to restricted customizations removing regression impact after product upgrades
- Support for both on-premise and cloud deployment options

An example of a smaller change performed on an SAP Fiori app—the SAP S/4HANA Custom Fields and Logic app—is shown in Figure 12.5.

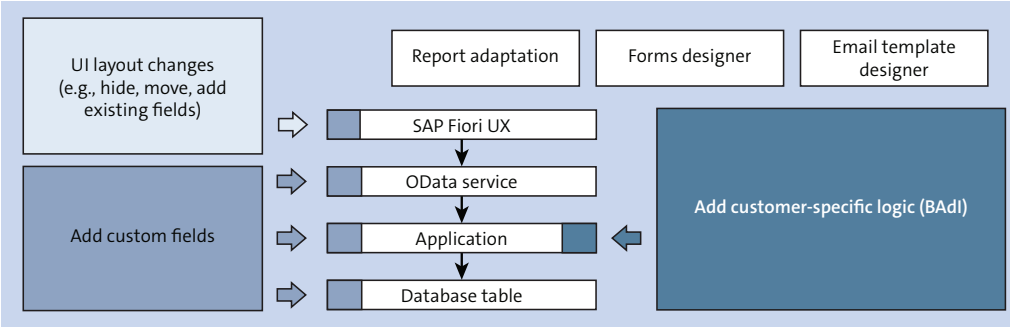


Figure 12.5 Key User Extensibility Example

Classic In-App Extensibility

This approach provides preexisting tools for full access to customize all layers; examples of these tools include the ABAP Workbench, ABAP Development Tools (ADT) for Eclipse, and SAP HANA Studio, based on Eclipse.

This approach is called the *classic* approach because it follows the same principles used in previous SAP ERP suites. The provision is only available in on-premise SAP S/4HANA, and we recommend that this approach only be used with the whitelisted APIs for SAP S/4HANA to ensure greater governance and reduced requirements for regression testing during product upgrades.

Whitelisted APIs for SAP S/4HANA In-App and Side-by-Side Extensions

In-app extensions and side-by-side extensions can use the SAP-managed (and thereby regression-controlled) public model APIs for SAP S/4HANA. These APIs are designed for SAP S/4HANA Cloud but are available for on-premise SAP S/4HANA as well.

The whitelisted APIs provide a wide variety of functionality, which provides greater governance of changes to the SAP S/4HANA application itself.

For SAP S/4HANA Cloud, this is the only method for in-app extensions and side-by-side extensions; it ensures stable lifecycle management and enables regular product upgrades on the public cloud.

The following types of APIs are available for in-app extensions:

- ABAP classes
- BAdIs for implementable code breakouts of business logic changes
- BAPIs and other function modules
- CDS views

Previously, SAP also defined *managed in-app extensibility* using the whitelisted APIs. This was a paid service for the enterprise edition of S/4HANA Cloud and has since been removed from documentation.

12.1.3 Side-by-Side Extensibility

In the side-by-side extensibility approach, customization occurs on an adjacent application layer. This approach is available for on-premise and cloud editions, using the latest development advantages from cloud technologies and tools to create extensions with development and update timelines decoupled from the SAP applications.

Therefore, side-by-side extensions can be built more quickly and released more frequently without impacting SAP S/4HANA, and these extensions provide the business with value-adds for SAP and early value realization.

This approach often uses PaaS provisions, such as SAP Cloud Platform, which is detailed in Section 12.2.

The purpose of the side-by-side extension is to ensure the stability of the core solution while extending the solution. It's the default option for SAP S/4HANA extension development and can provide the following, for example:

- Unique business processes (e.g., industry solution extensions)
- Specific front-office functionality for business-to-business (B2B)
- Specific front-office functionality for business-to-consumer (B2C)
- Specific back-office functionality
- Integrated custom or partner solutions for SAP S/4HANA
- Integrated open-source developments
- Integrated emerging technology services and solutions
- Integration with social networks
- Event streaming and triggering from IoT devices

Product upgrades and feature updates are the main benefits of this side-by-side extensibility approach; separate lifecycle management enables a stable SAP S/4HANA and stability in other SAP applications for LOBs to provide for business transactions and provide separate customization.

For example, SAP applications such as SAP S/4HANA or SAP Ariba can be upgraded separately from adjacent applications (e.g., a customized SAP Fiori-designed SAPUI5 application for a calendar view of deliveries). Therefore, business operations will continue to meet best practices, and the extensions will enable agility in the business to adapt rapidly to new requirements, market changes, and new technologies.

The side-by-side extensions are usually SAP Fiori-designed, SAPUI5-based server-side applications and are primarily run on a PaaS model; the PaaS offerings can be from different cloud providers and use different services. Businesses are increasingly adopting PaaS as a strategy for agile application development, with PaaS providing centralized and usage-based application hosting that's scalable and highly technology flexible. The hybrid cloud model, using best-of-breed services, solutions, applications, and "as a service" applications, has wide-ranging architectural implications for the technology landscape.

Critically, the side-by-side extensions should always be delivered through agile application development. When building within a cloud environment, it's necessary to leverage the best-in-class tools available for automating build, test, and release, as well as open-source frameworks for building the applications; this comes with risks, as we'll discuss in the following subsections. This approach requires agile methodologies to be used in delivery and a DevOps culture to be instilled in the business and developers.

The various scenarios for side-by-side extensions are as follows and are shown in Figure 12.6:

- Scenario S1 is an extension of the frontend server with a custom UI consuming existing OData services.
- Scenario S2 demonstrates the possibility of extending the existing UI via SAP Cloud Platform by calling an existing OData service.
- Scenario S3 has no change in SAP S/4HANA while you build a new data structure, business logic, and OData service with a new UI to develop a complete new solution that extends SAP S/4HANA.
- Scenario S4 shows data replication for analytics on SAP Cloud Platform.
- Scenario S5 is based on a new SAP S/4HANA OData service that is being consumed by a new custom UI on SAP Cloud Platform.
- Scenario S6 shows that SAP S/4HANA is consuming an SAP Cloud Platform service.

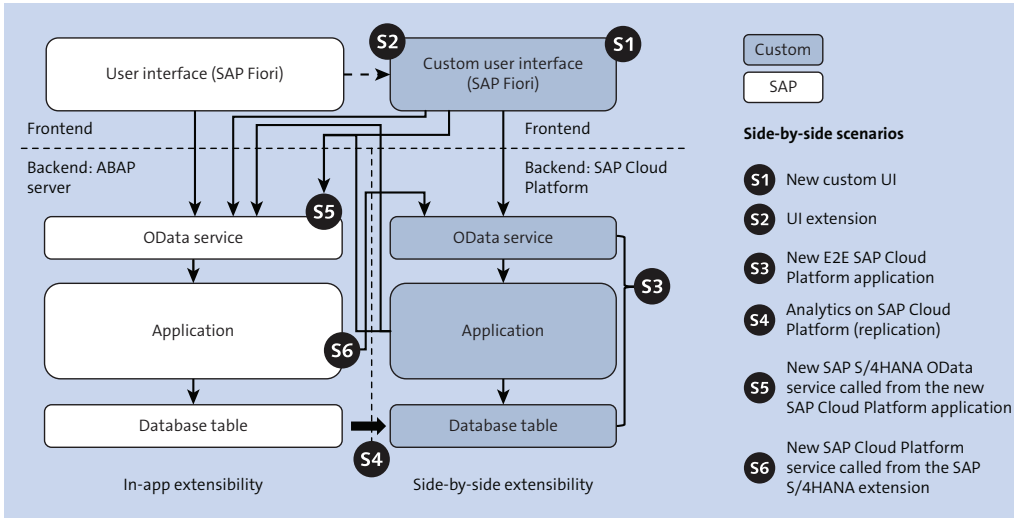


Figure 12.6 Side-by-Side Extension Scenarios

To complete the picture, Table 12.1 provides an overview of the programming models, development tools, and SAP S/4HANA APIs available for the different extensibility options.

Extension Type		On-Premise or Cloud	Programming Model	Development Tools	SAP S/4HANA APIs
Side-by-side extensibility with SAP Cloud Platform		Both	■ SAP Fiori ■ Other web techniques ■ Java ■ JavaScript ■ SAP HANA	■ SAP Web IDE ■ Related IDEs ■ Eclipse ■ SAP HANA Studio	■ Remote APIs: web services (OData) ■ SAP S/4HANA Cloud: only public remote APIs
In-app extensibility	Key user	Both	■ SAP Fiori flexibility ■ Custom fields, logic, reports, and so on ■ SAP HANA new/ extended CDS views	■ SAP Fiori UX adaption mode ■ SAP Fiori key user tools	■ Public local APIs: CDS views, ABAP class APIs, etc. (restricted key user scope)
	Managed	Both	■ SAP Fiori ■ ABAP web techniques (restricted) ■ ABAP (restricted) ■ SAP HANA	■ SAP Web IDE ■ Eclipse ■ ABAP Workbench	■ Public local APIs: CDS views, ABAP class APIs, etc. (restricted scope)
	Classic	On-premise only	■ SAP Fiori ■ Other ABAP UI techniques ■ ABAP ■ SAP HANA	■ SAP Web IDE ■ Eclipse ■ ABAP Workbench	■ Recommended: public local APIs: CDS views, ABAP class APIs, etc. ■ No technical restrictions

Table 12.1 Programming Models, Tools, and APIs for SAP S/4HANA Extensions

The side-by-side extensibility approach is recommended for most cases going forward. This approach provides the following benefits:

- Adjacent application layer hosting extensions creates a decoupled feature update timeline for SAP applications and enables parallel lifecycles of application development; reduced or no reliance on deployment windows and cutovers.
- Uses the latest development advantages from cloud technologies and toolsets, including a move to continuous integration, delivery, or deployment.
- Far wider choice and flexibility when selecting the right programming languages, frameworks, and run times from open-source options that are the best of breed for the intended use case; in addition, enables faster leverage of emerging technologies as new services are released from cloud providers.
- Retains SAP S/4HANA and other SAP applications running near best practices, with significantly reduced regression impact, enabling faster innovation cycles from SAP product updates.
- Cost efficiencies from cloud providers when running extensions using microservices (or, soon, serverless) runtime architecture.

However, when compared to development of in-app extensions, the development of side-by-side extensions requires a lot of initial effort, including cultural changes (which will be challenging for SAP ERP process-embedded developers and IT operations), such as the following:

- Redesign of architecture to encompass microservices (or, soon, serverless) options.
- New interfaces.
- New development processes and best practices to be instilled, including a path to production changes (such as continuous integration, delivery, or deployment). For example, there's a significant adjustment for build management, moving away from cherry-picking transports that move object version updates to environments and toward continuous code delivery environment updates based on updates to GitHub source control that trigger task runners.
- New project deliveries and prioritizations (i.e., agile methodologies) with associated mentality changes (developers work with key/end users).
- New developer and operations teams instilled with new way of working (developers work with operations and automate what they can to reduce burden/workload overall—as with DevOps).

12.2 SAP Cloud Platform

SAP Cloud Platform, the rebranding of SAP HANA Cloud Platform, is a PaaS offering that provides various solutions and services to leverage in application development. As shown in Figure 12.7, SAP Cloud Platform is to be the glue between SAP applications on-premise, application in the SaaS model, and all extensions.

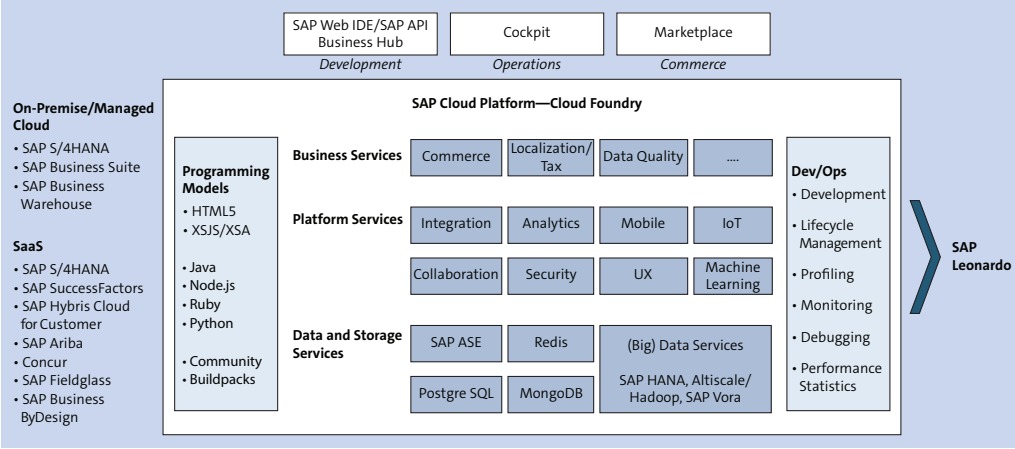


Figure 12.7 SAP Cloud Platform Overview

SAP is positioning SAP Cloud Platform as a unified PaaS by keeping already developed solutions and services in its "Neo" ecosystem but, going forward, using only Cloud Foundry and leveraging established best-of-breed cloud providers such as Amazon Web Services and Microsoft Azure. By leveraging Cloud Foundry, SAP ensures that it can easily bind/use any services and solutions provided by other PaaS offerings with Cloud Foundry, such as IBM Bluemix, Google Cloud Platform, Pivotal Web Services, Swisscom Application Cloud, or other cloud providers, including Oracle Cloud, Force.com App Cloud, and others.

SAP has built SAP Leonardo solutions and services on top of SAP Cloud Platform (a strategy used by all other cloud providers). SAP has seated application development on SAP Cloud Platform for the side-by-side extensions next to the SAP Leonardo Digital Innovation System solutions and services, thereby providing extensions within easy reach of emerging technologies such as services for machine learning, IoT,

blockchain, and mobile—all of which are high on businesses strategic imperatives watchlists.

According to the new official definition, SAP Cloud Platform is now the key strategic PaaS infrastructure that provides the foundation for SAP Leonardo and end-to-end microservices for machine learning, analytics, big data, security, UX, user management, and backend integration services to optimize IT landscapes, drive agility, and accelerate digital transformation. With numerous possibilities and a large scope of innovation, the possible use cases for SAP Cloud Platform center on three main areas (see Figure 12.8):

1. **Building brand-new cloud applications**
   The main idea here is to leverage SAP HANA capabilities for, for example, advanced analytics and IoT and to build enterprise collaboration solutions (e.g., connect SAP JAM or use SAP JAM predefined UI widgets or REST/OData APIs) to add social capabilities into applications and business processes and connect users, information, and processes.
2. **Extending cloud and on-premise solutions**
   Protecting existing investments into on-premise solutions while at the same time taking advantage of new technologies and recent innovations is the key demand of any client. The extension is focused mainly on extending cloud solutions (SAP Hybris Cloud for Customer, SAP S/4HANA Cloud, SAP SuccessFactors, Concur, SAP Fieldglass, SAP Business ByDesign, and other products in the roadmap) and on-premise solutions (SAP and non-SAP, including SAP Business Suite and on-premise SAP S/4HANA). The other key aspects of extension include innovative UX using SAP Fiori apps and mobile-enabled solutions developed on top of SAP Cloud Platform Mobile Services. It also helps you to take advantage of standard SaaS offerings to differentiate your business from the competition by building or enabling unique processes. It's a seamless integration with the same look and feel as in the core application, but it's built as a side-by-side scenario.
3. **Integrating applications and data**
   By taking advantage of integration technologies on SAP Cloud Platform, your business processes and data can be harmonized in a very secure and reliable environment. Also, provisions to commercialize integration content (prepackaged), adapters for integration with cloud- or on-premise SAP applications, and third-party applications provide an edge.

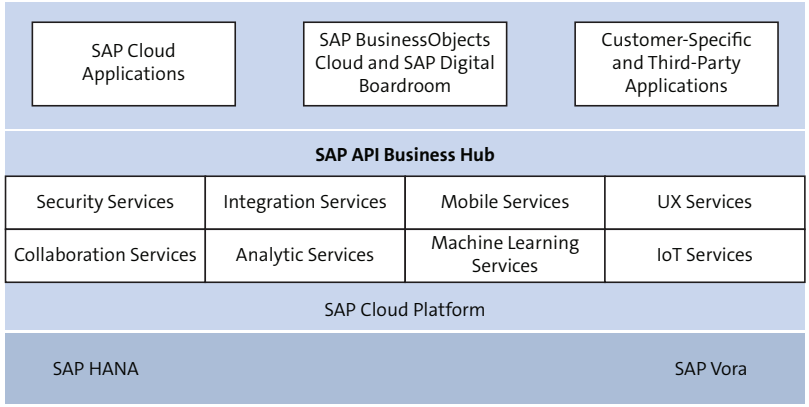


Figure 12.8 SAP Cloud Platform Capabilities

SAP Cloud Platform has evolved over the years into a comprehensive PaaS offering capable of simplifying the development and operation of new cloud applications and building extensions for existing SAP solutions, both on-premise and in the SaaS model. This has now turned into a designated extension, integration, and, most importantly, digital innovation platform for SAP's entire portfolio and forms the technical foundation for a whole set of new applications and products evolving around machine learning and IoT. Also, support for Cloud Foundry and OpenStack as the technologies for deployment and management simplifies deployment of business applications built with or on top of SAP Cloud Platform, including adding flexibility to select the data center of your choice and generating greater business value at a lower development and ownership cost while leveraging a multitude of innovations, such as bring your own language (BYOL). Overall, SAP Cloud Platform in combination with Cloud Foundry services and new SAP Leonardo services offers choice, flexibility, and enterprise-grade innovation.

In addition to providing a wide variety of services, SAP Cloud Platform with the Cloud Foundry environment enables developers to develop extensions or new solutions with different programming languages, runtimes, and frameworks, including the following:

- Java
- XSJS
- Ruby

- Node.js (with the Node.js package)
- HTML5
- SAPUI5 (now with more ready-to-use templates)
- Python (with library support for data manipulation, machine learning, and analysis)
- BYOL (bring your own language and runtime of choice)

With enhanced IDEs and new toolkits, you now have more power and can use less effort to build new applications or extend your existing applications. Some of your options are as follows:

- **SAP Web IDE**
  The newly improved SAP Web IDE now includes support for HTML5, SAPUI5 (with drag-and-drop controls on canvas), JavaScript, Node.js, Java (deploy only), and SAP HANA design artifacts (SQLScript and CDS, along with the calculation view modeler), with a rich, integrated Git client, including a history of committed changes, cherry picking, comparing commits, and so on.
- **SAP HANA Web-Based Development Workbench**
  SAP HANA Web-Based Development Workbench is a browser-based IDE for creating, editing, and debugging SAP HANA objects that can be used in place of SAP HANA Studio.
- **SAP IoT Application Enablement Toolkit plug-in**
  The SAP IoT Application Enablement Toolkit inside SAP Cloud Platform Web IDE supports rapid development of IoT applications through a wizard-based approach; no coding is necessary for this.
- **Hybrid Application Toolkit plug-in**
  The Hybrid Application Toolkit inside SAP Cloud Platform Web IDE supports quick development of Apache Cordova hybrid apps, with the support of templates, including live preview on a device emulator or a mobile device.
- **SAP Build**
  SAP Build is an open-source design tool that allows you to collaborate and develop prototypes based on design-thinking principles and understand the designing process. The tool also includes provisions to capture user feedback, and you can jumpstart designing by choosing one of the prototype examples from the gallery.

12.3 Internet of Things and Cognitive Analytics

IoT services are designed to facilitate and support the implementation of IoT applications. These services provide interfaces for registering devices and their specific data types, sending data to and storing data in a database running on SAP Cloud Platform, and providing easy access to the data stored. They support replication to and synchronization with remote databases into a consolidated SAP HANA database in the cloud. For example, you can consolidate sensor data from a remote database and build an analytical application on top for analytics and monitoring. In the context of IoT, SAP Cloud Platform provides capabilities to process high-volume data from any kind of machine, device, or sensor and then combine this information with the transactional data from the system of record or with additional information from social media, for example. The following are key features of IoT services:

- **Text analysis**
  Extract and process unstructured text data from various files with support for up to 31 languages. This allows you to identify a sentiment on seven different levels (e.g., strong positive, minor problem, etc.) in a tweet and analyze social media data. This is done by using language-based, full-text search text indexing and fuzzy search.
- **Geospatial processing**
  Store, process, manipulate, share, and retrieve spatial data by using SAP HANA.
- **Operational intelligence**
  Manage operational risk with end-to-end process visibility and better analytics supported by decision support and real-time insights.
- **Series data processing**
  Measure data and forecast trends (e.g., utilities and smart metering) with native series data storage and high-volume processing.
- **Graph engine modeling**
  Discover, manage, and analyze complex relationships for proximity- and location-based analytics.
- **Multitenant architecture**
  Logically isolate databases while sharing underlying system resources to optimize efficiency.

To extend IoT to manage and process IoT data, a set of services is available via SAP Cloud Platform to provide full control over your IoT lifecycle:

- **Remote device management**
  Manage devices from onboarding to decommissioning. Receive device information, configure devices remotely, and send commands to devices.
- **Message management services**
  Support various transport protocols and messaging formats to send, receive, and store IoT data in the persistence layer of SAP Cloud Platform.
- **Application enablement**
  Apply functionalities for remote device management and message management in your applications through APIs.

SAP Cloud Platform also can be leveraged to build cognitive solutions in multiple ways. All types of data can be leveraged using the SAP Cloud Platform IoT service to connect devices and sense the world or by performing text analysis using the built-in SAP HANA text analytics functionality. Of course, all other methods of analyzing business data using SAP HANA are also available. Although no computer vision service is yet available, SAP Cloud Platform makes it easy to tap into the API economy and leverage its connectivity service to integrate with, for example, IBM's Watson Developer Cloud to identify objects within an image.

Forming hypotheses isn't supported out of the box in SAP Cloud Platform. However, SAP HANA offers the powerful Predictive Analytics Library, which the developer can use to build models for testing hypotheses and training the cognitive solution. These models can be layered; for example, an SAP Cloud Platform solution might evaluate a hypothesis in a health care scenario, such as "Patient condition is worsening," based on an IoT stream of medical devices that signal an increase in temperature combined with textual analysis of the diagnosis. The solution then correlates that information with its medical knowledge to determine that temperature is a critical factor in the condition diagnosed.

Because SAP Cloud Platform is an ideal single place to gather data, it's easy to have solutions continually learn from new data fed into retraining the hypothesis model. SAP Cloud Platform makes it easy to develop SAP Fiori apps that allow users to give feedback on the recommendations and support they received from their cognitive solutions. The cognitive solution on SAP Cloud Platform can then periodically retrain itself.

The wide range of IoT services on SAP Cloud Platform lets you securely onboard devices over an extensive variety of protocols with full flexibility to process IoT data and derive relevant data either at the edge of the network or on SAP Cloud Platform.

Additional services on SAP Cloud Platform enable you to feed the relevant data into IoT applications, including real-time IoT analytics. SAP Leonardo on SAP Cloud Platform is the latest "digital transformation system" from SAP to enable IoT.

12.4 SAP Leonardo and Machine Learning

SAP recently acquired the Plat.One IoT platform and launched SAP Leonardo, which embraces different technology components such as design thinking, machine learning, big data, IoT, data intelligence, Blockchain, and analytics to make machines smarter and drive the end-to-end digital transformation across enterprises. SAP Cloud Platform as the strategic PaaS infrastructure provides the underlying framework for the SAP Leonardo foundation.

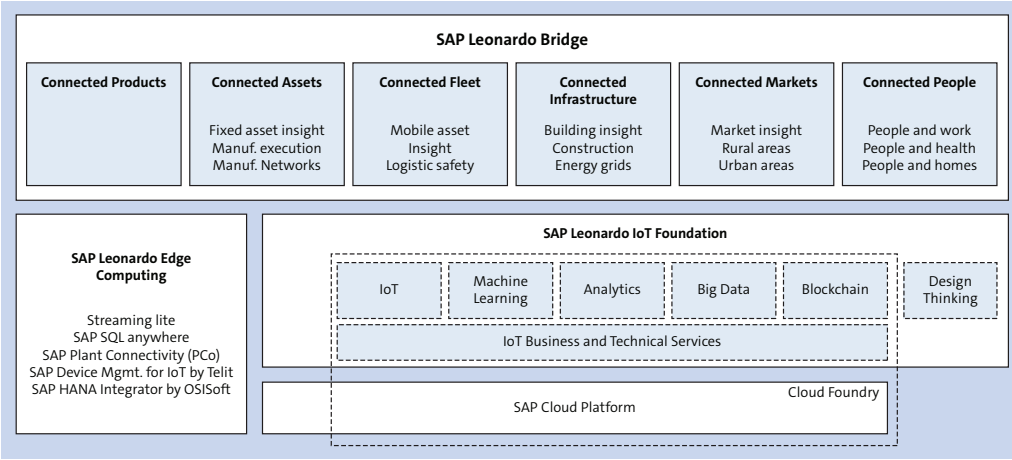


Figure 12.9 SAP Leonardo Innovation Portfolio

SAP Leonardo, as the innovation portfolio for IoT, is most relevant in the context of developing a side-by-side SAP S/4HANA IoT extension using SAP Cloud Platform and is well-structured to enable the Internet of Everything. SAP Leonardo includes the following components:

- **SAP Leonardo IoT Bridge**
  SAP Leonardo IoT Bridge blends real-time data from connected things with business processes and turns them into a live supply chain environment. Basically, it offers a range of enterprise-ready end-to-end packaged solutions.

- **SAP Leonardo IoT Edge**
  SAP Leonardo IoT Edge acts as an IoT gateway to collect data irrespective of connectivity, latency, or device protocol concerns.
- **SAP Leonardo IoT Foundation**
  SAP Leonardo IoT Foundation is at the center of the SAP Leonardo IoT portfolio. It's a combination of business services to build IoT solutions rapidly by creating digital twins, reusable application services, and applying predictive algorithms; and core technical services to perform stream analytics and run predictive scenarios. These new services run on the Cloud Foundry stack on SAP Cloud Platform.

  SAP Leonardo IoT Foundation technical services available on SAP Cloud Platform provide developers with efficient capabilities for a wide range of protocol support, including conversion, device management, scalable messaging, streaming analytics, big data connectors, integration services, user management, security, and IoT application enablement services.

Machine learning has been around for many years. With recent advances in cloud computing, there has been significant movement in the past decade, starting with IBM Watson and the explosion of machine-learning services since the start of 2016.

SAP Leonardo Machine Learning Foundation basically provides two different categories of machine-learning services including business and functional services that cover a wide range of capabilities to understand the content and meaning of a variety of data types, such as image, video, audio and speech, tabular and time-series, natural language data, and so on. The underlying technology of these machine learning APIs is based on Google's TensorFlow machine intelligence framework.

The new SAP Leonardo machine-learning services can add new dimensions and unseen analytics to any side-by-side extensibility of SAP S/4HANA on SAP Cloud Platform.

The SAP Leonardo machine-learning business services are meant for comprehensive tasks—for example, smartly classifying and processing an incoming ticket for a support center, routing it to the most appropriate agent, and suggesting possible solutions, thus reducing repetitive manual tasks and shortening the time to resolution. Available services include the following:

- The SAP Intelligent Financing API can be used to analyze the financial health score of a user based on historical activities.
- SAP Service Ticket Intelligence—Classification can be used to classify the type of ticket, especially at customer support centers.

- SAP Service Ticket Intelligence—Recommendation can be used to recommend possible solutions for customer support tickets, especially at customer support centers.

The SAP Leonardo machine learning functional services run on pretrained models and are more useful for image classification, topic detection, product image classification, time-series changepoint detection, language detection, similarity scoring, and so on. In side-by-side extensibility of SAP S/4HANA on SAP Cloud Platform, using these kinds of functional services can help businesses make decisions more intuitively, and these services run on a self-learning model. Available services include the following:

- Document Feature Extraction API, to extract feature vectors from a document and use them for comparison or clustering.
- Image Classification API, to return classifications for a given image, including probability for correct classification.
- Image Feature Extraction API, to extract feature vectors for a given image for comparison.
- Language Detection API, to detect language for a given text.
- Product Image Classification API, to classify a given image based on preset categories.
- Product Text Classification API, to classify products into specific categories based on product descriptions.
- Similarity Scoring API, to compare vectors extracted through Image Feature Extraction or Document Feature Extraction to find similarity between images or documents.
- Time-Series Changepoint Detection API, to return the probability of a changepoint for each data point in time-series data.
- Time Series Forecast API, to predict the next data points for the given time-series data.
- Topic Detection API, to extracts and return the score for the most relevant topic in a document.
- Translation API, to translate a given string from one language to another.

These machine-learning services are available as RESTful APIs and exposed through SAP API Business Hub (see Figure 12.10). Therefore, while developing an extension or new application on SAP Cloud Platform, you can add machine-learning dimensions to your solution via these RESTful APIs.

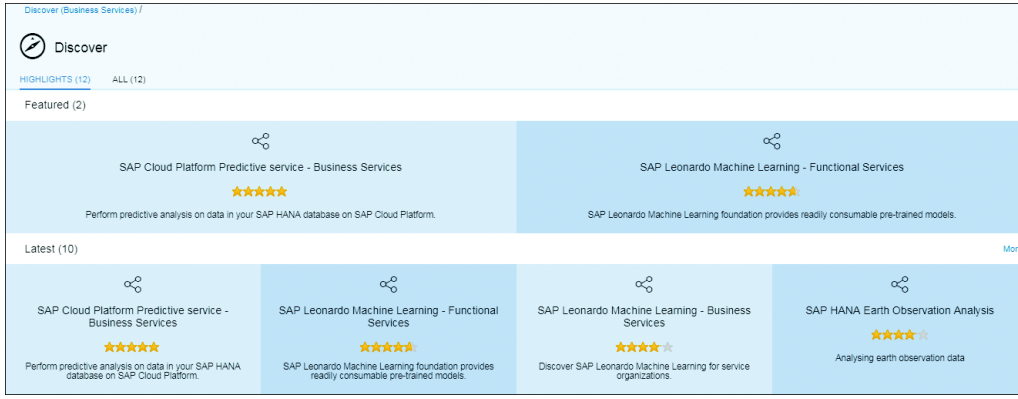


Figure 12.10 SAP Cloud Platform API Business Hub

Click the tile **SAP Leonardo Machine Learning—Functional Services** tile (Figure 12.11) and switch to the **Artifacts** tab. Here, you'll see a list of all the functional SAP Leonardo machine-learning APIs.

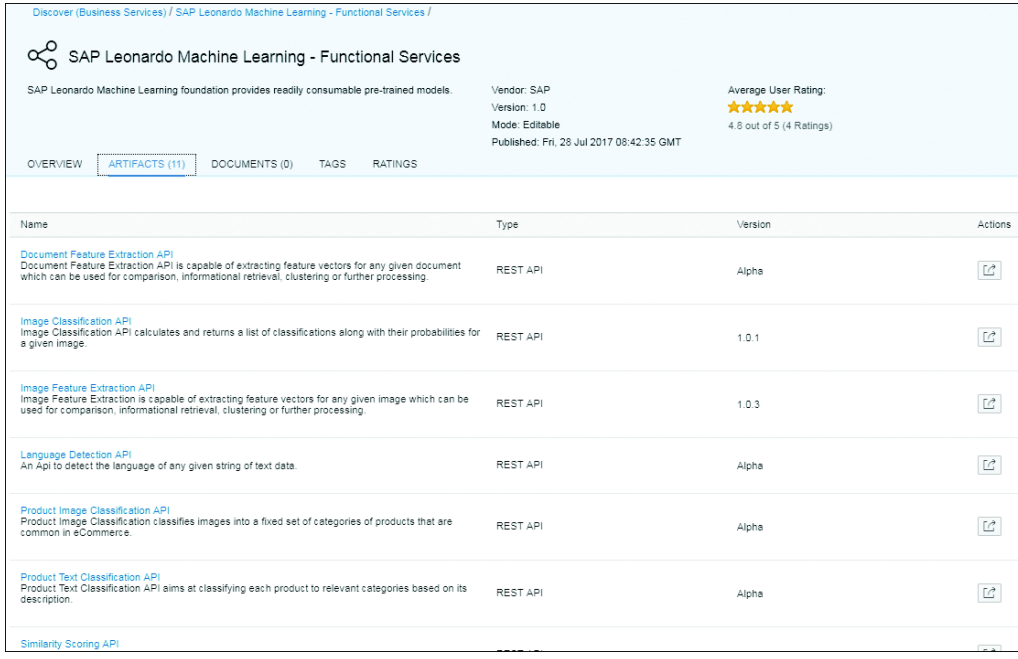


Figure 12.11 SAP Leonardo Machine Learning—Functional Services

Note

For more details on how to use machine-learning services, see *http://bit.ly/2fyfyNu*.

A possible side-by-side SAP S/4HANA IoT extension on SAP Cloud Platform can include IoT and machine learning along with other extension components by using SAP Leonardo IoT Foundation; the possible architecture of such an extension will look like that shown in Figure 12.12.

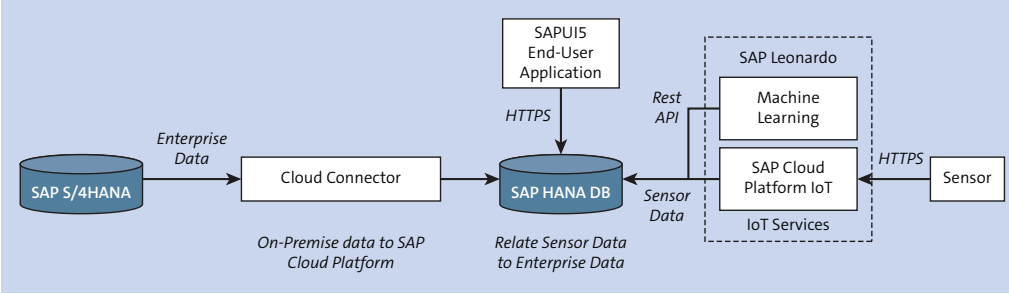


Figure 12.12 SAP S/4HANA IoT Extension Architecture

This kind of extension will help you onboard and manage your sensors and the data coming from them. You will be able to access the SAP Cloud Platform Cockpit to perform the following activities:

- Replicate on-premise data to SAP Cloud Platform using SAP Cloud Connector through destination configuration.
- Set up IoT message types and device types and register sensor devices.
- Bind IoT services to SAP HANA.
- Create HTTP destinations for IoT services and SAP HANA data services.
- Set up HTTP destinations to access machine-learning services.
- Consume on-premise data from SAP HANA databases on SAP Cloud Platform.
- Apply appropriate SAP Leonardo machine-learning REST-based services from SAP Cloud Platform API Business Hub to add intelligence on top of regular business logic.
- Develop UI extensions with SAPUI5 using SAP Web IDE to display the necessary business data.
- Integrate your extension into SAP Fiori launchpad.

12.5 Summary

In this chapter, we discussed the extension possibilities for future SAP solutions and covered how SAP S/4HANA can be extended via in-app and side-by-side extensions. We also took a detailed look at the strategy and purpose of both extension possibilities. We outlined possible side-by-side scenarios to illustrate the different options available via SAP Cloud Platform, including SAP Leonardo on SAP Cloud Platform, which is the latest digital transformation system from SAP and which supports IoT and machine learning. Finally, we took a quick look at SAP Leonardo.

Chapter 13
Adopting SAP S/4HANA

With the release of SAP S/4HANA, SAP has introduced a lot of confusion into the marketplace, leaving SAP customers wondering what path to adopt and why. Although the move to SAP S/4HANA is now more a question of when than if, the level of complexity around how to get there remains.

With the release of SAP S/4HANA, SAP has provided a digital core for its customers to leverage the latest technologies, ranging from big data and analytics to integration with cloud applications. SAP aims to improve user experience (UX) by increasing the use of mobile applications with simplified user interfaces (UIs) based on SAP Fiori. This transformation, with SAP S/4HANA as the digital core, integrates with the latest technologies, such as the Internet of Things (IoT), to fundamentally change the way we do business today.

In this chapter, we'll help you map your deployment path, including technical steps and associated restrictions. We'll help you determine whether a new implementation or a system conversion is the right option for you and provide additional information about the steps you may be able to take today to get ready for SAP S/4HANA.

This chapter outlines the technical steps for adopting SAP S/4HANA. Due to the impact of digital transformation on the global IT market, every organization that uses SAP should be considering an SAP S/4HANA implementation strategy. Moving to SAP S/4HANA is the foundation of digital transformation, but this transformation can be confusing and disruptive. With different transformation paths to SAP S/4HANA (see Figure 13.1), defining your own SAP S/4HANA transformation strategy is critical for success.

Which of the three transformation options you choose—system conversion, landscape transformation, or new implementation—will depend on your objectives. Answers to the following questions will influence your decision:

- What is your starting point? Is this an SAP or non-SAP system?
- What pain points are you trying to address with SAP S/4HANA?
- What time to value do you need? How quickly do you need to benefit from the SAP S/4HANA solution?

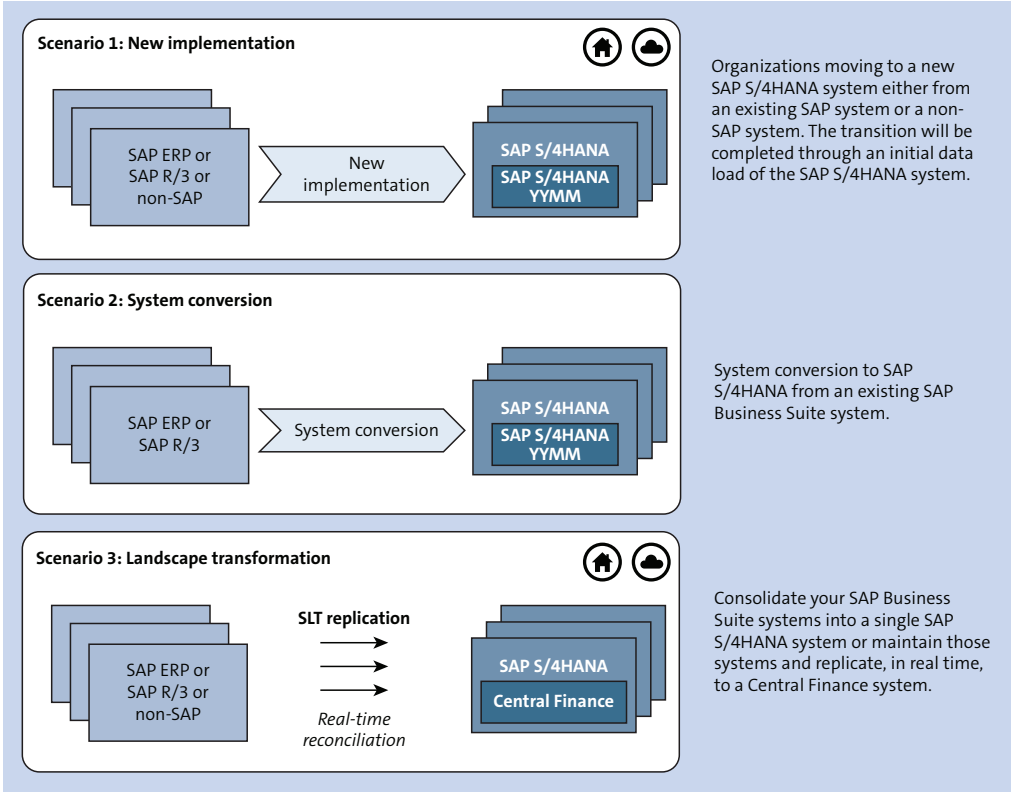


Figure 13.1 SAP S/4HANA Transformation from Current State

Throughout this chapter, we'll focus on the first two transformation options: a new implementation and a system conversion. We'll address the key technical and functional considerations to be considered before moving to SAP S/4HANA. You'll need to decide whether to convert your current SAP landscape to SAP S/4HANA or perform a new implementation that will consist of migrating your data from your legacy system to a new SAP S/4HANA system. Moving to SAP S/4HANA provides an opportunity to redefine and improve your current business processes. The new implementation

adoption scenario may provide more flexibility to perform business process standardization.

After considering the adoption scenarios for new implementations and system conversions, we will discuss some prerequisites and considerations to think about prior to converting your SAP system to SAP S/4HANA. We will include an overview of the tools and techniques available to make your SAP S/4HANA transformation project a success.

13.1 New Implementation Options and Approach

A new implementation is one of the three options provided by SAP to move to SAP S/4HANA. This scenario is valid for both existing SAP customers and new SAP customers. This scenario requires the implementation of a new SAP S/4HANA system with an initial data load.

As you learned in Chapter 10, there are two deployment options for new implementations: SAP S/4HANA or SAP S/4HANA Cloud. In this section, we'll look only at on-premise SAP S/4HANA for new implementations. We'll start with a brief look at the Business Scenario Recommendations (BSR) report, SAP S/4HANA Value Advisor, and SAP S/4HANA Transformation Navigator before providing some tips for getting started, performing sizing, and implementation.

13.1.1 Business Scenario Recommendations

The implementation of a new SAP S/4HANA system is an opportunity to reassess your business processes and identify where the simplifications provided by SAP S/4HANA can support your business objectives.

To understand the business benefits that are available when moving from an existing SAP system, you can leverage SAP's BSR report. This detailed report output provides a set of recommendations for new simplified business scenarios as part of SAP S/4HANA, including benefits associated with the SAP Fiori UX. It also provides recommendations for how to benefit from the SAP HANA in-memory platform to speed up your business transactions (see Figure 13.2).

This report runs using production usage statistics that allow SAP to provide output tailored to your specific business and organization requirements.

If you're interested in running the BSR report, additional information is available at *https://www.s4hana.com*.

Executive Summary – Top Recommendations

SAP S/4HANA simplifies and accelerates key business scenarios with in-memory technology. The table below shows the business scenarios in your system that could be simplified or improved and impact your business value.

LINES OF BUSINESS	BUSINESS SCENARIO		RELEVANCE FOR YOU	IMPROVED / RELEVANT TRANSACTIONS
Supply Chain	Basic Warehouse Management	Simplified	100%	114
Finance	Cost Management	Simplified	95%	87
Finance	General Ledger	Simplified	91%	59
Finance	Accounts Receivable	Simplified	86%	43
Finance	Profitability and Cost Analysis	Simplified	81%	38
Finance	Asset Accounting	Simplified	76%	35
Sourcing & Procurement	Purchase Order Processing	Simplified	72%	31
Services	Technical Assets, Structures, History		67%	25
Finance	Accounts Payable	Simplified	62%	27
Services	Service Execution and Delivery		62%	23
Sourcing & Procurement	Procurement Analytics	Simplified	58%	18

Figure 13.2 Sample Output from SAP Business Scenario Recommendations Report

13.1.2 SAP S/4HANA Value Advisor

Defining the value associated with SAP S/4HANA can be challenging, but there are several tools to help you identify which areas to focus on. First, SAP has released the SAP S/4HANA Value Advisor (see Figure 13.3), which allows you to discover the value associated with your digital journey based on a series of 35 value drivers.

Leveraging this interactive, online tool, you can select one or more industry solutions that you currently use or that you plan to use. In addition to the industry solutions, you will need to select your line of business (LOB) and answer questions related to focus areas and priorities to generate your SAP S/4HANA Value Advisor report.

The SAP S/4HANA Value Advisor report will provide a high-level overview of some of the business benefits associated with SAP S/4HANA and identify client success stories that highlight the benefits other customers have achieved by moving to SAP S/4HANA.

If you're interested in running the SAP S/4HANA Value Advisor report, additional information is available at http://*s4value.com*.

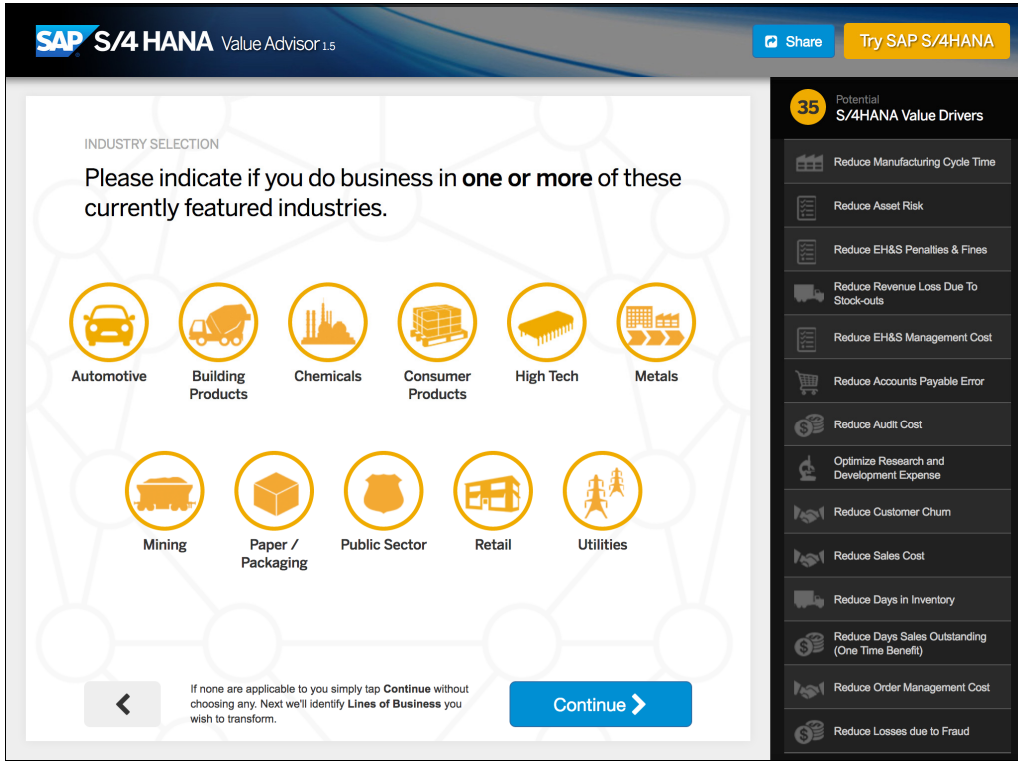


Figure 13.3 SAP S/4HANA Value Advisor

13.1.3 SAP S/4HANA Transformation Navigator

Navigating through the SAP S/4HANA world can be challenging, and the large number of SAP products available can make choosing the right ones seem overwhelming. Therefore, SAP has released a self-service tool (see Figure 13.4) called SAP S/4HANA Transformation Navigator to help define the strategic business and IT roadmap for SAP products. SAP has reviewed 2,100 of its products to provide clear guidance on the strategic path and the way forward, how its wider portfolio integrates with SAP S/4HANA, the impact on SAP licenses, and the business value of these applications.

If you're interested in running the SAP S/4HANA Transformation Navigator, additional information is available at http://*news.sap.com/navigating-to-your-digital-transformation*.

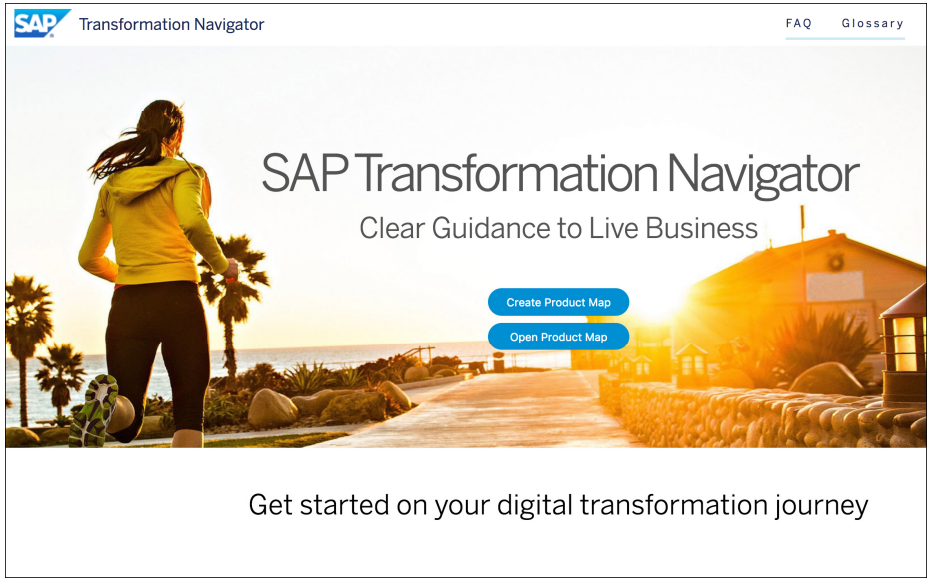


Figure 13.4 SAP S/4HANA Transformation Navigator

13.1.4 Getting Started

As with other SAP applications, SAP has made installation guides available for SAP S/4HANA that provide a list of the necessary tools and documentation for your new installation. These guides also provide the follow-up activities required after the installation and, of course, a system landscape and product overview for the version of SAP S/4HANA you're planning to install. Access these guides at *http://help.sap.com/s4hana* to help support the installation process.

13.1.5 Sizing Requirements

Getting the sizing right for SAP HANA can be challenging. For those of you unfamiliar with the term, *sizing* refers to establishing the right hardware requirements for an SAP system, such as physical memory, I/O capacity, and CPU power. Getting this right is important to ensure that you can meet your business needs while trying to keep a low total cost of ownership (TCO). SAP provides the Quick Sizer tool to size SAP HANA

correctly and ensure that business requirements can be met after project go-live. Although the questions asked during the Quick Sizer assessment may seem time-consuming and sometimes excessive, it's important to complete the steps accurately to avoid future sizing issues arising during production start. SAP also provides some sample configurations that can help define your SAP HANA sizing.

13.1.6 SAP S/4HANA Implementation Guidelines

Like other IT implementation projects, SAP S/4HANA implementation can be split into three main project phases:

1. **Plan**
   Plan the scope of the migration effort and identify key business scenarios.
2. **Install**
   Install the SAP HANA database and SAP S/4HANA application.
3. **Import**
   Import and migrate data from legacy environments.

The BSR report, SAP S/4HANA Value Advisor, and SAP S/4HANA Transformation Navigator can help identify the business scenarios and associated business case for SAP S/4HANA relevant to your organization; however, you should make a detailed assessment of your current business processes, existing pain points, and possible areas of improvement through a series of workshops.

The output of these workshops will start to feed the target architecture required to support the SAP S/4HANA implementation. In addition, you'll start to understand the scope of data migration work that will be required to move the master and transactional data from your legacy systems to the new SAP S/4HANA environment.

Each organization will have a set of business requirements that need to be met following these workshops. Figure 13.5 provides an overview of how the SAP S/4HANA architecture should be set up to support these requirements. This will be true regardless of whether your goal is to improve the UX via SAP Fiori apps, to provide more flexibility for the workforce by leveraging SAP Mobile Platform, or even to enhance reporting requirements when Core Data Services (CDS) views can be leveraged.

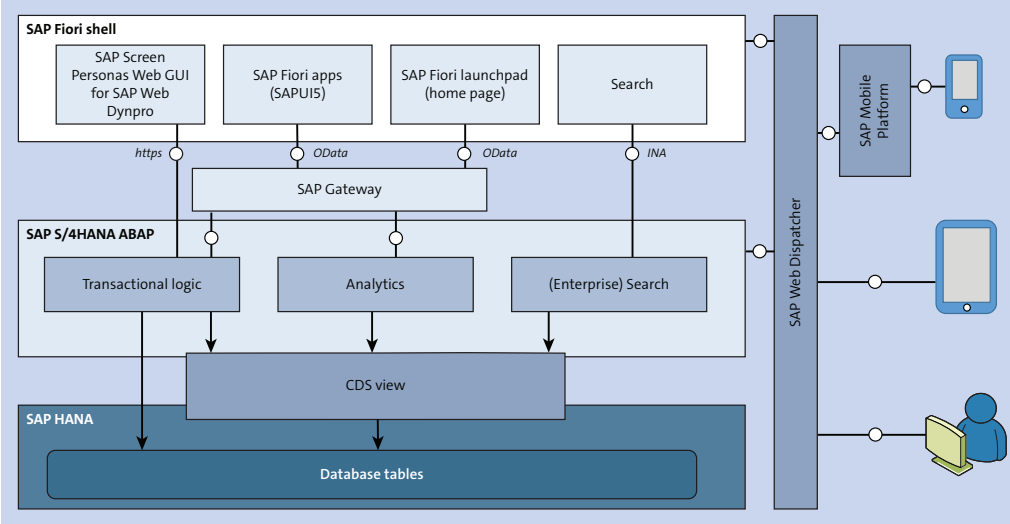


Figure 13.5 High-Level Stack Architecture of SAP S/4HANA

In addition to getting the architecture right, a key part of the new implementation will be defining the right data migration strategy to ensure that the data moved from the legacy system to the new SAP S/4HANA system is in good condition—that is, cleansed, relevant, and timely.

To accelerate the data migration process, SAP provides the SAP S/4HANA Migration Cockpit to support requirements for data migration to SAP S/4HANA.

The SAP S/4HANA Migration Cockpit comes with ready-made data migration templates that can be used to kick-start the data migration process. Additional cleansing functionality is also available to support business user review during the migration process. Loads can be simulated and account for system field settings and configuration, allowing the data migration team to quickly identify issues without impacting the SAP system and having to reverse data out after it has been posted. For more information, see Section 13.6.

The SAP S/4HANA new implementation scenario is a good way to start over, especially if you want to benefit from SAP S/4HANA functionalities while heavily reengineering your business processes. Alternatively, you may want to remove your old custom code that you've been keeping around for years and no longer use, or you

may want to take the opportunity to realign your data governance and quality to leverage SAP S/4HANA as the core for your digital transformation journey.

However, if you've been heavily investing in your SAP ERP environment for many years or have recently implemented an SAP ERP environment that is customized for your business, a new implementation may not be the right option. The SAP S/4HANA conversion scenario will be more suitable for your requirements, as you'll see in the following section.

13.2 System Conversion Options and Approach

This section addresses the conversion options and approach to SAP S/4HANA for organizations that are already using SAP and want to move from their classic SAP Business Suite system to SAP S/4HANA. The system conversion scenario is only applicable for SAP customers already using a previous SAP ERP version that want to move to on-premise SAP S/4HANA. It's not possible to perform a system conversion to SAP S/4HANA Cloud.

Note

The section assumes that a migration scenario is the logical progression for you. If you're considering a new implementation, refer to Section 13.1.

We'll cover the adoption roadmap based on your current starting point by taking into account the SAP system upgrade and conversion scenarios; what to expect from code HANAtization, including SAP HANA code optimization; and how to perform the migration of data from the old data structures to the new simplified structures.

SAP provides a clear roadmap and sequence to move to SAP S/4HANA while adopting the system conversion transformation scenario (see Figure 13.6). Preparation is key when converting to SAP S/4HANA, and a set of tools and accelerators are available to download via SAP Notes to assess the impact of the move to SAP S/4HANA and determine whether this transformation scenario is an option for you. The tools and related SAP Notes are provided in Section 13.2.3. Given that some functionalities within SAP S/4HANA aren't currently supported, or are supported with restrictions, a system conversion may not always be possible.

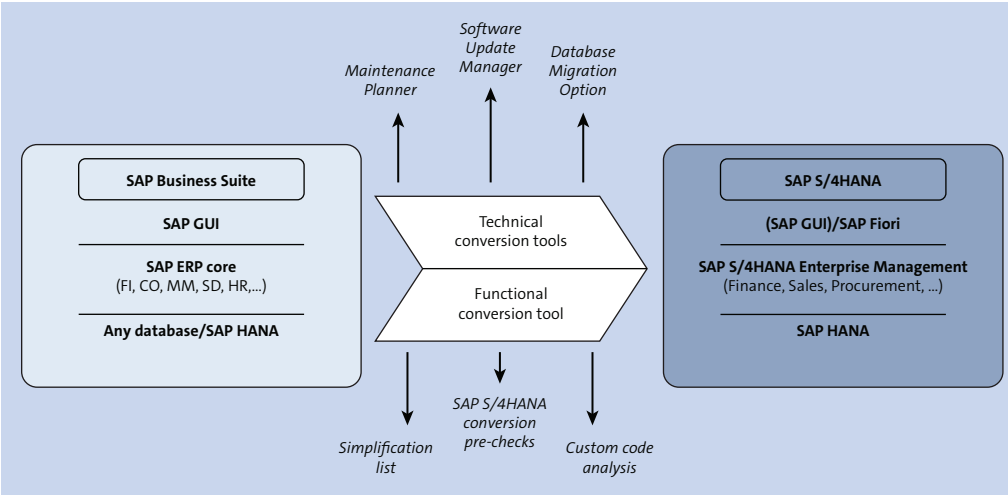


Figure 13.6 On-Premise SAP S/4HANA: System Conversion Sequence

13.2.1 Scenarios

Depending on your current SAP landscape, there are various steps to your SAP S/4HANA adoption. You may convert in one step from the following:

- SAP ERP 6.0, any EHP on a non-SAP HANA database
- SAP Business Suite powered by SAP HANA

We'll look at each of the adoption scenarios mentioned and evaluate the most suitable option based on your current starting point in the following subsections.

13.2.2 Adoption Paths

Depending on your current landscape, several paths can help you reach an end state for SAP S/4HANA. However, it can be challenging to understand which conversion path is the correct one for your organization. Assuming a conversion scenario is the logical progression for customers running on SAP ERP 6.0 on any non-SAP HANA database, the objective is to move to either SAP Business Suite on SAP HANA or SAP S/4HANA.

For SAP customers that decide to move to SAP Business Suite on SAP HANA as an interim step, enabling the SAP S/4HANA innovations, such as SAP S/4HANA Finance or SAP S/4HANA's logistics functionality (e.g., manufacturing, supply chain, sales and marketing, and sourcing and procurement, discussed in Chapters 3 to 7) is the next

step. Depending on the existing SAP ERP version in your SAP landscape, there are different approaches to perform the conversion from an SAP ERP 6.0 system running on a non–SAP HANA database to the SAP S/4HANA end state.

With the release of SAP S/4HANA 1605, SAP has created two SAP S/4HANA adoption paths (see Figure 13.7) for SAP customers. SAP S/4HANA Finance 1605 contains the finance-only simplifications, whereas SAP S/4HANA 1610 and 1709 contain the full SAP S/4HANA Enterprise Management solution. Please note that SAP S/4HANA 1605 is not part of the target SAP S/4HANA architecture and is only supported until 2025, given that most of the functionality is built on SAP ERP. SAP customers should look at moving to the latest SAP S/4HANA version (e.g., SAP S/4HANA 1709) and only look at alternative options if specific restrictions are in place for the target SAP S/4HANA version they are trying to move to.

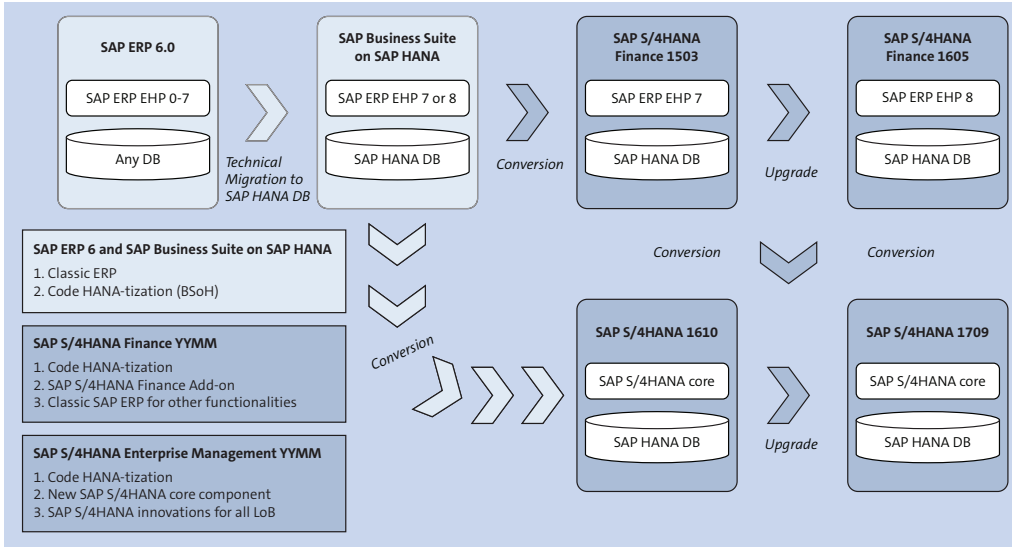


Figure 13.7 System Conversion Scenarios for SAP S/4HANA

Based on the business case, your organization will need to assess whether SAP S/4HANA Finance or SAP S/4HANA Enterprise Management is the right option. SAP S/4HANA Finance could be used as a stepping stone to benefit from some of the SAP S/4HANA functionality while reducing the change impact associated with the overall move to SAP S/4HANA Enterprise Management. Although this may seem like an attractive approach, SAP customers looking to benefit from SAP S/4HANA's logistics functionality and other SAP S/4HANA simplifications soon will still have to

undertake a second system conversion to benefit from these features, which should not be under-estimated.

With all these different scenarios, it's hard to define which option may be best for you. The decision will need to be backed by a business case, but if you are currently running SAP ERP 6.0, it's technically possible to migrate in one step to SAP S/4HANA, assuming the downtime window is acceptable for your organization.

The following subsections describe the two most common system conversion options available based on the SAP ERP release you're currently running on: the two-step approach and the one-step approach.

Two-Step Approach: Source Release Lower than SAP ERP 6.0 on Any Database

If you're currently running your SAP ERP environment on a version lower than SAP ERP 6.0 and you want to pursue the system conversion route, you'll need to upgrade your existing SAP system to a release that will allow you to perform the system conversion in one step using the Database Migration Option (DMO) of Software Update Manager (SUM). If your SAP system isn't yet Unicode-compatible, you can perform the Unicode conversion as part of the first upgrade phase, which is a mandatory requirement to migrate to SAP S/4HANA.

You can perform the Unicode conversion at a later stage, however, if your target SAP S/4HANA version will be running on AS ABAP 7.5; the DMO won't be able to handle the Unicode conversion at the same time. Therefore, you should complete the Unicode conversion as early as possible.

The recommended target version for the first step in a two-step approach is to move to SAP ERP 6.0, EHP 7 or above and perform the Unicode conversion at the same time. If you have a non-Unicode system, it isn't possible to move directly to SAP ERP 6.0, EHP 8, given that EHP 8 runs on SAP NetWeaver 7.5 and the system requires a Unicode source system, as mentioned previously.

One-Step Approach: Source Release SAP ERP 6.0 or Higher on Any Database

If your SAP system currently runs on SAP ERP 6.0, performing the conversion to SAP S/4HANA and the technical database migration to SAP HANA can be combined, again assuming the downtime window is acceptable for the business.

If the downtime window isn't achievable, you should consider downtime optimization. Various options are detailed in Section 13.7. The alternative is to separate these

two activities. As a first step, you can perform the upgrade and SAP HANA database migration by taking your current SAP ERP system to SAP Business Suite on SAP HANA.

The second activity consists of converting your system from SAP Business Suite on SAP HANA to SAP S/4HANA. This activity transfers your data from the old data structures to the new simplified data structures, allowing your organization to benefit from the new simplified processes available within SAP S/4HANA.

13.2.3 Tools for System Conversion

The conversion to SAP S/4HANA is split into two main parts (see Figure 13.8):

- The technical conversion, which consists of installing the new SAP software and/or migrating to the SAP HANA database
- The functional conversion, which requires a clear understanding of the simplification list, performing the conversion prechecks, and assessing the impact that SAP S/4HANA may have on your custom code and enhancements

In this section, we'll look at how these tools can support the conversion and what outputs they provide.

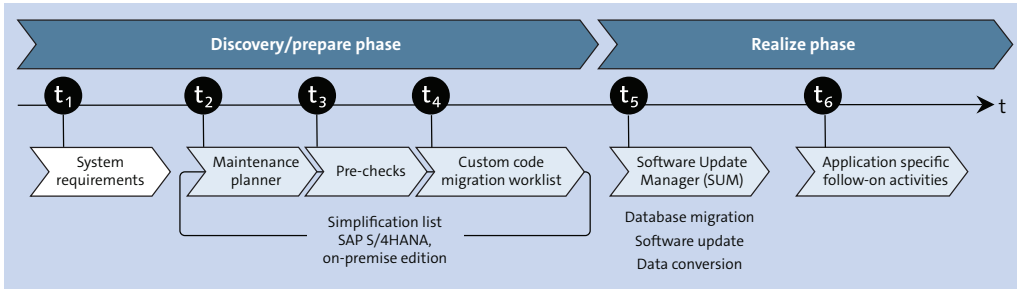


Figure 13.8 System Conversion Tasks for SAP S/4HANA

Technical Conversion Tools

SAP has been supporting its system upgrades and migrations for many years. This has given SAP the opportunity to build a well-established set of tools to support these types of transformation projects. Although SAP S/4HANA introduces additional complexity associated with the simplifications introduced with the new code line, the technical migration remains fairly straightforward and relies on tools that many of you have used in the past.

SAP Readiness Check

To support the adoption of SAP S/4HANA, SAP has released the SAP Readiness Check to help customers understand the readiness of their current SAP ERP system for the move to SAP S/4HANA. This also provides a centralized view of most of the checks that are required prior to moving to SAP S/4HANA.

The SAP Readiness Check helps customers answer the following questions:

- Are my add-ons compatible with SAP S/4HANA?
- Which transactions are affected by SAP S/4HANA?
- Are my business functions compatible with or supported by SAP S/4HANA?
- Will my custom code work after I move to SAP S/4HANA?
- Which SAP Fiori applications are relevant for me?

You can find out more about the SAP Readiness Check for SAP S/4HANA via the following link: *https://help.sap.com/viewer/product/SAP_READINESS_CHECK/100/en-US*.

Note

The SAP S/4HANA Readiness Check can be implemented using SAP Note 2290622 (Setting up the SAP Readiness Check for SAP S/4HANA).

Maintenance Planner

Most SAP technical architects or SAP Basis consultants are familiar with SAP's Maintenance Optimizer; however, this tool is no longer used directly for system conversions to SAP S/4HANA. Running the maintenance planner is now the prerequisite for executing the system conversion to SAP S/4HANA.

The maintenance planner is the successor to Maintenance Optimizer and is hosted by SAP to help SAP customers manage their landscape transformation changes. The maintenance planner also generates the stack XML that used to be obtained via the Maintenance Optimizer.

Before the conversion to SAP S/4HANA starts, the maintenance planner checks the system for add-ons, business functions, and even industry solutions. If any restrictions are identified, the maintenance planner stops the conversion from moving ahead. You don't have to wait to start the system conversion project before running the maintenance planner; it should be run as part of the preparation phase to identify any issues as early as possible. Any remediation items can be managed before the

SAP S/4HANA conversion project starts, if the system conversion is still a viable option based on the results provided.

Software Update Manager

As in SAP upgrades, SUM is used in the conversion to SAP S/4HANA. As you will see in Section 13.3.2, the latest version of SUM must be used.

You'll need to run the maintenance planner before running SUM, as explained in the previous section.

Database Migration Option

For those of you already familiar with SAP Business Suite on SAP HANA and who have already migrated to an SAP HANA database, the DMO will be familiar.

The DMO allows SAP customers to move from SAP ERP 6.0 to SAP S/4HANA in one step. In combination with SUM, DMO performs the database migration from any database to SAP HANA. The combination of both tools is referred to as *the DMO of SUM*.

The DMO of SUM will be used for SAP customers moving to SAP S/4HANA that are running SAP ERP 6.0 on any database. For SAP customers already using SAP Business Suite on an SAP HANA database, only SUM is required to move to SAP S/4HANA.

The technical conversion is only one part of the overall conversion process required as part of the SAP S/4HANA conversion journey. Additional functional checks must be completed to assess the impact of the new SAP S/4HANA code line and simplification items on your existing SAP environment.

Functional Conversion Tools

This is the area in which the conversion becomes challenging, but SAP has made good progress and provides additional tool sets to support the SAP S/4HANA conversion. Although multiple tools are available, don't underestimate the time and effort required to get the solution right. Multiple challenges can be expected along the way.

Planning is key to a successful SAP S/4HANA conversion, and the tools described ahead can help get you started at an early stage.

Simplification List for SAP S/4HANA

The *simplification list* is a document provided by SAP that helps SAP customers understand the impact of the simplifications associated with SAP S/4HANA. Hence, the simplification list facilitates the planning and effort estimation associated with an SAP S/4HANA conversion project.

Note

The simplification list is version dependent. Each time SAP releases a new Feature Package Stack (FPS) for a given SAP S/4HANA version, a new simplification list is delivered for that version. Therefore, you need to make sure you have the correct simplification list based on your target SAP S/4HANA conversion version.

In this list, SAP describes the functional impact that SAP S/4HANA has on business processes, individual transactions, and associated solutions. In certain cases, solutions may have been merged or simplified with a new architecture compared to the source systems from which you are performing the conversion.

The document also provides a set of recommendations for how to adjust your custom code based on a series of SAP Notes provided within the document.

Prechecks for SAP S/4HANA

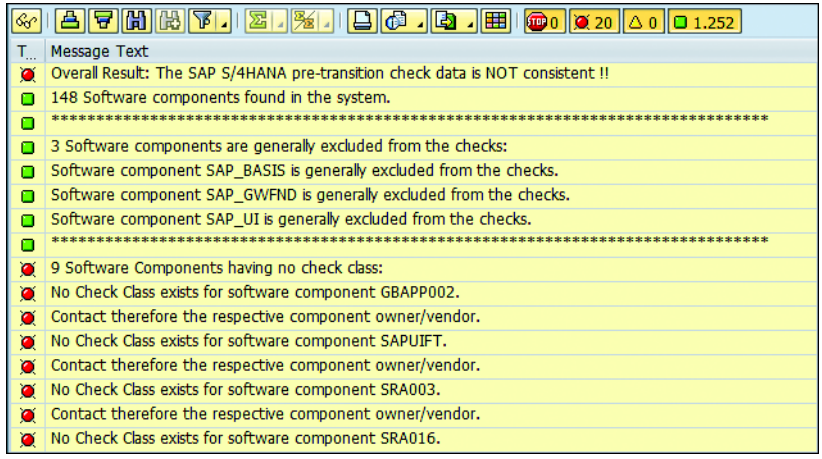
As part of the system conversion, SUM runs a set of prechecks to ensure that all the activities required to convert to SAP S/4HANA have been completed. If any activities haven't been carried out, SUM stops the conversion process.

To provide additional time and flexibility to carry out these prechecks, SAP has provided the *precheck report* as a standalone executable that you can complete prior to starting the SAP S/4HANA conversion. Again, like the simplification list, this report helps plan the activities and efforts associated with the move to SAP S/4HANA.

Note

Report R_S4_PRE_TRANSITION_CHECKS is available within SAP Note 2182725 (S4TC Delivery of the SAP S/4HANA System Conversion Checks). This SAP Note needs to be implemented in your source system, as well as the SAP Notes mentioned in the manual activities of the same document.

You can run the report as often as needed in simulation mode without creating any logs. With the simulation mode inactive, the report logs are saved in the application log and can be displayed at a later stage if required. Figure 13.9 provides sample output of the SAP precheck report (report R_S4_PRE_TRANSITION_CHECKS). At this point, you analyze the output and act accordingly. The green lights (squares) don't require any specific action, but you must address red lights (circles) before moving forward with the SAP S/4HANA conversion.



T...	Message Text
	Overall Result: The SAP S/4HANA pre-transition check data is NOT consistent !!
	148 Software components found in the system.
	**********
	3 Software components are generally excluded from the checks:
	Software component SAP_BASIS is generally excluded from the checks.
	Software component SAP_GWFND is generally excluded from the checks.
	Software component SAP_UI is generally excluded from the checks.
	**********
	9 Software Components having no check class:
	No Check Class exists for software component GBAPP002.
	Contact therefore the respective component owner/vendor.
	No Check Class exists for software component SAPUIFT.
	Contact therefore the respective component owner/vendor.
	No Check Class exists for software component SRA003.
	Contact therefore the respective component owner/vendor.
	No Check Class exists for software component SRA016.

Figure 13.9 Sample Output for Report R_S4_PRE_TRANSITION_CHECKS

After you've addressed all the precheck issues, you can move ahead with the conversion to SAP S/4HANA.

Simplification Database for SAP S/4HANA

With the release of SAP S/4HANA Enterprise Management, SAP has created the *simplification database*, which is based on the same concept as the simplification list. The simplification database will be updated for each SAP S/4HANA Enterprise Management version. The simplification database helps identify the simplification impact SAP S/4HANA has on the existing custom code running in your system.

The simplifications are downloaded in a ZIP file from SAP Service Marketplace and need to be imported into an SAP NetWeaver 7.5 system.

Note

Information on how to download the simplification database is available in SAP Note 2241080 (Custom Code Check Content for SAP S/4HANA, On-Premise Edition).

To understand how these simplification items impact your existing SAP system, an extraction of your custom code is required in the source system that you plan to convert to SAP S/4HANA. Based on the SAP version you're currently running, the SAP S/4HANA checks may be completed using the Code Inspector.

After the custom code extraction program has been run, the ZIP files generated from the output need to be loaded into the SAP NetWeaver 7.5 evaluation system into which you previously imported the simplification database.

When the load is complete, Report SYCM allows you to select the ZIP file that contains the extract of your custom code and run it against the simplification database. An example of the extraction process and output is shown in Figure 13.10.

The output of the report is also referred to as the *custom code migration worklist*.

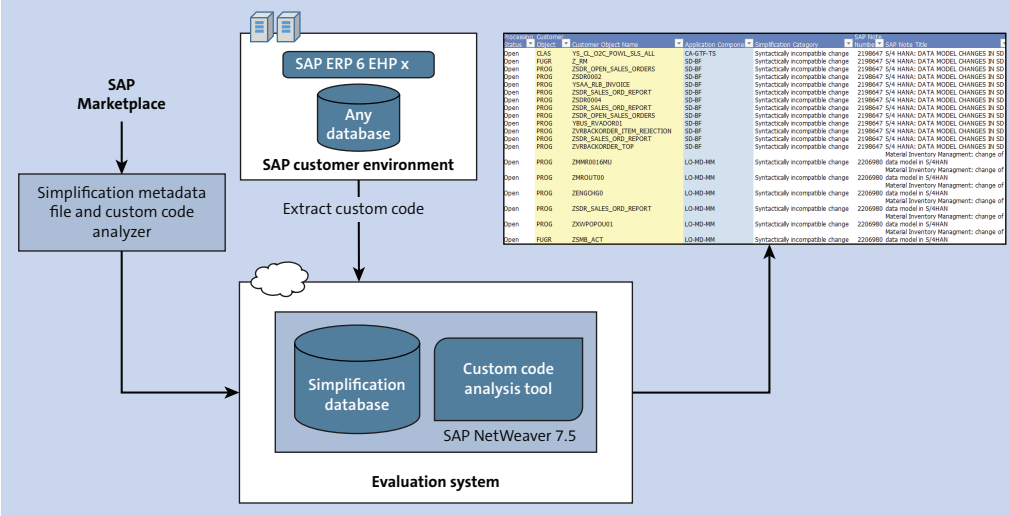


Figure 13.10 SAP S/4HANA Custom Code Migration Worklist

As with the simplification list, the output from the custom code migration worklist report will provide you with a series of SAP Notes explaining how to adjust your custom code. In addition, drilldown functionality is available to analyze which code line is impacted in the custom program and to which functional area the simplification is associated.

This list of tools will help you understand the impact of SAP S/4HANA on your custom code, but it won't replace areas covered as part of the Code Inspector, which we'll discuss in the following subsection on code remediation, HANAtization, and optimization.

13.2.4 Code Remediation, HANAtization, and Optimization

As part of the move to SAP S/4HANA, code adjustments will be required; the amount of adjustments will vary based on the volume of custom code and the source version you are converting from. These code adjustments fall into three main categories: code remediation, code HANAtization, and code optimization.

Code remediation is required following an SAP upgrade. The upgrade contains code changes and introduces new functionality that can impact the existing ABAP code in your SAP system. Certain features may also become obsolete and may need to be replaced as part of the code remediation process.

Standard SAP code should work as usual; however, custom code may need to be remediated to ensure that it's still working as expected. Code remediation may be required due to additional fields added in a primary key of a table associated with a sequence of screen changes in a batch data communication (BDC) program, obsolete function modules, or even prior changes to SAP programs using access keys that conflict with the new upgrade code.

Like SAP upgrades in the past, adjustments with Transaction SPDD and Transaction SPAU will also be required as part of your move to SAP S/4HANA. These adjustments are required when existing SAP standard objects are overwritten with the objects delivered as part of the higher SAP version you're converting to. During the SAP S/4HANA conversion, the developer responsible for the code remediation adjustments can decide, in agreement with the business, to retain or overwrite the objects based on any adjustments that may have been made in the previous SAP releases.

As mentioned, these adjustments are split into two categories: Transaction SPDD and Transaction SPAU. Transaction SPDD adjustments pertain to the list of all modified Data Dictionary (DDIC) objects, tables, data elements, and so on. Any adjustments required to these objects can be addressed within Transaction SPDD.

Transaction SPAU adjustments pertain to note corrections and modifications with or without the modification assistant. A developer needs to decide whether to adopt these modifications or reset them to the original statuses. All objects then need to be activated after the change.

Whether you're running SAP Business Suite on SAP HANA or SAP S/4HANA, an additional type of adjustment is required to allow the ABAP code to run on the SAP HANA database. This is referred to as *code HANAtization* and is required to make sure the code is compatible with the SAP HANA database. Previously, most of the code that consumed a lot of the system resources was managed within the application layer.

However, to benefit from the in-memory architecture available within the SAP HANA database, the code needs to be adjusted.

With the conversion to SAP S/4HANA, the ABAP code adjustments can be split into two categories:

- **HANAtization**
  The mandatory adjustments required to run the existing ABAP code on an SAP HANA database.
- **Code optimization**
  Modifications to the ABAP code that make it optimal and make it run faster, to benefit from the SAP HANA functionalities. SAP HANA code optimization leverages items such as SAP HANA modeling with code pushdown, which delegates data-intense calculations to the database layer.

SAP provides a set of standard tools to help with code analysis for HANAtization. The Code Inspector (see Figure 13.11) and ABAP Test Cockpit identify the existing SAP code that needs to be HANAtized. SAP provides a set of variants within these tools that help identify the mandatory requirements associated with code HANAtization.

The Code Inspector performs the code analysis based on the selected variant that contains the list of SAP development objects. The **Check Variant** area of the screen contains the information to perform the analysis—for example, "FUNCTIONAL_DB" in the **Name** field in Figure 13.11. The **Object Set** area defines the ABAP objects for which the HANAtization inspection needs to be performed.

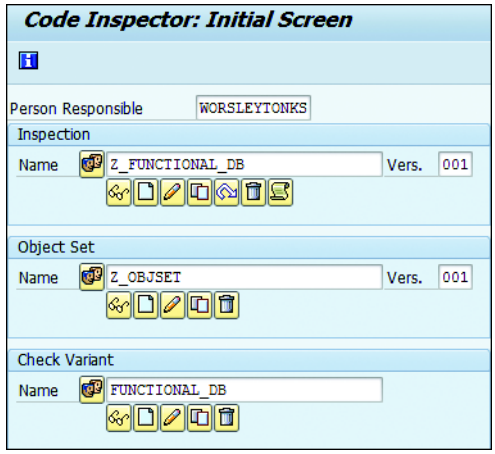


Figure 13.11 SAP Code Inspector Screen Selection

Note

You should use the FUNCTIONAL_DB variant in the Code Inspector. This check variant is delivered with SAP Note 1935918 (Downport Code Inspector Check Variants for HANA Migration), and it helps initiate the HANAtization process.

The FUNCTIONAL_DB variant contains checks that are mandatory for the analysis of ABAP custom code required as part of the move to SAP HANA.

The HANAtization requirements are classified into seven categories: Native SQL, database hints, location of ABAP Database Connectivity (ADBC) usages, location of special ABAP Dictionary function modules, database operations on pool and cluster tables, problematic SELECT/OPEN CURSOR by statements and depooling/declustering, and location of nonrobust ABAP code. A few examples of these categories are described in detail in the following list:

- **Native SQL**
  Native SQL refers to the custom code that uses Native SQL statements specific to an underlying database. Native SQL bypasses the synchronization of the SAP table buffers and can potentially cause data inconsistencies. An example of a Native SQL statement is provided in Listing 13.1.

```
EXEC SQL
  SELECT WERKS,ALAND,WKREG,WKCOU
    INTO :w_vbrp
    FROM vbrp
  WHERE VBELN = :lv_vblen
ENDEXEC.
```

  Listing 13.1 Example Native SQL Statement

  The adjustments for Native SQL as part of the HANAtization process mean that they must be rewritten as Open SQL in ABAP. These corrections can be made either before or during the project to migrate to the SAP HANA database.

- **Database hints**
  Database hints contain specific database code. In Figure 13.12, the database hint refers to an Oracle database and should only be used in exceptional cases. This can force the underlying database to work in a way different from what is expected as part of the standard SAP functionality.

```
215          where a~buffered   = 'X'
216            and b~ddlanguage = 'EN'
217            and c~fieldname  = 'CLIENT'
218  %_hints oracle 'merge join'.
```

Figure 13.12 Example Database Oracle Hint

The adjustments for database hints are straightforward. These can be commented out, but this activity can only be completed after the migration to SAP Business Suite on SAP HANA or after SAP S/4HANA has been completed.

- **Database operations on pool and cluster tables**
  Database operations on pool and cluster tables refer to the ABAP code having direct access to the physical pool. After depooling/declustering, these accesses become hard errors. An example of a database operation on pool and cluster tables is shown in Figure 13.13. After depooling/declustering is complete, the logical table is converted to a transparent table; however, the physical pool or cluster is still there but remains empty. This allows you to benefit from the SAP HANA analytical capabilities.

```
42
43   * 3. DOKCLU
44       DELETE from DOKCLU
45        WHERE  ID = 'TX'
46          AND  OBJECT = 'ZLOGIN_SCREEN_INFO'
47          AND  LANGU = 'E' AND TYP = 'E'.
48
```

Figure 13.13 Example Database Operation on Pool and Cluster Table (Table Clusters)

Per SAP's ABAP best practices, database operations should be avoided on these physical tables but not on logical tables.

The adjustments for database operations on pool and cluster tables require a rewrite of the code to avoid database operations. These corrections can be completed prior to the SAP HANA migration start.

- **Problematic by statements and depooling/declustering**
  Depooling/declustering requires a search for `SELECT` and `OPEN CURSOR` statements for pool or cluster tables for which no `ORDER BY` clause is specified. This becomes an issue when the order of the returned database entries changes if the database table is modified into a transparent table. An example of depooling/declustering is shown in Figure 13.14.

```
65        SELECT * FROM MSKU into table it_msku
66               WHERE MATNR = MATNR
67               AND   KUNNR = KUNNR
68               AND   SOBKZ = KONSIKUNDE.
69    elseif werks ne ' ' and matnr eq ' '.
```

Figure 13.14 Example of Depooling/Declustering

Per SAP's ABAP best practices, results should be sorted when the result is stored manually in an internal table. These corrections can be made prior to the start of the SAP HANA migration.

In the previous examples, we captured a few areas that require adjustments to run on the SAP HANA database platform. These issues will be flagged by the Code Inspector and classified into three categories (see Figure 13.15):

- Errors (red)
- Warnings (yellow)
- Information (green)

Tests	Error	Warn...	Infor...
List of Checks	94	97	1320
Security Checks	0	0	0
Robust Programming	94	97	1320
Search DB Operations in Pool/Cluster Tables	0	0	0
Search problematic statements for result of SELECT/OPEN CURSOR without ORDER BY	94	97	1320
Errors	94	0	0
Warnings	0	97	0
Information	0	0	1320
Search Functs.	0	0	0

Figure 13.15 Sample Code Inspector Output

Some of these modifications will be mandatory, such as for the errors in Figure 13.15; others will just be recommendations.

For the SAP conversion scenarios described in Section 13.2.1, modernization and optimization of the remaining custom code is a separate activity, possibly driven by other business change requirements or transformational requirements. For new implementations, SAP S/4HANA-enabled custom code is the default.

Note

For SAP HANA code remediation best practices and considerations, additional information can be found in SAP Note 1912445 (ABAP Custom Code Migration for SAP HANA—Recommendations and Code Inspector Variants for SAP HANA Migration).

13.2.5 Application-Specific Conversion Steps

In addition to the assessments completed with the simplification list, the simplification database, and the SAP S/4HANA prechecks, some application-specific conversion activities are required to complete the data conversion to SAP S/4HANA after the installation of the software.

The activities required for each of these applications will vary based on the target SAP S/4HANA version you're converting to. For example, if you're converting to SAP S/4HANA 1610, you may not benefit from the wider simplifications and innovations available in SAP S/4HANA 1709; therefore, some of the conversion steps and prerequisites may be different.

SAP S/4HANA Finance Data Conversion

The SAP S/4HANA Finance data conversion process is tied closely to the overall SAP S/4HANA system conversion and can't be executed in isolation.

Prior to performing the application-specific follow-on activities, it's important to ensure that the steps already addressed in this chapter have been completed, as follows:

1. Complete the system prechecks to ensure that SAP S/4HANA Finance can be installed.
2. Execute the functional prechecks to ensure the completeness of the financial data.
3. Assess and perform any adjustments to custom programs that may be required to ensure a smooth execution of the finance functions after go-live.

In addition to these checks, you must have completed the system reconciliation between the different finance applications. This will ensure the data will be merged into the Universal Journal (table ACDOCA) without any issues. Month-end activities for the previous period also must be completed prior to starting the data migration from the old data structures to the new ones that are available with SAP S/4HANA.

Additional migration and configuration requirements are required for the following FI functions:

- SAP General Ledger (G/L)
- Asset Accounting (FI-AA)
- Cash Management

After the configuration steps are completed for these items, the execution of the data conversion can proceed from the old data structures to the new ones.

SAP S/4HANA Logistics Data Conversion

Like for the SAP S/4HANA Finance application-specific conversion activities, SAP S/4HANA's logistics functionality requires some additional steps as well, although these steps aren't as manually demanding.

During the SAP S/4HANA logistics preparation, you must complete the activities that are included as part of the prechecks. For example, a conversion to the new data structure for the material number may be required, as the material number can change from 18 to 40 characters based on options selected when moving to SAP S/4HANA.

In addition to the material number extension adjustments, a fundamental change in SAP S/4HANA logistics functionality is the introduction of the mandatory business partner approach. This requires additional Customizing settings to be completed and checks to be performed to ensure customer and supplier integration is complete, as all customers and vendors are set up as business partners in SAP S/4HANA Enterprise Management.

The detailed step-by-step conversion requirements are available within the target conversion guides for the associated target SAP S/4HANA version. This includes the associated FPS that you've decided to convert. These documents are available on the SAP help forum at *http://help.sap.com/s4hana*.

13.3 SAP S/4HANA Conversion Prerequisites

A direct conversion path to SAP S/4HANA isn't currently available for all SAP customers. A series of prerequisites needs to be met before it's possible to convert to SAP S/4HANA. Based on the business functions, SAP add-ons, or industry solutions that are currently installed in your SAP ERP environment, some features may not be supported. You either must remove these features (e.g., an SAP add-on) or perform a new implementation without these functionalities if you want to move to SAP S/4HANA and can't afford to wait for them to be made available in a future release of SAP S/4HANA.

The following sections highlight some of the points you may want to consider before undertaking your SAP S/4HANA conversion journey, the prerequisites that must be met to convert to SAP S/4HANA, and an overview of some of the restrictions based on the functionality currently in use in your SAP system.

13.3.1 SAP S/4HANA Transformation Considerations

You must address several considerations during the technical conversion to SAP S/4HANA. The conversion approach must be adjusted depending on the business' ability to accommodate system outages and overall project timelines.

The prerequisites required to convert to SAP S/4HANA should not only focus on the mandatory requirements but also ensure that your SAP environment is in the best possible shape prior to the conversion start. This reduces the overall project risk and ensures a smooth transition to SAP S/4HANA.

Some of the considerations to factor into your SAP S/4HANA conversion scenario are listed here:

- **Migration timelines**
  Given the disruptive nature of the SAP S/4HANA conversion, it's important to identify the right time for your business to make the move. The usually-avoided go-live dates, such as key business sales cycles and financial month-end or year-end close, should still be avoided.
- **Custom code**
  As part of the conversion to SAP S/4HANA, many code changes are applied to your SAP system. Although most code will work normally after the conversion, some of your custom code may require mandatory changes to ensure a smooth transition. This also includes database-dependent code. As discussed earlier, SAP HANA code remediation is also referred to as *HANAtization*. (See Section 13.2.4 for more details.)
- **Technical and functional implications**
  Before moving to SAP S/4HANA, it's important to understand the current functional limitations the conversion may have on your SAP system. For example, if you aren't currently using G/L in SAP ERP, it's possible to convert to SAP S/4HANA, but you won't benefit from the new G/L functionalities, such as parallel accounting and document splitting. In the past, if you wanted to use these functionalities, you had to first migrate to New G/L, and then perform the SAP S/4HANA conversion. With the latest releases of SAP S/4HANA, after conversion parallel ledgers can be activated with SAP S/4HANA 1610 and document splitting with SAP S/4HANA 1709.

Note

It's important to ensure that all your current systems are patched to the minimum level prior to starting the system conversion. The minimum requirements to move to on-premise SAP S/4HANA are listed in this section.

With the latest release of SAP S/4HANA Enterprise Management, there has been considerable enhancement to the functional scope, with key additional features mainly focusing on the logistics and finance areas. These additional features have led to a change in the technical prerequisites needed to run SAP S/4HANA.

This has also led to an adjustment in the technical architecture of SAP S/4HANA.The architecture now consists of the following (see Figure 13.16):

- SAP S/4HANA core components
- SAP NetWeaver 7.5 (or above)
- SAP HANA database

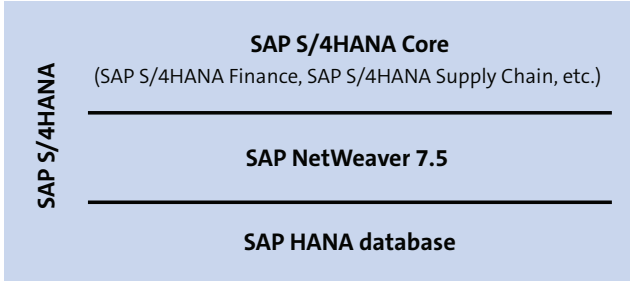


Figure 13.16 On-Premise SAP S/4HANA Base Technology

13.3.2 SAP S/4HANA Application Prerequisites

While preparing to convert your SAP ERP system to SAP S/4HANA, you need to ensure that you are using the correct version of the Software Provisioning Manager (SWPM) for the installation and using SUM, with or without DMO, for the conversion. It's important to use the latest patch levels of SWPM and SUM that are available in the Software Logistics Toolset (SL Toolset).

Before you start using the SUM tool, make sure that you have the latest version of the corresponding guides:

- *Conversion Guide*: Converting SAP Systems into SAP S/4HANA Using SUM SP 15 (or above)
- *SUM Guide*: Updating SAP Systems Using Software Update Manager 1.0 SP 15 (or above)
- *DMO Guide*: DMO of SUM 1.0 SP 15 (or above)

Note

SAP Note 2233962 (Conversion Related Information) provides the latest information on converting to SAP S/4HANA using SUM SP 15. Be sure to read this SAP Note prior to starting the tool.

In addition, there are different installation requirements depending on the SAP S/4HANA version that you want to convert to.

Note

On-premise deployment of SAP S/4HANA includes the component ST-A/PI. If this component isn't installed in your SAP environment, you'll need to use the add-on installation tool. If these add-ons are available, you need to make sure they are up-to-date. Use Report RTCCTOOL, per SAP Note 69455, to ensure that the newest versions of add-ons ST-PI and ST-A/PI are implemented.

13.3.3 SAP S/4HANA Functional Restrictions

Prior to moving to on-premise SAP S/4HANA, it's important to understand the impact of the new SAP S/4HANA solution on your existing processes and to check if it's possible to convert based on the functionalities within your existing SAP system. The list of restrictions linked to moving to SAP S/4HANA continuously changes with the release of additional FPSs.

Note

For SAP S/4HANA 1610, see SAP Note 2333141 (SAP S/4HANA 1610: Restriction Note).

In the following subsections, we'll explore the limitations of SAP S/4HANA in industry-specific functionality, finance, and logistics. We'll close the section with a brief overview of some of the technical limitations.

Industry Limitations

Although SAP continues to enhance its solution with additional industries supported in SAP S/4HANA, several restrictions need to be checked prior to performing the migration.

Table 13.1 lists areas and functionalities that are restricted in SAP S/4HANA 1610 and the SAP Notes that describe these restrictions.

Areas	SAP Note Highlighting Restrictions
Master Data Governance	2349002
Aerospace & Defense (A&D)	2496784—SAP S/4HANA 1709 Restriction
Automotive	2347206
Mill Products	2495974—SAP S/4HANA 1709 Restriction
Banking	2328754
Public Sector	2348636
Finance	2344977
LOB Manufacturing: QM	2345333
LOB Manufacturing: MM-IM	2345321 and 2440007
LOB CEC	2231667
Globalization	2349004
Best Practices Framework	2348479
Environment, Health and Safety (EHS)	2383548
Global Trade Service (GTS)	2382239

Table 13.1 Restricted Areas in SAP S/4HANA 1610

In addition to the current restrictions in industry solutions and additional areas, such as MDG with SAP S/4HANA, several adjustments have been made to simplify the data model and business process within the finance and logistics areas. This has led to certain features being removed, impacting the conversion possibilities of SAP S/4HANA.

Functional Limitations

As with the FI and CO modules, a simplification of the Sales and Distribution (SD) and Material Management (MM) modules has led to a certain number of restrictions within SAP S/4HANA.

First, the maximum material number length has been extended in SAP S/4HANA, from 18 characters to 40 characters. Therefore, restrictions have been introduced in the following areas:

- Archived data
- Application Linking and Enabling (ALE) generation for Business Application Programming Interfaces (BAPIs)
- Customer and supplier material numbers
- Logistics Information System (LIS)
- Integration with other SAP products

Note

Long material number–related restrictions are described in SAP Note 2233100. If you're using the extended material number, before converting to SAP S/4HANA, further information on the restrictions can be found in SAP Note 2384347 (Conversion for DIMP-LAMA).

SAP S/4HANA provides enhanced functionalities for material packaging, which creates restrictions for packaging material with more than 35 characters in combination with returnable packaging logistics:

- **Electronic Data Interchange (EDI) processing of returnable packaging account statement requests (message type ACCSTAREQ)**
  The IDoc type ACCSTA01 allows supplier and customer material numbers for packaging materials of up to 35 characters to be transmitted.
- **EDI processing of returnable packaging account statements (message type ACCSTA)**
  The IDoc type ACCSTA01 allows supplier and customer material numbers for packaging materials of up to 35 characters to be transmitted.

With SAP S/4HANA's logistics functionality, the business partner approach has become mandatory and restrictions have been applied for the number of fields that can be used. In addition to the business partner restrictions, the integrated solution of Service Parts Management using SAP CRM Order Management with an active Service Parts Management configuration (direct delivery scenario) in combination with SAP S/4HANA is not released with SAP S/4HANA 1610.

Additional restrictions associated with SAP business functions may occur while moving to SAP S/4HANA. When a business function is activated in the source system but

defined as "always off" in the target SAP S/4HANA system, then system conversion won't be possible.

If the business function was switched off in the source release but is flagged as "always on" in the target release, then the business function will be automatically activated as part of the system conversion.

The business functions currently unavailable in SAP S/4HANA 1610 are listed in Table 13.2.

Business Function	Description	Software Component
LOCISOCN_SD_BIL	N/A	IS-OIL
ERP_VALUE_PACK	Value Pack	QRT_STAG
FND_VISUAL_BUSINESS	Visual Business	QRT_STAG
FND_MOBILEINBOX_WF_1	FND, Workflow & Alert (Mobile)	QRT_STAG
/SAPNEA/J_SCC_BF	Business function for SCC JP	QRT_STAG
CA_CATS_CE	CATS classic for CE	S4CORE
ERP_CF_INTEGRATION_1	ERP, Integration with CLA & FM	S4CORE
FND_IDM_1	FND, Identity Mgmt Integration	S4CORE
HCM_NWBC_ROLES	HCM, Roles for SAP NWBC	S4CORE
HCM_CRM_CATS_PROFILE	CRM, Time Rec.—CATS Profiles	S4CORE
ERP_WEB_CHANNEL_1	SAP Web Channel Exp. Mgmt	S4CORE
ERP_WEB_CHANNEL_2	SAP Web Channel Exp. Mgmt 2.0	S4CORE
ERP_WEB_CHANNEL_3	SAP Web Channel Exp. Mgmt. 3.0	S4CORE
ERP_CF_INTEGRATION_CPM	ERP, Integration with Claims	S4CORE
FND_HRICP_1	Framework to Track IT Changes	S4CORE
FND_IBO_MULTIBE_1	FND, Multi Back-End for Inbox	S4CORE

Table 13.2 Business Functions Not Released in SAP S/4HANA 1610

Business Function	Description	Software Component
CA_PA_CE_GE_QUALI	CA, EE Qualifications for CE/GE	SAP_ABA
FDT_TEST_ENTERPRISE_BF_OFF	BRF+ Test Business Function Off	SAP_BASIS
FDT_TEST_ENTERPRISE_BF_ON	BRF+ Test Business Function On	SAP_BASIS
ILM_BLOCKING	ILM Blocking Functionality	SAP_BASIS
ILM_STOR	ILM Database Store	SAP_BASIS
RS_IQM	IQM Reporting	SAP_BW
/SDF/WS_MON	Web Service Monitoring	ST-PI
/SDF/E2E_TRACE	N/A	ST-PI
UI_FRW_1	UI Framework	WEBCUIF
UI_FRW_RTE	UI Framework RTE	WEBCUIF
UI_FRW_2	UI Framework	WEBCUIF
UI_FRW_1_DOCU	UI Framework Documentation	WEBCUIF
UI_FRW_2_DOCU	WebClient UI Framework Docu.	WEBCUIF
COMMODITY_MANAGEMENT_01	Commodity Sales, Commodity Procurement, Commodity Risk	EMAa-FnIaNgSeEmReVnt 01

Table 13.2 Business Functions Not Released in SAP S/4HANA 1610 (Cont.)

Technical Limitations

Before migrating to SAP S/4HANA, you'll need to ensure that your add-ons are compatible with SAP S/4HANA. For standard SAP add-ons, Table 13.3 provides the name, component version, and software components that are compatible with SAP S/4HANA 1610.

Name	Component Version	Software Component
SAP Access Control	SAP ACCESS CONTROL 10.1	GRCPIERP V1100_700
SAP Capital Yield Tax Management	SAP CYT MGMT FOR BANKING 8.0	CYT 800

Table 13.3 SAP Add-Ons Compatible with SAP S/4HANA 1610

Name	Component Version	Software Component
SAP Capital Yield Tax Management	SAP CYT MGMT FOR BANKING 8.0	CYT 800
SAP Tax Declaration Framework for Brazil (SAP Note 2215394)	TAX MNGMT FRAMEWORK BR 1.0	TMFLOCBR 100
SAP Electronic Invoicing for Brazil (SAP Nota Fiscal Eletronica)	SAP NFE 10.0	SLL-NFE 900
SAP Decision Service Management	DECISION SERVICE MGMT. 1.0	DECSERMG 100
SAP Fraud Management	SAP ASSURANCE & COMPLIANCE 1.2	SAPFRA 120
SAP Enterpr Project Connection (SAP Note 2288953)	SAP ENTERPR PROJ CONN 3.0	EPROJCON 300
SAP Manufacturing Integration and Intelligence	SAP MII 15.1	OEE_ERP 150
SAP Manufacturing Integration and Intelligence	SAP MII 15.1	OEE_ERP 150
SAP Access Control 10.1 for SAP S/4HANA	SAP PROCESS CONTROL 10.1	GRCPIERP V1100_700
	SAP AC 10.1 FOR SAP S/4HANA	GRCFND_A V8000 GRCPIERP V1100_700 GRCPINW V1100_700 POASBC 100_731
SAP Risk Management	SAP RISK MANAGEMENT 10.1	GRCFND_A V1100
SAP Process Control 10.1 for SAP S/4HANA	SAP PC 10.1 FOR SAP S/4HANA	GRCFND_A V8000 GRCPIERP V1100_700 GRCPINW V1100_700 POASBC 100_731

Table 13.3 SAP Add-Ons Compatible with SAP S/4HANA 1610 (Cont.)

For SAP-standard custom-development add-ons, a list isn't yet available. SAP recommends contacting SAP at least three months before starting your SAP S/4HANA implementation to allow sufficient time for any adjustments if required. For supplier and partner add-ons, you'll need to check with them directly to see if their add-on has been released with SAP S/4HANA.

The list in Table 13.3 shows the current add-ons. If your add-on has been incorporated into the SAP S/4HANA solution, it will be considered part of the SAP S/4HANA Enterprise Management functionality and will no longer be considered an add-on.

Because SAP S/4HANA isn't supported with any code-page configuration other than Unicode, all SAP systems currently running on multiple or single code-page configurations need to be converted to Unicode. Based on the current level of your existing source release, the Unicode conversion can be combined with the migration using the DMO of SUM. Any language-related issues must be addressed prior to the migration start.

Note

If you're looking to convert your existing SAP system to SAP NetWeaver 7.5 or above, the source system also needs to be a Unicode system. Therefore, any SAP environments that currently run a non-Unicode system will need to perform a two-step approach to get to the end state of SAP S/4HANA running on SAP NetWeaver 7.5.

In addition, although SAP has removed dual-stack deployments with SAP NetWeaver 7.4, doing so is also one of the technical prerequisites prior to converting to SAP S/4HANA. Based on the current level of your existing source release, you may need to factor this into your conversion scenario. The AS Java component needs to be separated from the AS ABAP stack and deployed as a standalone system.

Note

With the latest release of SAP S/4HANA 1709, some of the restrictions associated with SAP S/4HANA 1610 are likely to change.

13.4 Housekeeping Activities

If you're considering a conversion to SAP S/4HANA, you have a prime opportunity to ensure that your existing SAP ERP installation is in a good state to convert to SAP S/4HANA. Volume of data, amount of custom code, and code quality are all factors that can disrupt your conversion to SAP S/4HANA. It's never too late to get your house in order, and we recommend that you start working on your housekeeping activities today to prepare your SAP ERP system for its conversion to SAP S/4HANA.

Because you can't limit or assign a time dependency to the amount of data migrated during the SAP S/4HANA conversion, it's important to ensure that you migrate only the relevant and required data. This is even more relevant for SAP systems that have been running for several years and for which there is no existing archiving strategy. Without archiving or data cleansing, all the data will be migrated to SAP S/4HANA, creating data issues during the conversion process. Archiving and cleansing your data not only avoids these data inconsistencies during your project but also reduces the system downtime during the cutover weekend.

Therefore, a detailed analysis of the data in the system that you plan to convert to SAP S/4HANA helps identify where inconsistencies and issues might arise and where you can reduce the database size. Consider performing the following:

- **Cleansing activities**
  Certain types of data that may not be relevant for archiving can be deleted soon after they are created. Data such as spool data, job logs, background jobs, and so on fall into this category. In a productive environment, jobs should be deleted on a regular basis.
- **Archiving activities**
  As the best practice approach, SAP standard data archiving is free functionality to perform data management in an SAP system. You can use SAP data archiving to safely remove data from the database and store it in an attached archive.

In addition, SAP Information Lifecycle Management (SAP ILM) can be licensed to improve data-retention management (archived in SAP ILM–aware storage) by managing deletion based on defined retention policies.

To reduce the system downtime and optimize memory costs and hardware sizing, data archiving is a key part of the conversion to SAP S/4HANA. However, without an existing archiving strategy, it can be a challenge to delete or archive obsolete data from tables that show the largest growth in data volume in accordance with legal requirements and corporate policies. An appropriate data-archiving project should be started as soon as possible.

Note

SAP Notes 679456 (Reducing Data Volume before Unicode Conversion) and 1422822 (I18n Table Process Information) provide useful hints about which tables might be candidates for a size reduction that reduces data volume before a Unicode conversion.

Note

SAP Note 1659622 (SMIGR_BIG_ROW_STORE_TABS: Determine Tables from Database) provides the ABAP Report SMIGR_BIG_ROW_STORE_TABS to identify large tables that will be stored as row-store tables in SAP HANA. The small memory footprint of the row store is beneficial to minimize the database startup time.

With a conversion to SAP S/4HANA, although your data footprint is meant to shrink due to the reorganization and column-store compression with SAP HANA, it's important to convert only the relevant data to in-memory storage. The price difference between in-memory and disk capacity is substantial.

The files archived before the system conversion are still supported and accessible after the system conversion to SAP S/4HANA.

13.5 System Conversion Considerations

Prior to starting the conversion to SAP S/4HANA, you need to consider a few points to ensure that this is the best transformation path for your organization. With three paths available (refer to Figure 13.1)—new implementation, system conversion, or landscape transformation—it's important to understand the benefits and challenges of choosing one option over another.

Although SAP provides three transformation paths, there really are only two main implementation options available—often referred to as *greenfield* for new implementations or *brownfield* for system conversions.

With a greenfield approach, you start a fresh implementation from scratch, which covers the new implementation and landscape transformation scenarios that entail a data migration from an existing or multiple existing SAP ERP or non-SAP ERP systems.

Alternatively, you may decide to convert your existing SAP ERP system, which allows you to keep your configuration, custom development, and data. In this section, we'll compare and contrast the two implementation options to help you decide which will work best for your organization.

13.5.1 Greenfield Implementation

The move to SAP S/4HANA is a great opportunity to simplify certain business processes and ways of working in your organization and to redesign the way you do

business. If this is something you're considering, and you want to perform business process standardization, a greenfield implementation may be the right option for your organization. Although starting with a new implementation may seem a bit daunting, a set of accelerators based on SAP Activate provide configuration packs and best practices to set up the new system and complete the data migration required to get the new system up and running.

You should also take into consideration your current release level. SAP S/4HANA currently runs on SAP NetWeaver 7.5 (or above) on an SAP HANA database. For some organizations on older releases, such as SAP R/3 4.6c, a new implementation of SAP S/4HANA could be the perfect option to get back to the latest release while avoiding the challenges faced during the upgrade process and conversion to SAP S/4HANA. For organizations on SAP ERP 6.0, a one-step approach is available for system conversion, but a greenfield approach may still be preferable due to business considerations.

Custom code should also be factored into the decision of whether to choose a greenfield or brownfield implementation. In an average SAP ERP system, between 25 and 75 percent of custom code isn't used, and up to 50 percent of modifications are considered obsolete. Adapting custom code to SAP S/4HANA can be very time-consuming and result in few benefits.

For a greenfield implementation, this is a good opportunity to start again by leveraging SAP Best Practices and standard functionality. SAP Activate supports these activities (more information on SAP Activate is available in Chapter 14). Any custom code that is still required can be leveraged from the legacy system and adapted on the fly to be incorporated into the new SAP S/4HANA system.

In certain cases, specific functionalities and features, such as industry solutions or SAP add-ons, may no longer be available or required. If clear business benefits have been identified that are driving the immediate move to SAP S/4HANA, it may be an opportunity to consider redesigning some of the existing business processes and start with a new implementation rather than waiting for the technology restrictions to be resolved. For functional restrictions, see Section 13.3.3; report R_S4_PRE_TRANSITION_CHECKS, discussed in Section 13.2.3, will let you know if any of your current functionality will be impacted.

Finally, you must consider the impact on your data with a greenfield implementation:

- You will have more flexibility to cleanse your data during the implementation if you decide to go down the new implementation route. This is an opportunity

to restore data quality as a key part of your organization's governance procedures.

- If the effort and time associated with cleansing the data in your systems seems excessive to make your SAP environment "conversion ready," then, again, a new implementation may be the best option for you because it provides greater flexibility around data cleansing during the conversion process. You'll also be able to define the amount of data you want to move to the new SAP S/4HANA system. This option can considerably reduce the effort associated with the move to SAP S/4HANA based on the volume of data that requires cleansing.
- If you have a large volume of data and don't want to undergo a data-archiving project, you may want to follow the new implementation route and perform your data migration on a select set of data based on your future business and system requirements.

13.5.2 Brownfield Implementation

A system conversion will provide you with less flexibility to enhance your business processes compared to a greenfield implementation; however, you'll still benefit from the simplifications SAP provides as part of the move to SAP S/4HANA. This can be a difficult decision to make, especially for customers who have spent many years investing in their existing SAP ERP environment; for others, it will be a no-brainer.

About release levels, as mentioned earlier in Section 13.2, a one-step approach is available for customers currently running SAP ERP 6.0, with or without an enhancement pack. Older releases may choose to go with a step-by-step approach, moving to SAP ERP 6.0, EHP 7 or above and then to SAP S/4HANA.

If most your custom code is still in use (unlike in the average SAP ERP system, as noted in the previous section), a brownfield implementation may be the correct approach for your organization. Under these circumstances, you can pursue a system conversion and implement a small code-cleansing project prior to the conversion start to help reduce the system code base and return to SAP's standard functionality. This also reduces the TCO of your SAP system further down the line.

Functionality restrictions linked to industry solutions or SAP add-ons not yet supported by SAP S/4HANA can be problematic if you're using these functionalities within your existing SAP environment and looking to convert your existing SAP system to SAP S/4HANA. You may want to delay your system conversion until they are

made available. In the meantime, SAP has started to provide options to remove some additional add-ons, which will help with the transition to SAP S/4HANA.

Note

More information about currently unsupported industry solutions and add-ons is available in SAP Note 2011192 (Uninstalling ABAP Add-Ons).

Note

SAP also provides compatibility packages that allow SAP customers a limited-use right to run classic SAP ERP solutions on an SAP S/4HANA installation. The use right currently expires on December 31, 2025.

Additional information and the scope matrix for SAP compatibility packages for SAP S/4HANA can be found in SAP Note 2269324 (Compatibility Scope Matrix for SAP S/4HANA On-premise).

Finally, you must consider the impact on your data with a brownfield implementation:

- The system conversion requires a high level of data quality and requires you to perform some cleansing activities during the conversion project if you want to successfully migrate your data from the old data structures to the new SAP S/4HANA data structures.
- If you've been running your SAP ERP system for multiple years and have undertaken many upgrades, the system conversion process will be more complicated. In this case, allocating the right amount of time and effort to data cleansing is key. This data cleansing can be initiated as part of the system conversion phase during the sandbox conversion. You can address any challenges or issues that occur and relate to data during the sandbox conversion. More importantly, these adjustments and cleansing activities need to be replicated accordingly into the production environment to ensure that the data issues don't occur when performing the same activities on the other environments after refresh—especially in production.
- While performing a system conversion, there is no way to limit the amount of data that will be moved from the old data structures to the new ones. If you've been running your SAP systems with no data-archiving policy for several years, then this can add up to a lot of data! The amount of data in your system impacts the

downtime required to perform the system conversion, in addition to other factors, such as the number of company codes for batch parallelization. To alleviate this issue, you must introduce a data-archiving project prior to starting your system conversion to reduce data volumes.

Both greenfield and brownfield implementations have their benefits and downsides regarding time, effort, and speed to implementing SAP S/4HANA. However, because organizations will have invested differently in their existing SAP environments, these elements will be a key part of the decision-making process.

Note

An alternative option is to deploy SAP S/4HANA as a Central Finance system, which allows you to centralize all your financial data into one system in real time. The source systems can be SAP or non-SAP systems. This scenario is ideal for those SAP customers looking to centralize their finance functions that can't achieve standardization in their existing systems due to a lack of global governance.

Central Finance will provide a consolidated view leveraging the Universal Journal. Although Central Finance requires a separate SAP S/4HANA license, it can be a stepping-stone toward your final SAP S/4HANA Enterprise Management solution. Once your Central Finance system is up and running, you can look at incorporating carefully selected processes and/or legal entities into the SAP S/4HANA system, which will allow you to gradually decommission your legacy systems. The use of the original Central Finance system will gradually transition into a full-blown SAP S/4HANA system once all your business entities and processes have been incorporated into this system. This adoption scenario is equivalent to a new implementation scenario and will add complexity while you maintain two or more ERP systems throughout the transition. However, early value can be achieved with this adoption scenario by completing simple data mapping and real-time replication leveraging SAP MDG, which is provided with the Central Finance license.

13.6 SAP S/4HANA Migration Cockpit

SAP has released the SAP S/4HANA Migration Cockpit to support customers with the adoption of SAP S/4HANA via new implementations, and it's embedded as part of the solution. This cockpit is available for both SAP S/4HANA and SAP S/4HANA Cloud and doesn't require any additional license costs.

Like previous data migration tools, the SAP S/4HANA Migration Cockpit requires extracts of data from the legacy systems, whether SAP or non-SAP systems, and leverages embedded migration tools to complete the data migration process (Figure 13.17).

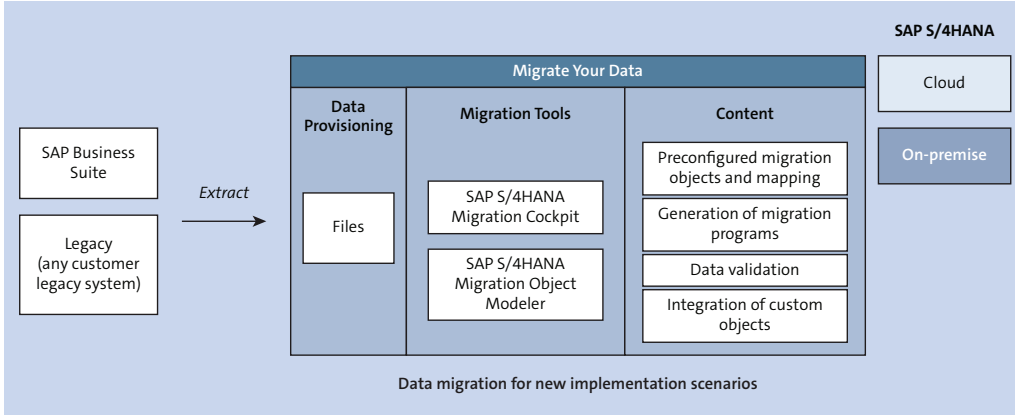


Figure 13.17 SAP S/4HANA Migration Cockpit Overview

The cockpit provides preconfigured content mapping for data migration objects, automated mapping, and self-generated programs based on predefined templates.

13.6.1 On-Premise SAP S/4HANA

With the flexibility and custom development capability provided with on-premise SAP S/4HANA, the on-premise SAP S/4HANA Migration Cockpit also needs to cater for custom objects, including custom fields and enhancements that need to be incorporated into the data-migration process. The SAP S/4HANA Migration Object Modeler (Figure 13.17) provides the flexibility to support these business requirements.

Under the source structure, it's possible to perform the adjustments required to add fields into the standard structure so that data can be transferred easily to the SAP S/4HANA system. The same adjustments can be completed in the target structure to accommodate the transfer of data without any development required.

Once the adjustments have been completed in both source and target structures, the structure mapping needs to be completed to accommodate the custom fields included as part of the migration process. The field mapping can be completed through a simple drag and drop of the fields to complete the mapping requirements.

The following is the list of standard objects available with the SAP S/4HANA Migration Cockpit for SAP S/4HANA 1610 and above; additional data objects will be included in future releases:

- Accounts payable (vendor open item)
- Equipment task list
- Accounts receivable (customer open item)
- Exchange rate
- Activity price
- Fixed asset (including balances)
- Activity type
- Functional location
- Bank master data
- G/L account balances (classic G/L); G/L account open item
- Batches
- Internal order
- Bill of material
- Inventory balances
- Characteristic
- Material (including long text)
- Class
- Material consumptions
- Contracts (purchasing)
- Profit center
- Cost center
- Purchase order
- Customer
- Purchasing info record
- Equipment
- Routing
- Sales order
- Supplier
- Work center

13.6.2 SAP S/4HANA Cloud

For SAP S/4HANA Cloud, public version, the SAP S/4HANA Migration Cockpit is embedded into the guided configuration menu. You will need to create a migration project to start the data transfer from your legacy system to the target SAP S/4HANA Cloud system.

Once your migration project is created, you'll need to select the data objects in scope for the migration and generate the corresponding templates to perform the loads. The cockpit will support load simulations and allow you to monitor the data-migration process through a central cockpit dashboard.

The simulation allows you to perform data-load checks against the customizing setup in your SAP S/4HANA Cloud system.

The following is the list of standard objects available with the SAP S/4HANA Migration Cockpit for SAP S/4HANA Cloud 1705; additional data objects will be included in future releases:

- Accounts payable (vendor open item)
- Exchange rate
- Accounts receivable (customer open item)
- Fixed asset (including balances)
- Activity price
- Functional location
- Activity type
- G/L account balances (classic G/L); G/L account open item
- Bank master data
- Inspection method
- Batches
- Inspection plan
- Bill of material
- Internal order
- Characteristic
- Inventory balances
- Class
- Maintenance plan
- Code/code group

- Maintenance task list
- Commercial project management
- Master inspection characteristic
- Contracts (purchasing)
- Material (including long text)
- Cost center
- Material inspection type
- Customer
- Material commodity code
- Equipment
- Sales contract
- Material classification material price change pricing condition
- Sales order
- Profit center
- Scheduling agreement
- Purchase order
- Selected set and selected set codes source list
- Purchasing info record
- Supplier
- Routing
- Work center

The SAP S/4HANA Migration Cockpit will accelerate your move to SAP S/4HANA for new implementations. With predefined content and mapping for each migration object, no programming is required to create the load programs. Data validation is enabled through simulation loads and ready-made reports with flexible data structures, allowing easy integration of custom data structures for on-premise solutions.

13.7 Tools and Techniques for Minimizing Downtime

Although functional enablement of the SAP S/4HANA solution can be included in the same change window as the technical upgrade and database migration, you might want to keep the activities separate due to complexity, risk, and increased downtime requirements.

If two downtimes aren't acceptable, you have a few options to help minimize the system downtime during the cutover weekend.

13.7.1 Data Volume Management

As mentioned in Section 13.4, it's important to maintain low data volumes via data archiving or by removing unnecessary data that may not require archiving. This is valid prior to moving to SAP S/4HANA, but should also be considered as part of your best practices throughout the application lifecycle management (ALM) of your SAP and IT landscapes.

Data volume management (DVM) may not be specific to SAP S/4HANA, but it will support and help you manage your system data efficiently by reducing your data footprint. You not only reduce your system's complexity and cost but also avoid long downtime windows that the business can rarely afford and which continually delay these types of projects.

Before undertaking your conversion to SAP S/4HANA, you'll want to run your database as slim as possible to ensure minimized downtime. DVM can help you get rid of unnecessary data while ensuring that the relevant information is available to maintain your business processes.

DVM and the DVM work center run on SAP Solution Manager 7.1 SP 05 and above.

13.7.2 Optimizing Database Migration Option Performance

Several options exist to optimize the performance and minimize the downtime associated with the DMO. Once again, like in DVM, these improvements aren't specific to SAP S/4HANA and can also be applied on an SAP Business Suite on SAP HANA migration.

Note

More information on how to optimize downtime with DMO is available at *http://bit.ly/1Ub9OWK* on SAP Community.

Use the benchmarking tool to assess the migration timelines for your SAP system to help you identify the optimal number of `R3load` processes and optimize table splitting.

If the overall performance of DMO still isn't sufficient to complete the SAP HANA migration within the expected downtime, you can enable the migration of selected application tables during the DMO uptime.

Note

SAP Note 2153242 (Estimation of Table Sizes and Downtime for SUM DMO with SLT) provides Report RSDMODBSIZE, which helps optimize downtime by finding the largest tables in SAP and giving an estimation of their transfer time.

13.7.3 Near-Zero Downtime

The Near-Zero Downtime (NZDT) approach allows SAP customers to reduce system downtime from potentially days to only several hours.

The standard SAP S/4HANA conversion steps required during the project are listed in Figure 13.18.

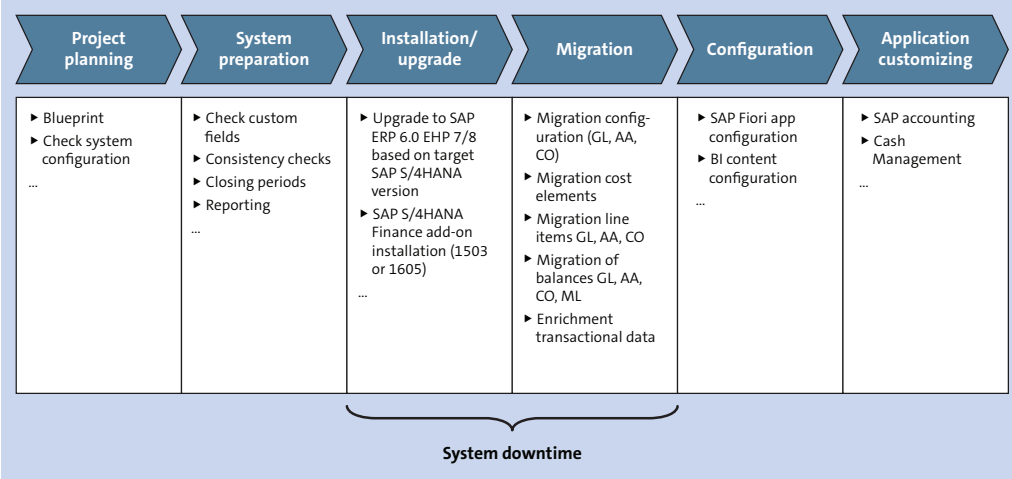


Figure 13.18 Standard Conversion Process for SAP S/4HANA Finance

Based on the database size, the SAP ERP source version (e.g., SAP ERP 6.0, EHP 7), the number of company codes, and so on, the activities associated with the system business downtime can vary considerably. To mitigate this risk and avoid a two-step upgrade and migration approach, SAP provides NZDT as part of the System Landscape

Optimization (SLO) services. The NZDT version available for SAP S/4HANA works in a similar way to how it was used in the past, capturing log tables that are replicated at a later stage (Figure 13.19).

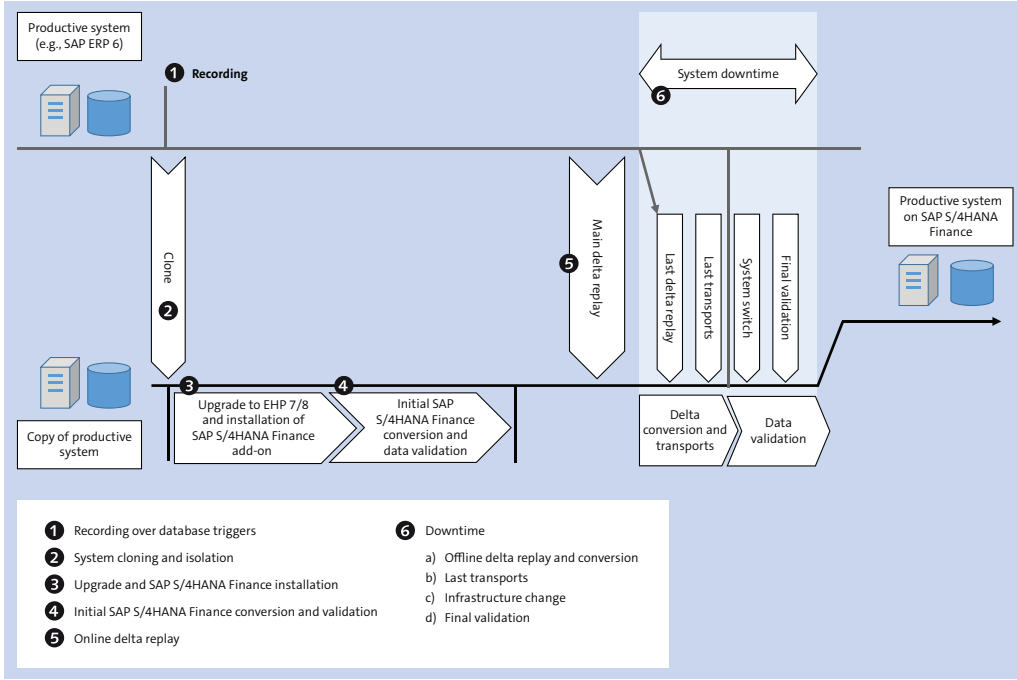


Figure 13.19 SAP S/4HANA Finance, Downtime Reduction with NZDT

All the SAP S/4HANA prechecks, consistency checks, closing activities, and reporting snapshots need to be completed in the production environment. After these steps are finalized, a clone of the production system is created, and the recording phase associated with the NZDT process can start.

> **Note**
>
> Like all other upgrade and conversion projects, the precheck and consistency check activities are performed across the entire landscape prior to executing the same steps in the productive environment as part of the cutover activities.

During the recording phase, business activities are restricted and a "hard freeze" is put in place in the following areas:

- General (FI/CO/AA):
  - No archiving
  - No Customizing changes
  - No changes in the repository
  - No postings in closed periods
- Asset account-specific:
  - No data transfer for asset data (Transaction AS91)
  - No asset depreciation postings with old depreciation report RABUCH
  - No asset deactivations via asset transfer posting or full/complete retirement
  - No year-end closing activities via FI-AA (Transactions AJRW and AJAB)

All new records posted in the production system during the recording phase are captured in log tables and replicated during the downtime window. With the current SAP S/4HANA conversion steps, you can't select a timeline to define the amount of data that is transferred. NZDT allows customers to migrate only the delta postings captured during the recording phase during the business downtime window, hence considerably shortening the downtime window. All other activities are migrated while the production system is still up running.

13.8 Summary

Adopting SAP S/4HANA is clearly complex and requires a thorough assessment to understand which transformation path is right for you. Multiple considerations need to be assessed to understand whether a greenfield or brownfield implementation is the right choice for your business. The adoption scenario needs to be aligned with your expected outcome and the benefits you are looking to achieve with SAP S/4HANA. SAP S/4HANA is clearly the way forward if you want to continue to use SAP and benefit from the latest innovations. You can start performing some of the housekeeping activities straight away to reduce your overall project timelines and aim for a smooth transition to SAP S/4HANA.

In the next chapter, we'll explain how SAP Activate can support each of the SAP S/4HANA adoption scenarios. We'll review the new SAP framework that supports the SAP S/4HANA implementation project, and we'll cover all aspects of the solution from agile methodology.

Chapter 14
Using SAP Activate

SAP Activate is a framework based on an agile methodology that helps simplify the adoption of SAP S/4HANA whether it's for a new implementation, system conversion, or landscape transformation.

SAP Activate is SAP's framework for SAP S/4HANA. SAP Activate is more than just a method; a series of SAP Best Practices and guided configuration come with the SAP Activate methodology to accelerate project delivery and lower implementation costs for SAP S/4HANA projects.

Throughout this chapter, we'll take you through an overview of SAP Activate, including how it's used and which aspects are most well-suited to the different types of projects you may be considering. We'll also perform a deep dive into some of the tools and accelerators SAP Activate provides to support your project delivery. We'll then demonstrate how the methodology and framework can help accelerate end-to-end project execution for your organization.

14.1 SAP Activate Overview

SAP Activate is a combination of methodology, SAP Best Practices, and the guided configuration packs that have been specifically designed for SAP S/4HANA (Figure 14.1).

The level of adoption of the SAP Activate framework will vary for each transformation scenario. You may choose to use only the methodology with templates and accelerators if you're performing a system conversion, whereas you can use the full suite, including SAP Best Practices, model company, and guided configuration, for a new implementation. This is also true for the deployment scenario you decide to consider, be it SAP S/4HANA Cloud or on-premise SAP S/4HANA.

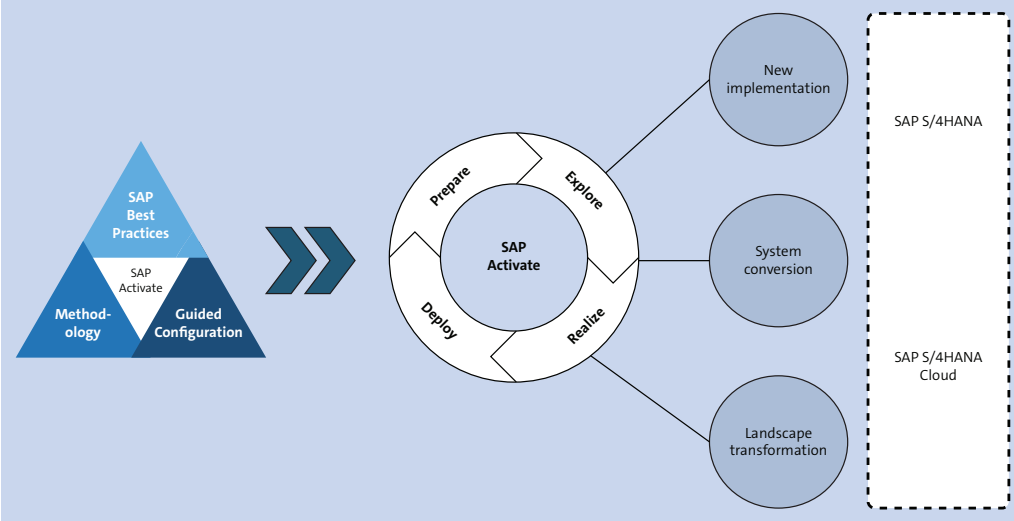


Figure 14.1 SAP Activate Overview and Deployment Options

Although primarily aimed at SAP S/4HANA, SAP Activate can also be used for implementation projects such as SAP Business Suite for SAP ERP, SAP Customer Relationship Management (SAP CRM), SAP Supply Chain Management (SAP SCM), and so on. In addition, you can use it for some SAP cloud solutions, such as SAP SuccessFactors, SAP Hybris Cloud for Customer, and SAP Ariba.

SAP Activate is a flexible framework, given that it supports different starting points and different adoption and deployment scenarios based on the type of SAP S/4HANA scenario you're looking to implement. As noted earlier, this can be a new implementation, a system conversion, or even a landscape transformation.

For those of you familiar with SAP's ASAP methodology, SAP Activate is the successor to ASAP.

The SAP Activate framework also comes with a set of functionalities ready to support your SAP S/4HANA project. Based on the adoption scenario, certain features may not be available within the SAP Activate framework. These restrictions also vary for on-premise and cloud deployments. Table 14.1 highlights the features of SAP Activate available for each adoption and deployment scenario.

		New Implementation	System Conversion	Landscape Transformation
Scenario characteristics		Data migration to SAP S/4HANA	Technical conversion from SAP ERP to SAP S/4HANA	IT transformation (consolidate or carve out) of SAP systems or a Central Finance scenario
Target audience		New or existing customers	Existing customers	New or existing customers
Deployment Option				
SAP Activate	SAP Best Practices	Yes	Migration and cloud integration	Migration and cloud integration, ready-to-run business processes based on use cases
	SAP Activate methodology	Yes	Yes	Yes
	SAP guided configuration	Yes	No	Applicable if ready-to-run business processes are used

Table 14.1 How SAP Activate Supports SAP S/4HANA Adoption Scenarios

As explained in Table 14.1, under the deployment options, the SAP Activate framework is split into three key areas (see Figure 14.2):

- SAP Best Practices
- Tools for guided configuration
- Methodology

Currently, self-service and expert configuration are available only for SAP S/4HANA Cloud versions.

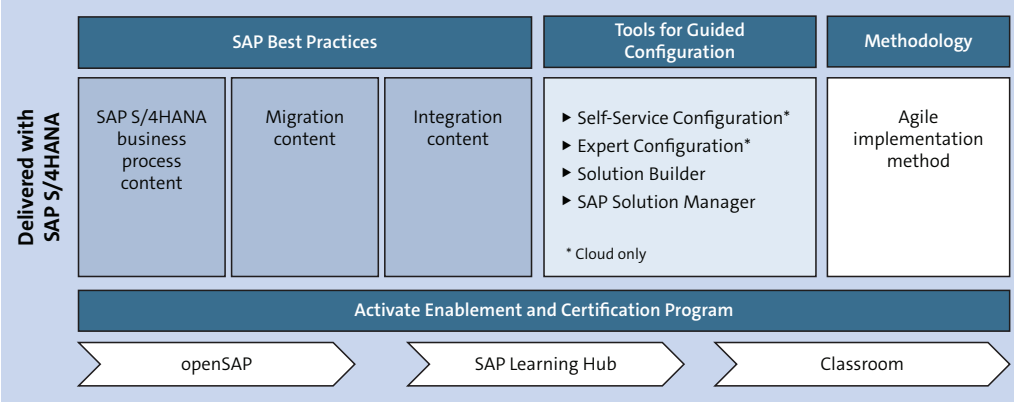


Figure 14.2 SAP Activate Accelerators

We'll perform a deep dive into these three key areas in the following sections. However, in addition to SAP Best Practices, guided configuration tools, and the agile implementation method, SAP Activate also provides a series of ready-to-use templates and accelerators that you can leverage throughout your project-delivery cycle. These accelerators are adapted to each phase of the SAP Activate methodology, and templates range from guidebooks to checklists or even questionnaires to support the delivery of your SAP S/4HANA project.

The agile implementation method accelerates product development and focuses on shippable releases, also referred to as *sprints*. The techniques used enable more efficient and higher-quality delivery execution while reducing the overall implementation risks. The agile approach differs from the traditional *waterfall* approach, in which each phase of the project (e.g., design, build, testing, etc.) was sequential. With the agile method, these phases become incremental.

Nevertheless, the use of these templates isn't mandatory. One of the benefits of SAP Activate is the flexibility it provides based on the complexity and size of your implementation project. How many times have we all struggled while trying to adopt a method or template before realizing that more than 50 percent of it doesn't fit the project or our organization's requirements? One of the benefits of SAP Activate is that it provides a set of standard deliverables for each work stream. You can either adopt or adjust these deliverables according to your specific requirements, as demonstrated in Figure 14.3.

If you want to explore some of the SAP Activate templates in more detail, sample versions are provided as part of the SAP Activate framework. These are available on the SAP roadmap viewer for SAP Activate at *http://bit.ly/2afat9p*.

Prior to finding the right templates for your project, you'll need to select the deployment scenario (i.e., cloud or on-premise) and the methodology (agile or waterfall) that you intend to use. In each deployment and methodology section, a set of accelerators and their associated templates are available to be downloaded, as shown in Figure 14.4.

Now that you have a better understanding of the ways SAP Activate can be used, including the scope and impact of each adoption and deployment scenario, in the following sections we'll explain how to use SAP Best Practices, how to leverage the tools for guided configuration, and how the methodology needs to be adopted to achieve successful project delivery.

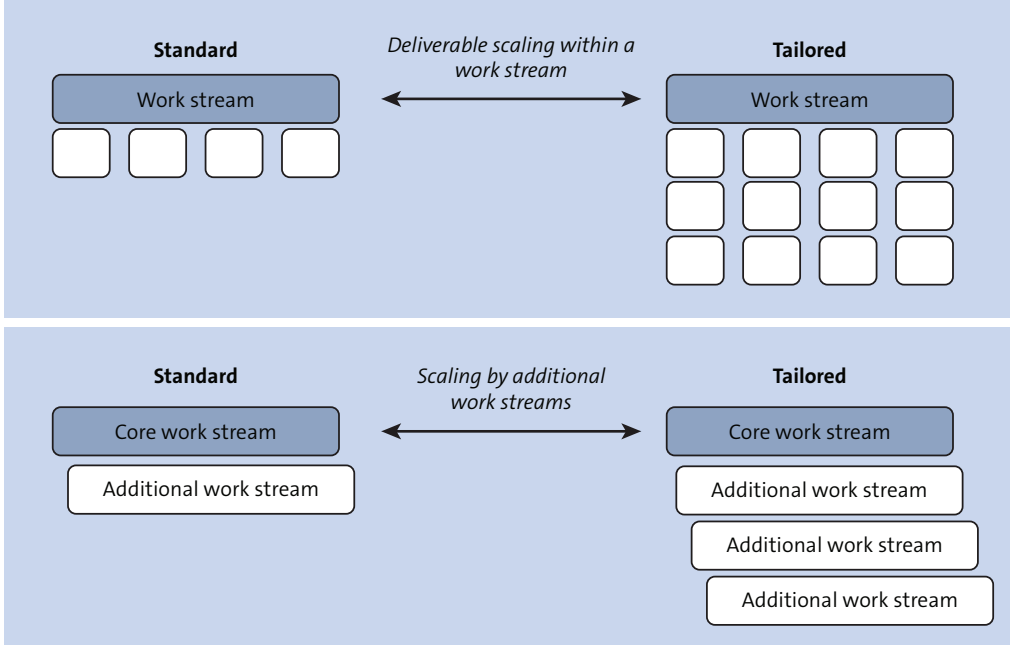


Figure 14.3 SAP Activate Flexible Methodology

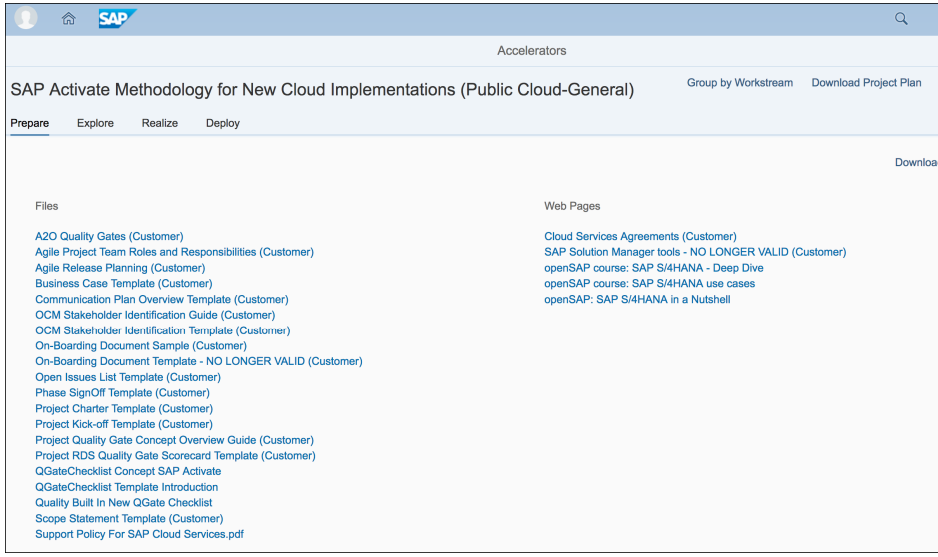


Figure 14.4 Sample List of SAP Activate Accelerators for SAP S/4HANA Cloud

14.2 SAP Activate Methodology

The SAP Activate methodology is built on an agile delivery approach, using SAP Best Practices that have been built to provide structure while delivering sufficient space for specific customer requirements.

The objective of SAP Activate is to accelerate the implementation or system conversion project you're undertaking. It provides structure and a foundation to adopt SAP S/4HANA with the methodology built around six key characteristics:

- **Start with SAP Best Practices**
  Use ready-to-run business processes.
- **Validate solution**
  Use SAP Best Practices to validate your process through fit/gap workshops.
- **Modular, scalable, and agile**
  Structure your project to deliver in sprints.
- **Cloud-ready**
  Leverage cloud-based solutions to provide flexibility and speed.
- **Premium engagement ready**
  Use SAP Control Centers to support building and running your SAP solution.

- **Quality built-in**
  Identify risk early with total quality approach.

In addition to these characteristics, SAP Activate is divided into four phases known as *prepare*, *explore*, *realize*, and *deploy*. The phases and the activities associated with each phase support the project execution to adopt SAP S/4HANA (see Figure 14.5).

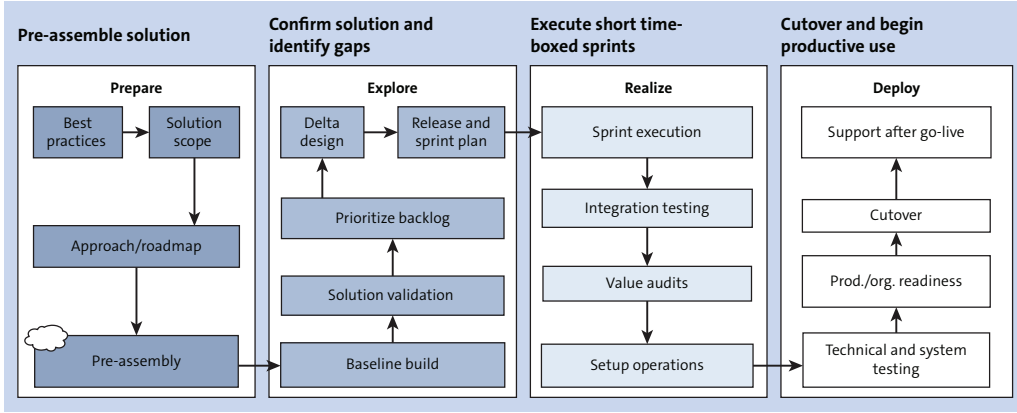


Figure 14.5 SAP Activate Methodology Phases

In the next few sections, we'll provide a detailed overview of each phase of the SAP Activate methodology before closing with a brief discussion of quality gates.

14.2.1 Prepare

The prepare phase is the foundation of the overall project kickoff and planning activities. You should start with SAP Best Practices to accelerate your SAP S/4HANA adoption. Doing so ensures process standardization and is based on business processes that have been adopted, tested, and tried for many years. The objective here is to provide faster time to value for SAP customers—that is, to allow them to benefit from SAP S/4HANA more quickly. The journey to adopt the SAP S/4HANA solution is already complex. Complexity will vary based on your starting point, but SAP Best Practices will help speed up the overall delivery.

These SAP Best Practices also provide a baseline for the overall solution, defining the scope of work to be adopted as part of the SAP S/4HANA implementation. Model companies also can be used that come with a full set of ready-to-use business processes, organizational structures, and sample data to support faster adoption. Additional detail on model companies is provided in Section 14.3.

To get started with SAP Best Practices, you need an SAP S/4HANA system—either an on-premise sandbox system or a ready-to-use SAP S/4HANA Cloud solution—to explore the content. This is referred to as *preassembly* in Figure 14.5.

For preassembly, the recommendation is to use a cloud-based SAP system that will allow you to jump-start your project with a system that can be up and running in a short time frame. This system includes SAP Best Practices and is aimed at supporting the validation steps during the explore phase. This helps clarify any process requirements or gaps in a live system before starting any work in the development environment.

During the prepare phase, the target environments are set up, and you can leverage the preassembled solutions using SAP Rapid Deployment Solutions (SAP RDS), SAP Best Practices, and the other prebuilt assets.

14.2.2 Explore

Coming out of the prepare phase, you should now have your baseline solution initiated using the tools and SAP Best Practices identified in that phase.

During the *explore* phase, you validate your baseline and identify if any of the business processes differ from that baseline. This phase is used to play back and validate the business processes with the key stakeholders. The business process validation and the associated detailed analysis are completed during the fit/gap workshop (see Figure 14.6).

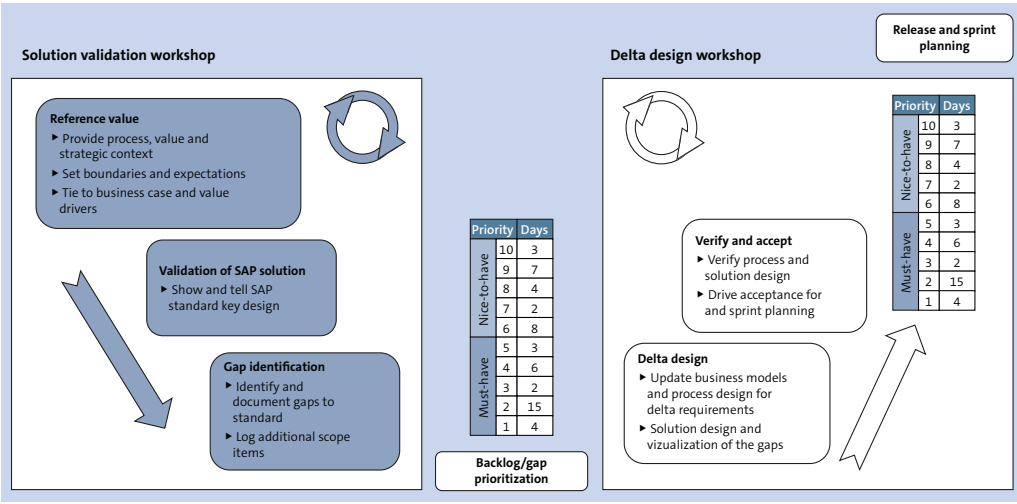


Figure 14.6 Fit/Gap Analysis and Workshops

Two types of workshops will help define the target business processes to be incorporated into the SAP S/4HANA solution. First, the SAP Best Practices reviews, known as *solution validation workshops*, will ensure that most processes are covered with the SAP Best Practices solution. This will also provide you with the opportunity to flag any gaps associated with SAP Best Practices and align the SAP solution to your specific business process requirements.

After the solution validation workshops have been completed, a series of delta design workshops will be initiated, taking into account the number of gaps identified and the associated complexity of each of these gaps.

The target business processes then will need to be updated to be in line with the latest agreement coming out of your delta design workshops.

The fit/gap workshops should also leverage the preassembly solution put together during the prepare phase. In addition to the preassembly system, SAP Best Practices and SAP Solution Manager can be leveraged to initiate the documentation of your business processes. The starting point should be to leverage the SAP standard business processes and documentation, driving standardization across the board. However, any process changes identified during these workshops can be documented and maintained in SAP Solution Manager, as explained later in Section 14.4.4.

As an output of these workshops, the project team should have a clear understanding of the process gaps and the recommended solutions to remediate these gaps. After these gaps have been captured, the project management team can finalize the release and sprint plans that define the build and test activities per release, prior to moving into the realize phase.

14.2.3 Realize

Although the *realize* phase is also sometimes referred to as *build and test*, the agile methodology backbone of SAP Activate means you can expect shorter configuration and build cycles that are better integrated with the business functions to receive feedback on the fly.

The realize phase will vary based on the SAP S/4HANA adoption you've decided to undertake. Although the activities will be considerably different depending on whether this is a new implementation, a system conversion, or a landscape transformation, all the activities are still supported by the SAP Activate framework. You can find additional information on how to adopt SAP S/4HANA in Chapter 13.

After validating the business solution and undertaking the delta design workshops in the explore phase to flush out any additional business requirements, it's now time for your target solution to be configured, developed, and tested. This phase also provides the opportunity to execute testing and peer review to ensure the solution build is up to standard. In line with the overall SAP Activate method and agile delivery, the objective of this phase is to ensure that a minimum viable product (MVP) is ready to use. Additional features can be added through additional sprints. This will accelerate the deployment of your SAP S/4HANA solution and guarantee better time to value.

14.2.4 Deploy

The *deploy* phase supports the final preparation before you move all your transports into the production environment and execute the cutover activities during the go-live weekend. All testing activities must be completed prior to initiating these activities. During this phase, end-user training and execution of the change communication occurs. The project leads will prepare the sites for transition, and any data-migration activities are executed in the productive environment before handing the system back to the business users.

Prior to executing the live cutover activities, a dry run should be performed to capture time lines and understand and identify any challenges that may occur during the actual cutover. It's also a good opportunity for you to make all the project teams and business teams familiar with the activities they will execute during the cutover, ensure integration across these teams, and align expectations for the big weekend.

The cutover will consist of a ramp down of the legacy system and ramp up in the new SAP S/4HANA system. Interfaces need to be redirected to the new productive environments, and all the build activities completed during the realization phase should now be moved to production.

Once all these activities are complete and smoke tests are executed, the system can be handed over to your business users. *Hypercare activities*, which entail supporting the production system after a new release has been moved to that environment, will start straight after the project go-live, and it's important to ensure that your operations

teams receive a handover to maintain the systems during the run phase. Handover activities should be initiated well in advance to guarantee a smooth transition.

14.2.5 Quality Gates

In addition to the four project phases in the SAP Activate method, a minimum of four quality gates are mandated as part of SAP S/4HANA implementation projects (see Figure 14.7). For more complex implementation programs, additional quality gates may be required.

A *project preview* session at the beginning of the prepare phase is strongly recommended to give the project team time to influence the next phase and perform any necessary adjustments. *Review* sessions at the end of each phase are mandatory to guarantee project standards and to ensure the agreed approach has been followed. It's possible to combine the preview and the review sessions for each phase to accelerate the overall process.

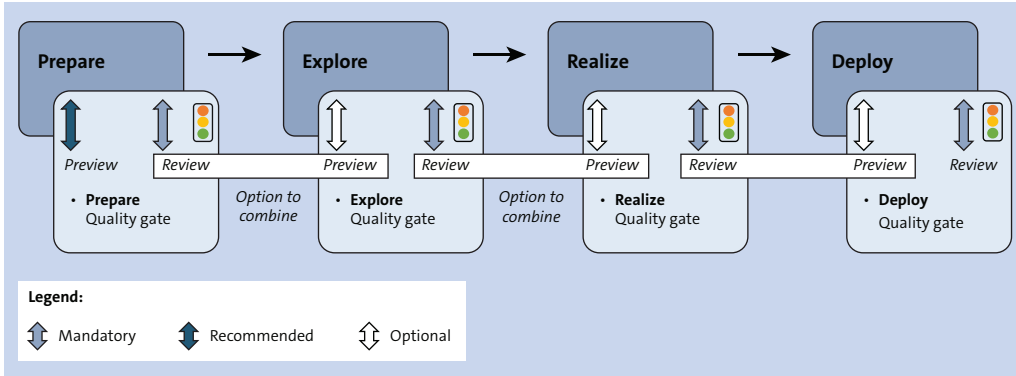


Figure 14.7 Mandatory Project Quality Gates and Recommended Review Phases

If you want to explore the SAP Activate methodology further, you can do so through SAP Jam for SAP Activate. There, you can access SAP Activate content and templates and interact with other SAP Activate subject matter experts in the SAP community (see Figure 14.8).

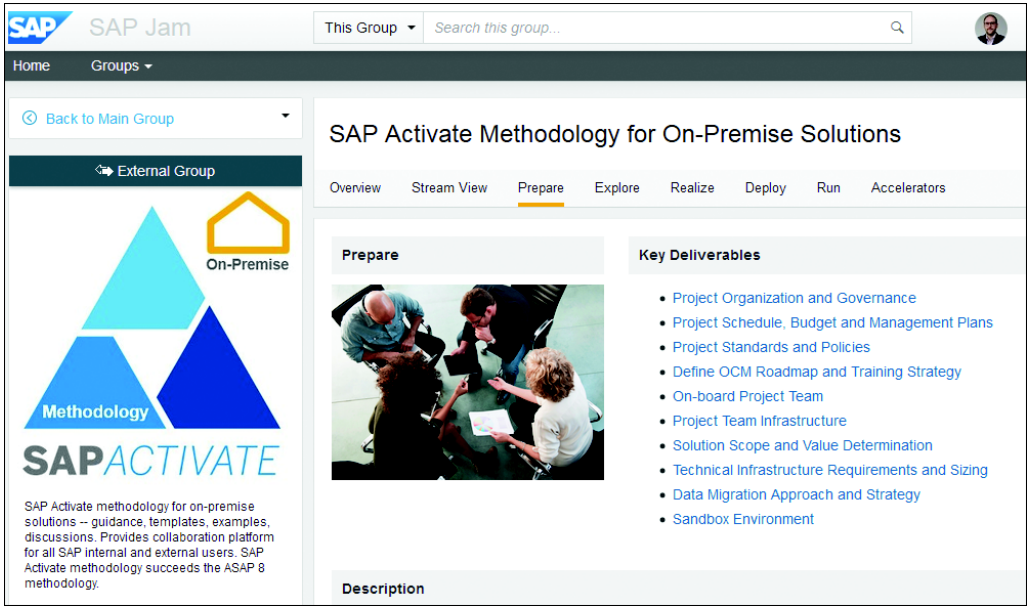


Figure 14.8 SAP Activate Methodology SAP Jam Group

To request access to the SAP Methodologies group on SAP Jam, submit your request at *http://bit.ly/SAPActivate*.

Now that you have a better understanding of how the SAP Activate method and project structure support the SAP S/4HANA project delivery, we'll dive into the SAP Best Practices and configuration tools that support the method.

14.3 SAP Best Practices for SAP Activate

SAP Best Practices provided with SAP Activate are made available to help kick-start the overall SAP S/4HANA implementation project. They provide ready-to-run business processes for SAP S/4HANA that also integrate with SAP cloud solutions such as SAP Ariba, SAP Hybris Cloud for Customer, SAP SuccessFactors, and SAP Hybris (see Figure 14.9).

The SAP Best Practices were built using SAP's deep industry and business process expertise to provide out-of-the-box processes, data, and template organizational structures to support strategic business imperatives and accelerate the adoption of SAP S/4HANA.

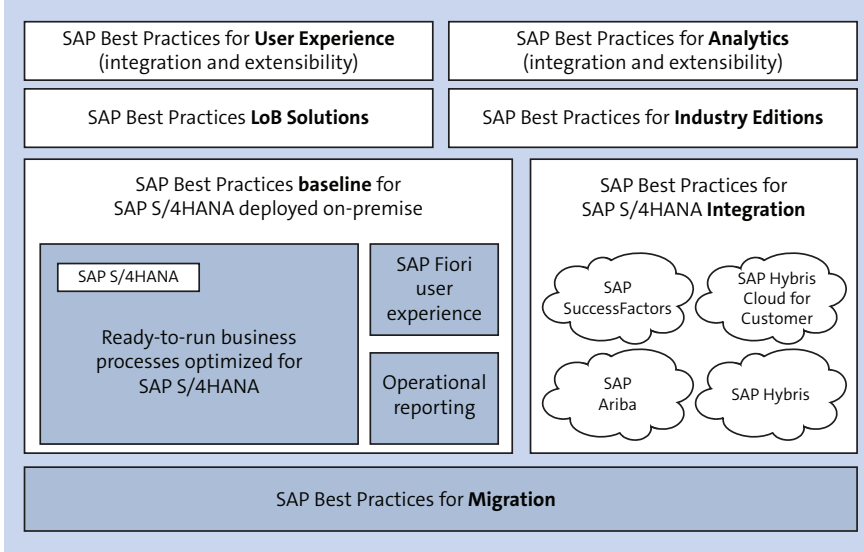


Figure 14.9 SAP Best Practices for On-Premise Deployment

SAP Best Practices content is made ready and available in your SAP S/4HANA system. However, it's worth checking if a more recent version of SAP Best Practices content has been made available before you start your implementation.

Note

SAP Best Practices content will vary based on the SAP S/4HANA version you're trying to implement. Content can be checked in SAP Note 2244659 (SAP Best Practices for S/4HANA, on premise edition Germany [DEV2]) or SAP Note 2247743 (Information on the installation of SAP Best Practices S/4HANA on premise edition [USA; USV2]) depending on whether you need DE or US localizations.

SAP Best Practices not only kick-start the build process but also provide a baseline for the preparation phase and support the fit/gap workshops. SAP Best Practices should be activated in the sandbox system to demonstrate the solution while supporting fit/gap analysis to flush out any specific requirements you may have as part of your business processes.

SAP Best Practices should drive rapid adoption of the standard SAP processes and solutions, which will help you eventually avoid additional customization requirements, thus reducing the overall maintenance cost for your SAP system.

Using the information from the fit/gap workshops, any delta requirements that aren't covered by SAP Best Practices will be prioritized to plan the realization effort and time lines.

After the scope of the solution has been agreed on and the related SAP Best Practices identified, the reference content associated with SAP Best Practices can be imported and activated in the development system.

Note

The procedure for activating reference content in the development client is available in SAP Note 2247743 (SAP Best Practices for S/4HANA, on-premise edition [USA; USV2]).

You'll need to select your SAP S/4HANA version to identify the relevant SAP Note for your best practice activation.

Prior to importing the SAP Best Practices content, the client associated with SAP Best Practices needs to be set up so that you can activate and deploy the content.

Note

Additional information on how to set up the SAP Best Practices client is available in the SAP Administration Guide for the Implementation of SAP S/4HANA, at *http://bit.ly/29aQhUn* (S-user ID required).

After the SAP Best Practices content has been imported, you can select the SAP Best Practices that you want to activate. SAP Best Practices are organized by business process—for example, period-end closing, make-to-stock production, accounts payable, and so on. This makes it easy to select the specific business processes you're looking for, as shown in Figure 14.10.

Scope Items

Scope Items	Description
US_BD3_OP	Sales Processing using Third Party (w. Shipping Notification)
US_BD6_OP	Credit Management
US_BD9_OP	Sales Order Processing: Sale from Stock
US_BDA_OP	Free of Charge Delivery
US_BDD_OP	Returns and Complaints
US_BDG_OP	Sales Quotation
US_BDH_OP	Sales Order Processing for Prospect
US_BDK_OP	Sales Processing using Third Party (without Shipping Notificat
US_BDN_OP	Sales of Nonstock Item with Order specific Procurement
US_BDQ_OP	Debit Memo Processing
US_BDW_OP	Returnables Processing
US_BEA_OP	Revenue Planning
US_BEG_OP	Standard Cost Calculation (Plan)
US_BEI_OP	Period End Closing "General" Plant

Figure 14.10 Scope Selection in SAP Solution Builder

Each **Scope Item** has a series of dependencies that are referred to as *building blocks*. Additional information on the SAP Solution Builder tool and the building blocks are provided in Section 14.4.3. The building blocks will contain items such as sample master data, customization sets, and templates (e.g., process documents or reports).

The SAP Solution Builder tool allows you to activate the SAP Best Practices package you specifically require for your SAP S/4HANA project. The selection of these SAP Best Practices packages will be defined by your business processes and are generated from the output of the validation and delta design workshops.

SAP Activate also provides model companies that help jump-start the configuration process within SAP S/4HANA. The model companies are an additional service on top of SAP Best Practices and come with associated business processes, master data, and organizational structures (see Figure 14.11).

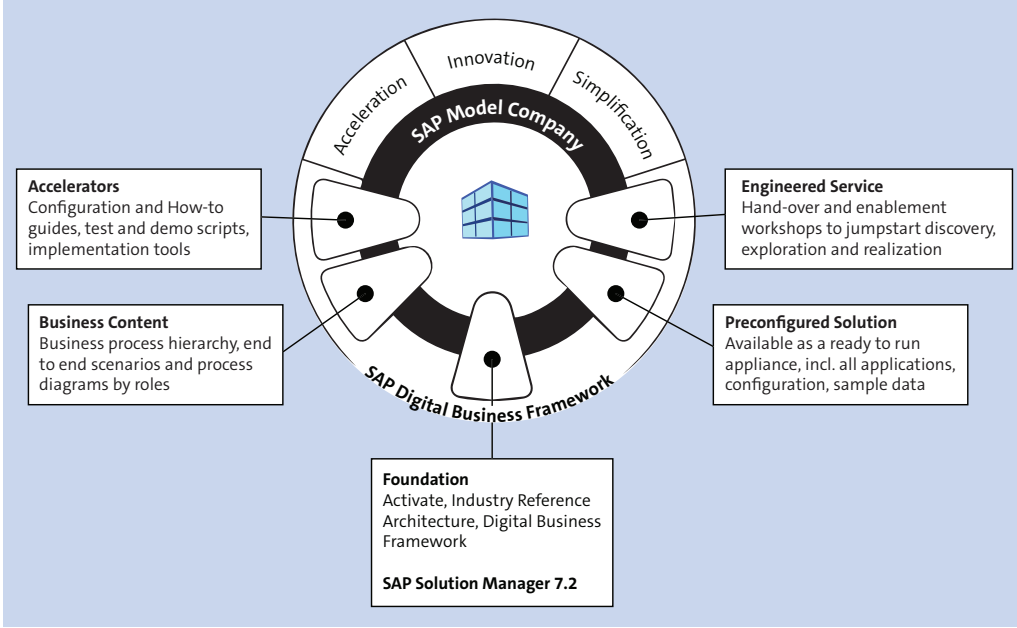


Figure 14.11 SAP Model Company for SAP S/4HANA

While leveraging the model companies, you can benefit from ready-made and preconfigured country or industry solutions. The country and industry solutions also can be activated via the SAP Solution Builder tool.

Note

SAP Activate provides SAP Best Practices for industries by leveraging the existing SAP RDSs for SAP S/4HANA. SAP is building multiple country localizations as a priority, but it will continue to enhance LOB scenarios and industry best practices on top of the existing SAP S/4HANA baseline.

14.4 SAP Activate Tools

SAP Activate isn't just a method; it also contains accelerators and tools that can be used by the entire project team during each phase of the SAP Activate framework. The SAP Activate accelerators vary from best practices guidebooks to delivery templates, checklists, and project management deliverables.

To support guided configuration of the SAP S/4HANA solution, SAP provides four key tools for the implementation of SAP S/4HANA:

- Self-service configuration (available with cloud deployment only)
- Expert configuration (available with cloud deployment only)
- SAP Solution Builder tool
- SAP Solution Manager

There are a few differences between SAP Best Practices and tools that are available with on-premise SAP S/4HANA versus SAP S/4HANA Cloud. The main discrepancies center on preconfiguration and content lifecycle management services, as described in Table 14.2.

SAP S/4HANA Cloud	On-premise SAP S/4HANA
SAP Best Practices, including business and integration processes optimized for SAP S/4HANA Cloud	SAP Best Practices, including business and integration processes optimized for on-premise SAP S/4HANA
Starter system for initial scoping and fit/gap	Project jump-start with on-premise software appliance
Self-service configuration for initial setup	N/A

Table 14.2 SAP S/4HANA Best Practices Based on Deployment Options

SAP S/4HANA Cloud	On-premise SAP S/4HANA
Scope extension through expert configuration	Scope extension through the classical Implementation Guide (IMG) approach
Content lifecycle management enabled by SAP	Content lifecycle management unavailable
SAP Solution Manager in the cloud, including SAP Best Practices business process and project content	SAP Solution Manager in the cloud or customer location, including SAP Best Practices business process and project content

Table 14.2 SAP S/4HANA Best Practices Based on Deployment Options (Cont.)

We'll now look at the functionality and benefits provided by the guided configuration solutions, the SAP Solution Builder tool, and the integration with SAP Solution Manager.

14.4.1 Self-Service Configuration

Self-service configuration is currently only available with SAP S/4HANA Cloud. The initial SAP S/4HANA system is preconfigured with sample data that provides a jump-start to system configuration and supports the prepare phase and the fit/gap workshops during the explore phase. The preconfigured system also comes with ready-to-run business processes provided with the SAP Activate framework and SAP Best Practices, as mentioned in previous sections.

Self-service configuration enables you to adjust the out-of-the-box solution to your specific business requirements. It leverages the SAP Fiori UX, making the overall solution easier to use than the IMG normally accessed via Transaction SPRO. The new UI, focused on simplification and ease of use, will only display configuration activities added as part of the SAP Best Practices preselected scope, described in Section 14.3.

The new UI considerably reduces the time and complexity associated with performing the configuration tasks by simplifying the number of screens required to complete the system configuration requirements (e.g., company code setup). However, the self-service configuration doesn't allow you to change the business process flow. It does allow you to adjust the existing business processes to support your organizational structure requirements. Process adjustments fall under the umbrella of expert configuration, covered in the next section.

14.4.2 Expert Configuration

Expert configuration is primarily aimed at advanced SAP users who are responsible for maintaining business process configuration within their organizations. Again, this is only for SAP S/4HANA Cloud.

This functionality provides both SAP customers and partners the ability to build on top of the standard SAP business processes while also ensuring consistency with the standard SAP business processes. The modeling of your solution needs to be completed via expert configuration, either to adapt standard SAP processes or to build your own new processes.

14.4.3 SAP Solution Builder Tool

The SAP Solution Builder tool is used to activate the SAP Best Practices content provided with SAP Activate for SAP S/4HANA.

After all the installation data files and solution scope files have been downloaded from the SAP Service Marketplace for the selected countries and release, you can import them into the SAP Solution Builder tool.

After importing SAP Best Practices, the installation data that contains the installation settings associated with configuration, and data for the SAP S/4HANA solution, this content can be uploaded into the system.

An SAP Solution Builder profile has been created to import all SAP Best Practices; however, if your project scope has already been defined, it's possible to select the SAP Best Practices content that you're looking to activate, as mentioned in Section 14.3. This defines the solution scope file that contains the technical structure, scope items, building blocks, and technical objects for the SAP S/4HANA solution.

In addition, the selected scope items are assigned to building blocks. Certain scope items may have dependencies related to the building blocks, which means that some items will need to be deployed in a predefined sequence because the building blocks have reusable content, such as business configuration, sample master data, and so on, that is used cross-scope.

Once all the configuration is complete, including your specific business configuration requirements, it's recommended that you separate the transports among SAP Best Practices, the changes to SAP Best Practices, and your own specific configuration.

14.4.4 SAP Solution Manager

SAP Solution Manager 7.2 is designed to support SAP Activate. You can import SAP Best Practices for SAP Activate into SAP Solution Manager 7.2.

It's possible to review some SAP Best Practices content in SAP Solution Manager 7.1 by activating the solution package via Transaction SOLAR_PROJECT_ADMIN; however, the information provided isn't identical to the SAP Best Practices available with SAP Solution Manager 7.2.

Note

Throughout this book, when we refer to SAP Solution Manager, we'll be referring to SAP Solution Manager 7.2, as it's the version designed to support the implementation of SAP S/4HANA using SAP Activate.

SAP Activate provides templates, in addition to the SAP Best Practices described in Section 14.3, that can be imported into SAP Solution Manager to support project management time lines and activities, as well as business process design.

In addition, for any of your business processes that differ from the standard SAP Best Practices, adjustments can be made and documented in SAP Solution Manager via Business Process Model and Notation (BPMN). This will help you consolidate project documentation and process modeling within your SAP Solution Manager system.

In addition to the other benefits SAP Solution Manager usually provides while managing the application lifecycle of your SAP system, SAP Solution Manager 7.2 provides a centralized access point for project templates, SAP Best Practices, business process models, and documentation supporting the overall implementation of SAP S/4HANA.

14.5 Summary

SAP Activate is the framework designed to support your SAP S/4HANA adoption, regardless of the transformation scenario or deployment method you decide to follow for your SAP S/4HANA implementation. Certain restrictions are currently in place based on these decisions; however, SAP will continue to develop the SAP Activate framework to support and accelerate the adoption of SAP S/4HANA based on these scenarios.

Let's now move on to Chapter 15, which will introduce you to the other solutions that may be part of your SAP landscape.

Chapter 15
SAP S/4HANA and the SAP Landscape

This chapter addresses the growing SAP portfolio of products used to build a digital value chain. We'll cover the SAP products outside the SAP S/4HANA core solution that you'll need to complete a digital platform, as well as address functional overlaps and synergies for a complete picture.

Now that you understand the key innovations SAP S/4HANA provides for finance and logistics, we want to take a closer look at the extended SAP portfolio—those line of business (LOB) solutions that complete the SAP S/4HANA digital core (see Figure 15.1). These are still independent solutions that can be consumed standalone if required, but they're also tightly integrated with the SAP S/4HANA core to meet the demands of a digital platform. Like SAP S/4HANA, these solutions were also designed to support the drivers of digital transformation—real-time information, big data, customer experience, connected devices, and so on.

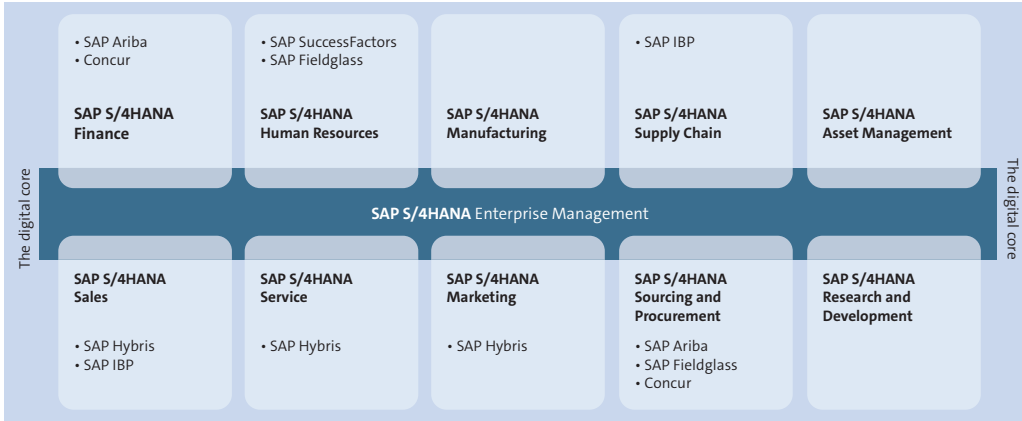


Figure 15.1 SAP S/4HANA Suite and Line of Business Solutions

With these edge solutions, you can do the following:

- Simplify your procurements and sourcing strategy with SAP Ariba
- Manage your contingent workforce with SAP Fieldglass
- Control your travel and expense costs with Concur
- Optimize your human resources (HR) processes with SAP SuccessFactors
- Improve your customer relationship management with the SAP Hybris portfolio
- Manage your master data using SAP MDG
- Optimize your supply chain with SAP IBP

In the following sections, we'll give an overview of each product, its functional capabilities, and how it fits in to the overall SAP portfolio.

15.1 Sourcing and Procurement: SAP Ariba

The SAP Ariba software as a service (SaaS) suite contains the biggest business commerce network to offer real-time collaboration between buyers and sellers. SAP Ariba is SAP's strategic sourcing and procurement solution embedded in SAP S/4HANA. Because the SAP S/4HANA suite contains all core functionalities and capabilities, SAP recommends SAP Ariba for source-to-pay as one of several edge products that complete the digital core.

Procurement with SAP Ariba is organized into three main processes:

1. Sourcing and contracts
2. Requests and purchases
3. Invoices and payments

15.1.1 Sourcing and Contracts

The sourcing process focuses on the management of electronic requests for information (RFI), requests for quotation (RFQ), and requests for proposal (RFP). At the same time, sourcing also conducts process compliance, reverse auctioning, and reporting against business key performance indicators (KPIs). The contract process focuses on the management of contracts (e.g., expiration) and conducting authoring compliance.

The main areas of sourcing and contracts in which SAP Ariba stands out are as follows:

- **Spend analysis**
  Good spend visibility is very important for companies, but not all companies have it. Traditionally, spend visibility has incorporated data aggregation, dashboards, and reporting, but with SAP Ariba Spend Analysis, companies can access commodity classification, supplier enrichment, market intelligence, and integrated spend management. SAP Ariba Spend Analysis will provide accurate ideas to make decisions such as improving the pipeline, increasing purchasing with suppliers, reducing inventory costs, mitigating supplier risk, and so on. Therefore, SAP Ariba Spend Analysis makes spend management more effective through data enrichment, 3-D visibility for true spend intelligence, robust analytic tools, and native integration with sourcing, contract management, supplier information, performance management, and procure-to-pay.
- **Supplier discovery**
  One of SAP Ariba's strengths is supplier discovery. The Ariba Network can be used to search for new potential suppliers. Suppliers are required to introduce their commodities with a unique code (United Nations Standard Products and Services Code [UNSPSC]), which enables customers to reach out to suppliers. Suppliers must pay to be available in the Ariba Network, unless a customer invites a supplier to an RFx, in which case no extra costs (e.g., license costs) are charged to the supplier.
- **Supplier lifecycle performance**
  SAP Ariba Supplier Lifecycle and Performance provides comprehensive tools to help you onboard, qualify, segment, and manage supplier performance more effectively. Integrated into your procurement processes, it lets you drive spending to preferred suppliers and scale compliance for your entire supply base using an array of key capabilities. The key capabilities of SAP Ariba Supplier Lifecycle and Performance are as follows:
  - Unified vendor data model in the cloud provides a single accurate supplier record
  - Supplier self-service in the cloud via Ariba Network makes it easy for suppliers to self-maintain their own information
  - Flexible matrix for supplier qualification and segmentation lets you manage suppliers based on specific parameters
  - Full integration with other SAP Ariba procurement applications supports speed and consistency throughout the entire procurement business

- **Strategic sourcing**
  The Ariba Network enables SAP Ariba sourcing to have a very agile and rapid way of creating and managing RFx or auctions. Customers have detailed information about responses from suppliers that were invited to RFx or auctions, as well as real-time contact with those suppliers.

  Strategic sourcing incorporates capabilities such as sourcing projects with the ability to embed best practices for sourcing processes, approvals, and collaboration, as well as RFx and auctions management using electronic template-based event support for RFI, RFP, and RFQ. SAP Ariba supports multiple auction types, savings pipelines and tracking, decision support and optimization, integrated customer support, and out-of-the-box integration with spend visibility, discovery, contracts, suppliers, and procure-to-pay.
- **Contract management**
  SAP Ariba Contracts manages all organization agreements and subagreements on an integrated SaaS platform. It creates workflows during contract creation and maintenance. It leverages prebuilt best practices templates and workflows and improves collaboration with suppliers. Contract lifecycle management provides organizations the opportunity to put their users in charge of contract maintenance. A contract repository is available for contract users in SAP Ariba. In the contract details, there is also the possibility to add clauses to the clauses repository.

15.1.2 Requests and Purchases

Request processing focuses on strategic requisitioning capabilities, such as collaborative requisitioning and approvals, supplier onboarding, and catalog management, among others. The buying process focuses on order routing, spot-buy capabilities for noncontract spending, purchase order generation, and supply chain execution.

The main areas of requests and purchases in which SAP Ariba stands out are as follows:

- **Collaborative requisitioning and approvals**
  The Ariba Network enables multiple suppliers to collaborate. It works with catalog and noncatalog items, supports a spot-buy functionality, and enables collaborative configuration of complex items. The approval phases include four steps: precollaboration, begin collaboration, end collaboration, and postcollaboration.
- **Catalog management**
  With the Ariba Network, there are three types of items in a catalog: standard catalog, noncatalog, and punch-out catalogs. A *punch-out catalog* is a special version of

a supplier's web catalog that's connected to the procurement system of a purchasing organization. Punch-out items behave the same way as catalog items in that a supplier can have one or more links to the punch-out catalog. Catalog kits enable adding multiple, bundled products with one click.

- **Order routing and notices**
  Among other order-routing functionalities, orders are transmitted through the Ariba Network, exported to SAP S/4HANA or SAP ERP, copied, dispatched manually, and combined.
- **Spot buy**
  Indirect materials such as one-offs or emergency purchases that usually need rapid processing can be bought using SAP Ariba's spot-buy capability. These suppliers are referred to as "long-tail" or one-off suppliers. Approved suppliers can be found in the SAP Ariba Spot-Buy Catalog, which follows corporate policies and ensures secure payment and shipment of goods. Typically, these nonsourced goods make up to 15 percent of the overall indirect spend.
- **Supply chain execution**
  Efficient supply chain execution is one of the important competitive key differentiators of the global and outsourced economy. Companies are asked to collaborate with all trading partners through a single global solution across multiple processes and geographies in real time. SAP Ariba Supply Chain is based on the Ariba Network, connecting all systems and stakeholders, collaborating effectively with multiple tiers of suppliers, and trading with partners at the same time in direct materials procurement. It manages all relevant processes, including consigned inventory, rolling delivery schedules, and contract management. SAP Ariba users can respond to changes in supply and demand in real time and identify errors using configurable business rules with automated validation and reconciliation.
- **Guided buying**
  The SAP Ariba guided-buying capability is a persona-based application offering nonprocurement professionals a single place to search for goods and services, making purchases with little to no involvement from the procurement department.

  The guided-buying capability captures organizations' purchasing policies and uses them to guide casual users and functional buyers to the outcomes they need. Users know right away when a policy is violated, rather than finding out after submitting a request. An example guided-buying screen is shown in Figure 15.2.

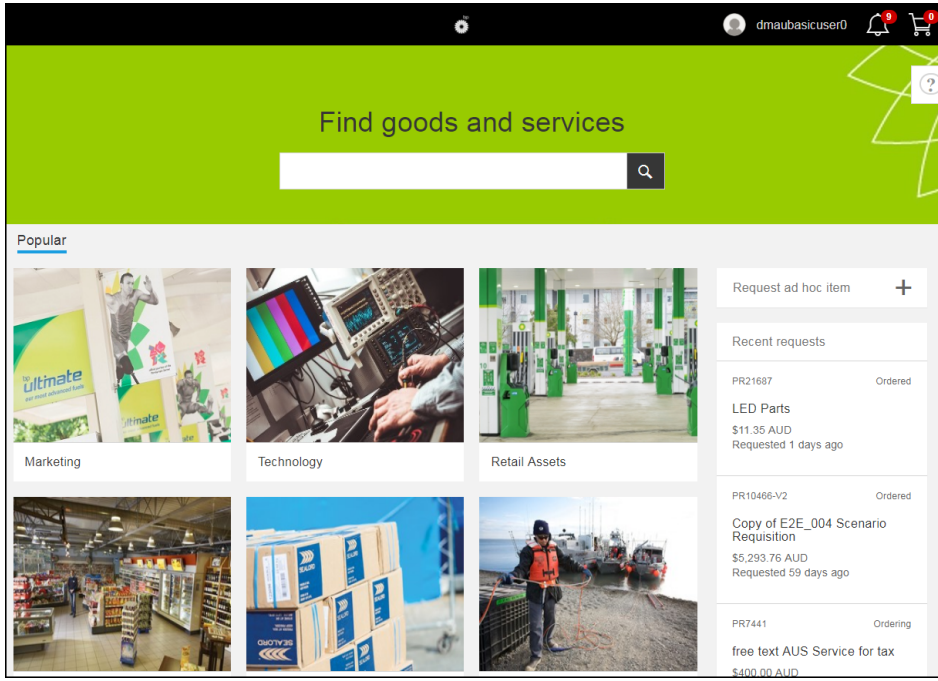


Figure 15.2 Guided Buying Landing Page

Here are some of the key features of guided buying:

- Guided buying targets exclusively casual users and functional buyers.
- Guided buying focuses on the ultimate UX: smart, simple and quick.
- Guided buying targets no-touch or low-touch procurement.
- Guided buying does not replace the purchase-to-pay (P2P) or sourcing functionalities but offers a better, simpler, and guided functionality for a specific subset of users who do not require all additional capabilities the aforementioned modules offer.
- Guided buying can also be an entry point for users to other SAP Ariba modules, like those that handle sourcing and procurement.

15.1.3 Invoices and Payments

Invoice processing focuses on digitizing invoices into an electronic format, which contains process steps such as delivery, matching, validating, and approval of invoices. SAP Ariba proactively converts suppliers submitting paper invoices to an electronic

process after they reach a certain volume threshold, reducing the expense of paper as a positive side effect.

Payment processing focuses on synchronizing the delivery with electronic payments to eliminate risks and inefficiencies.

The main areas of invoicing and payments in which SAP Ariba stands out are as follows:

- **Invoice automation**
  Buyers have taken a series of approaches to automate their invoice processing. The invoice workflow for accounts payables (AP) streamlines the capturing, processing, matching, and finally approving of all invoices. Business users of SAP Ariba Invoice Management can create their own workflows tailored by categories of spend, suppliers, or other business-crucial variables. Invoicing can be performed easily and anywhere by email or smartphone, supporting remote and line-level invoice approval. It supports monitoring of both transaction details and supplier performance.
- **Invoice reconciliation**
  SAP Ariba's payment capability allows for simple supplier reconciliation. Invoices are matched either two ways or three ways. In the two-way scenario, after receipt, both the supplier invoice and the corresponding purchase order are matched, validated, and finally reconciled. In the three-way scenario, the purchase order receipt is considered as well. Invoices aren't changed; instead, a copy of the invoice is created and changed. Validation is performed on both the header and line item level by comparing amounts for each level to each other's document. In a final step, amounts are paid.
- **Discount management**
  With SAP Ariba Payables, discounting capability, suppliers are supported if requesting discounts from their buyers, enrolling in net or discount terms, and offering and accepting dynamic discounts. Buyers are supported in the ongoing management of discounts.
- **Working capital management**
  Usually, suppliers face challenges with inconsistent payment terms such as rigidly initiated payment terms from buyers. SAP Ariba's payment capability manages and extends payment terms of the working capital, which usually strategically results in reduced days sales outstanding (DSO) on the supplier side or extended days payable outstanding (DPO) on the buyer side.

- **Business-to-business (B2B) payments**
  A secure partner is engaged to capture, manage, and maintain sensitive supplier bank information to bridge the gap between invoicing and payment. Payment control is improved at a lower cost of processing. At the same time, the risk of fraud associated with payments is minimized.
- **Expense reimbursement**
  Travel expense reimbursement (through Concur) provides all employees with functionality to enter, calculate, approve, and finally reimburse expense types such as mileage for private cars used, meals, accommodation/hotels, and local and public transport.
- **Bank automation**
  SAP Ariba's payment capability eliminates the need to maintain supplier bank account information as bank account data is stored in an external IT environment. Supplier payment inquiries are reduced when paying suppliers automatically.
- **SAP Ariba's invoice collaboration service (ICS)**
  This solution facilitates conversion of paper invoices to cXML (including OCR) using a process that includes validation. A service provider managed by Ariba receives paper invoices by mail or electronic invoices via email and converts them to cXML (an electronic format) for posting to the Ariba Network. The buyers can also scan the invoices themselves or use their own service providers to scan and send the images to SAP Ariba.
- **SAP Ariba's open invoice collaboration service (open ICS)**
  This is like ICS, but the main difference is that the buyer's service provider (e.g., OpenText) handles the scanning and OCR and generates the cXML format. Ariba works with the buyer and the service provider to integrate the provider's invoice-conversion solution with the Ariba Network.

15.1.4 SAP Ariba and SAP S/4HANA

SAP's strategy for procurement is divided into two blocks. Operational transactions (materials management, purchase order, operational contract, etc.) are part of SAP S/4HANA Enterprise Management, and strategic collaboration is covered by the LOB solutions from SAP Ariba, SAP Fieldglass, and Concur, as shown in Figure 15.3. This creates a set of hybrid solutions that reflect the demand of today's organizations and that leverage the advantage of SAP Ariba and SAP S/4HANA integration. Strategic sourcing is executed in the SAP Ariba applications; best-value bids are finalized and

result in a contract with price terms. The following scenario shows that SAP Ariba and SAP S/4HANA work perfectly in a fully integrated way:

- With the SAP Ariba Catalog, contract terms and pricing can be enforced at the catalog item level, driving compliance and resulting in realized savings.
- SAP Supplier Relationship Management (SAP SRM) users can punch out to the SAP Ariba Catalog to search for items and then complete their purchase order process in SAP SRM.
- After purchase order execution in SAP SRM, the purchase order is sent over to the supplier via the Ariba Network for fulfillment and invoicing.

From a licensing perspective, it's possible to have a licensing model for the pure cloud scenarios (with SAP Ariba as the procurement engine integrated into SAP S/4HANA) or for hybrid scenarios (SAP S/4HANA from end to end).

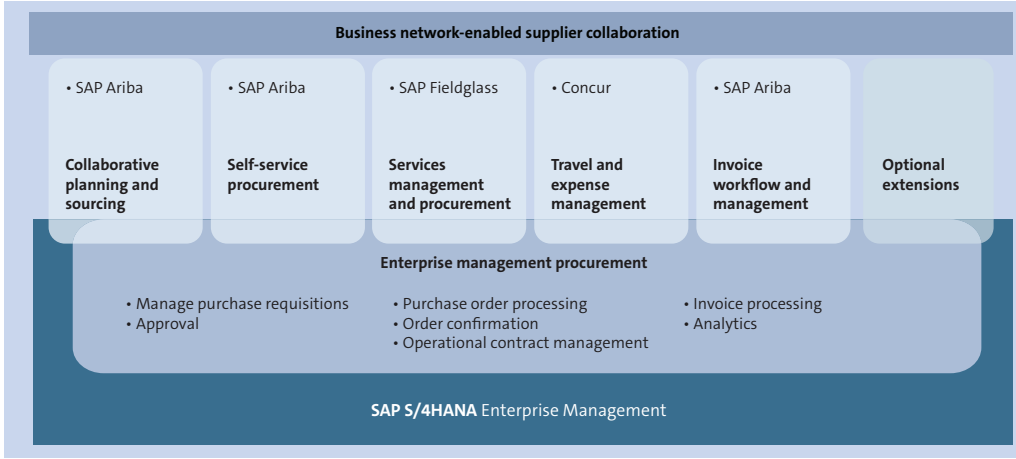


Figure 15.3 SAP S/4HANA Suite and Lines of Business

From a technical integration perspective, a lot of prepackaged integration content or best practices are already available in rapid-deployment solutions (RDSs). These cover strategic procurement, operational procurement, and collaborative finance integration scenarios. According to SAP's future roadmap for SAP S/4HANA integration, there will be further integration content to ensure a rock-solid and tight integration with the LOB solutions from SAP Ariba. If customers now want to move toward SAP S/4HANA, they can already start using SAP Ariba products to put real strategic sourcing in place.

15.2 Contingent Workforce Management: SAP Fieldglass

SAP Fieldglass is the leader in services procurement and contingent workforce management, and it completes the SAP portfolio for external services such as contingent workers, statement of work projects and services, independent contractors, and specialized talent pools. SAP Fieldglass's main solution is a cloud-based vendor management system (VMS) that automates the complete contingent and statement of work (SOW) labor lifecycle (see Figure 15.4). As part of the overall SAP S/4HANA strategy, SAP Fieldglass completes the exciting SAP SuccessFactors and SAP Ariba portfolio, and it gives customers total workforce management with full-time and contract workers in a single platform.

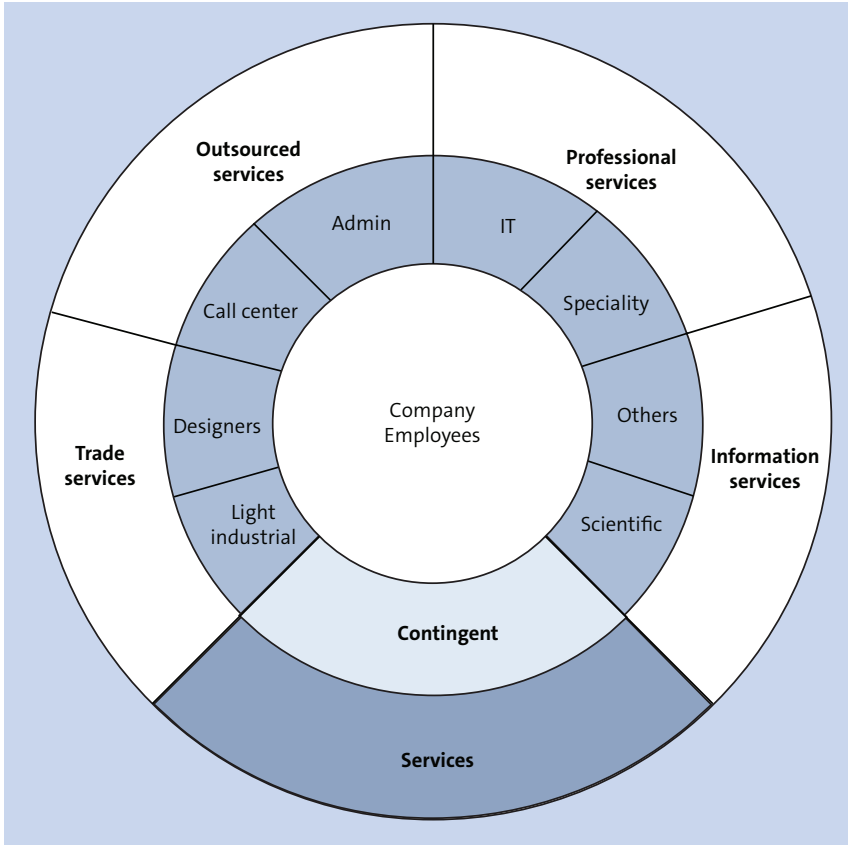


Figure 15.4 Overview of SAP Fieldglass Services

15.2.1 Vendor Management System

SAP Fieldglass supports the full lifecycle of a service engagement, from creating the RFx to evaluating the service provided (see Figure 15.5). It provides the capability to support complex projects with multiple SOWs and supports clients through the lifecycle from sourcing to engaging, managing, and invoicing.

The SAP Fieldglass VMS enables users to do the following:

- Use the Decision Wizard as a guide though the different engagement types and support the best worker composition from temporary workers to consulting services.
- Create requisitions easily that cover the essential parts of a job posting to support hiring managers in their process.
- Perform approvals outside the tool via email and cover multiple levels of authorization. These can be tied to different types of rules, such as financial limits or departments/functions.
- Establish distribution lists of top-performing suppliers, and, from there, establish stepwise distribution to second- or third-tier providers. This enables users to assign specific or important job postings/categories to preferred suppliers to increase quality.
- Use the candidate review to get a quick side-by-side comparison of candidates, build shortlists, track the whole history of candidates, and get guidance on the candidate's price.
- Improve the quality and experience of new workers with action items and checklists though the on- and off-boarding functions. This also provides transparency to the project management office.
- Adjust the time and expense functionality to the organization's needs to reflect different types of workers.
- Convert approved time sheets into an invoice that supports legal/tax requirements and discounts via the automatic invoicing function.

In addition, there are business intelligence and administrative tools that support the overall process and provide needed transparency.

From an integration point of view, there are currently more than 800 integration points available and standard integrations into some LOB solutions from SAP. The overall platform is based on an n-tier J2EE architecture and is delivered as a multitenant SaaS solution hosted by SAP Fieldglass itself.

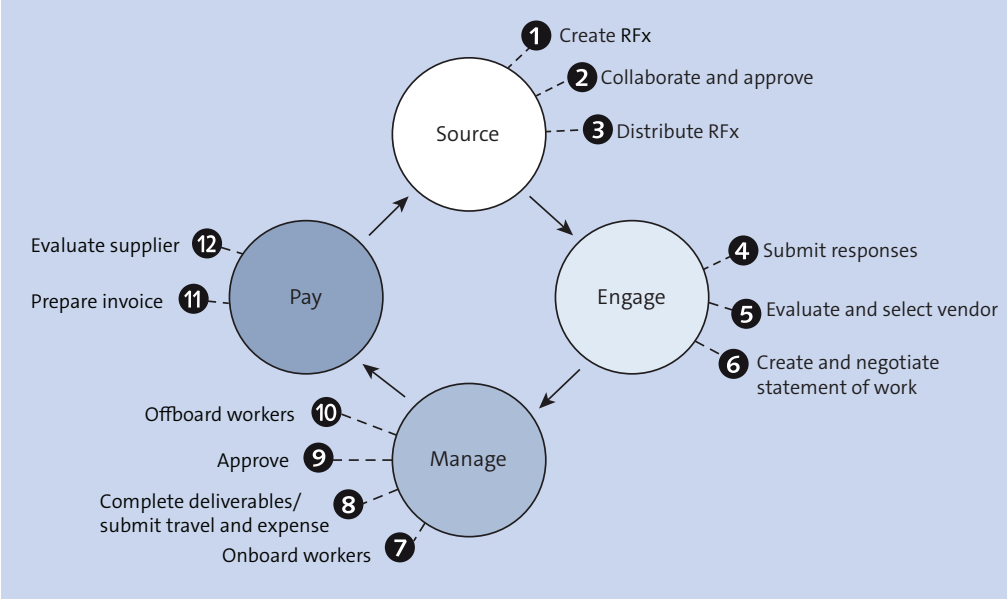


Figure 15.5 Typical Overview of Service Engagement Lifecycle

15.2.2 SAP Fieldglass and SAP S/4HANA

SAP Fieldglass follows the same strategic direction as the other cloud-based solutions outlined in Figure 15.3. Its focus is on services procurement and contingent labor; from a strategic perspective, it will be the go-forward solution for services procurement within the SAP solution stack. Therefore, tight integration with other business networks products, such as SAP Ariba and SAP SuccessFactors, is required.

As an outlook for future releases, SAP has shared that it anticipates offering a standard integration for invoice processing delivered as prepackaged content for SAP S/4HANA within the next releases, which would underpin the strategic positioning of SAP Fieldglass as part of the future SAP S/4HANA roadmap.

From a license perspective, SAP Fieldglass can be run as a separate solution with a separate license model that isn't part of the SAP S/4HANA license. If a customer is going to implement SAP S/4HANA, there is no conflict and no direct implication. Companies that want to implement SAP Fieldglass can start with an existing ERP system; integration scenarios and packages are already available.

15.3 Travel and Expense Management: Concur

Concur is a solution that combines and integrates overall spending into three major blocks: Concur Travel, Concur Expense, and Concur Invoice. The central principle is that all connected information can be managed in one place and provide transparency into overall spending. Concur integrates with numerous third-party solutions and apps, from Airbnb and United Airlines to Uber and Starbucks.

15.3.1 Spend Management

All information used to plan a trip and to organize travel is captured within Concur Travel, even if it's captured offline by a travel agent working with Concur. All this information is exchanged with Concur Expense and flows into an employee report, which makes it much easier for employees to create their expense reports.

The portfolio consists of five main products:

1. **Concur Expense**
   Provides full visibility into spending and the ability to ensure policy and regulatory compliance. It provides the capability to synchronize a credit card as a baseline for the generation of claims. It also provides a nice and easy UX to guide you through the expense-claiming process.
2. **Concur Travel**
   Uses the same easy UX as Concur Expense and simplifies online travel reservations and booking. As noted, this booking tool is tightly integrated with Concur Expense and feeds information to Concur Expense as a baseline for expense reports.
3. **Concur Invoice**
   Accelerates and simplifies the invoicing of expenses and reduces invoice costs significantly. It helps automate invoices and provides transparency into your overall travel and expense spending.
4. **Concur for Mobile**
   Complements the web-based solution to make it possible to manage expenses and perform travel or invoice approvals from a mobile device.
5. **Concur Intelligence**
   Delivers data and tools to control spending. Interactive dashboards, reports, and alerts provide a real-time view into how much is being spent and who's spending it.

Integration of Concur Expense and Concur Invoice into SAP's HR and financial solutions is planned as part of the overall digital core strategy. Especially for HR, a legal

reporting standard integration is planned for the near future. For Concur Travel, further integration into mobile with, for example, location-based bookings is planned. As part of Concur Intelligence, a spend management dashboard with actionable analytics is planned.

Concur has two focus areas planned to enhance and integrate into the existing SAP portfolio:

- **Consistent preconfigured country regulatory templates across SAP and Concur**
  The goal is to deliver simplified regulatory templates out of the box for existing countries such as Germany, the United Kingdom, and France, as well as new countries.
- **Standard seamless, automated integration with SAP backend**
  This integration is currently available via the Boomi connector for SAP, flat file, web service, custom connector, or customer bridge program. Further enhancements, especially in employee management/HR, include cost object data for HR and finance master data and the support for finance interface postings.

15.3.2 Concur and SAP S/4HANA

Like for the two previous products discussed, Concur is aimed at completing the business network and extending the SAP portfolio toward travel and expense management. From an implementation perspective, there are no limitations for SAP S/4HANA. The integration path is the same for customers running SAP ERP Human Capital Management (SAP ERP HCM) and SAP ERP Financials (FI) on separate instances and on a single instance, or for customers running SAP S/4HANA Finance, or any combination of these. From an integration perspective, SAP shared that standard integration packages that support FI and payroll postings will be available in a future release that support integration scenarios via SAP Cloud Platform or SAP Process Orchestration (SAP PO).

From a financial perspective, Concur is available with a separate license and isn't being considered in the SAP S/4HANA license model.

15.4 Human Resources: SAP SuccessFactors

As part of the digital core strategy, SAP SuccessFactors is the default HR functionality of SAP S/4HANA. Mobile-enabled with a modern UX, SAP SuccessFactors includes a

complete set of core HR options with payroll, tightly integrated talent management solutions, robust workforce analytics and planning, and social collaboration tools.

This cloud HR suite is a highly scalable SaaS solution that offers various ways to extend existing process functionality beyond what's available out of the box. Standard solution configuration capabilities are supported with the ability to create new objects and business rules with the Metadata Framework (MDF) and create new applications with SAP Cloud Platform.

Further, standard integrations between SAP SuccessFactors and SAP S/4HANA are available to ensure that SAP SuccessFactors Employee Central is truly the next-generation core HR system of record for employee data.

Let's look at SAP SuccessFactors functionality in more detail in the following subsections.

15.4.1 Employee Data

SAP SuccessFactors Employee Central is the core HR component of the SAP SuccessFactors solution. It captures employee and organizational data, and it's built around the concept of self-service for HR professionals, managers, and employees.

SAP SuccessFactors Employee Central is an enterprise-grade, event-based transactional system with full workflow support. It includes position management, time-off management, global benefits, and reporting on employee and organizational data, as well as compliance and auditing. It also includes SAP SuccessFactors Employee Central Payroll, which is provided as an SAP-hosted solution based on SAP's long-established on-premise payroll engine.

15.4.2 Talent Management

SAP SuccessFactors has a broad array of talent management and related analytics functionality:

- **SAP SuccessFactors Recruiting Management and SAP SuccessFactors Recruiting Marketing**
  Together, these functions form a comprehensive recruiting solution that supports attracting, engaging, and selecting better candidates in an efficient way and then measuring the results of the recruiting process. Recruiting Management is a mobile and socially enabled applicant-tracking system that allows companies to select and hire the best talent faster. Recruiting Marketing is a social recruiting

marketing platform that allows companies to attract and engage quality candidates via state-of-the-art social solutions, custom career sites, and analytics to measure the efficiency of various recruitment channels used in recruiting marketing campaigns.

- **SAP SuccessFactors Onboarding**
  This solution for new hires and hiring managers improves time to productivity, job satisfaction, and new hire retention. It guides and empowers new hires to access SAP SuccessFactors solutions via which they can fill in required new hire forms, access documentation, become acquainted with their new teams, enroll in and complete initial training, set initial goals, and use social collaboration tools that will help them become familiar with the new work environment.
- **SAP SuccessFactors Learning**
  This is a comprehensive learning management system that supports social and mobile learning to ensure compliance and development of talent with an enhanced learning experience. SAP SuccessFactors Learning enables managing, developing, and deploying instructor-led, offline, and formal and social online training.

  The SAP SuccessFactors Learning content service allows you to focus on learning quality and strategies while eliminating the need for hosting learning content and managing content infrastructure, security, delivery, and updates of learning content.
- **SAP SuccessFactors Performance & Goals**
  This is a performance management and goal-setting solution that allows you to create an aligned and high-performing workforce. Goal management enables you to communicate company strategy, create meaningful individual and group goals across the company, and assign/cascade them to employees so that they can support company business goals and strategy. Goals execution and progress can be measured in real time. SAP SuccessFactors Performance & Goals delivers various types of evaluations, performance assessments, and performance calibration; it streamlines the performance appraisal process and helps managers by providing tools (writing and coaching assistant, legal scan) and content that ensure a meaningful and compliant performance review and feedback process. Employee performance in relation to business goals is measured and can be integrated with the company reward system.
- **SAP SuccessFactors Compensation**
  This is a comprehensive compensation management solution that helps to retain top talent by supporting a pay-for-performance strategy and process. Compensation management allows you to create reward budgets with flexible approvals

workflows, and budget spending monitoring is supported by analytics. It also enables you to create compensation plans with various pay components, including basic pay, bonuses, and stock. Part of SAP SuccessFactors Compensation is the variable pay module that supports very complex bonus programs based on performance results from multiple employee assignments within the company. Compensation enables a pay-for-performance reward culture by supporting reward pay based on performance results. Compensation calibration helps to make better compensation decisions with the support of objective ratings and ultimately helps to retain top talent and increase employee productivity.

- **SAP SuccessFactors Succession & Development**
  This solution supports succession planning and career development planning and allows you to identify, develop, and retain talent throughout the organization.

  Succession management allows you to identify key positions in the organization and nominate potential successors for those positions while monitoring their readiness to fill the role. The objective is to plan for staffing changes and ensure the readiness of nominated successors. Career development planning allows you to create development plans, track development activities for employees and nominated successors, and align learning activities with identified competency gaps to ensure that employees and successors will be ready to take on new future roles within the company. It improves motivation with continuous development and career planning; employees can track their preferred roles and monitor their readiness based on the competency levels required to progress to the role. A comprehensive talent search engine, a nine-box grid performance-potential matrix, and talent calibration are also provided.

- **SAP SuccessFactors Workforce Analytics**
  This is a comprehensive analytics and reporting solution that allows you to create reports and dashboards (with trend analysis) with aggregated data and with the ability to drill down to deeper levels of detail. It comes with a set of predefined metrics and KPIs across core HR and talent modules. Workforce Analytics supports reporting on external data sources and can be connected to multiple systems to create cross-functional reports and dashboards. These reports and dashboards can be delivered to managers and business leaders in the form of published reports and easily consumable insights with a combination of core HR, talent, and non-HR data. Workforce Analytics enables access to industry benchmarks so that companies using the solution can compare themselves with industry peers across various metrics.

- **SAP SuccessFactors Workforce Planning**
  This solution addresses an organization's need to plan the future workforce based on business need and trends. It's a strategic workforce planning tool based on a long-term planning approach (as opposed to a short-term, operational planning approach) to match the required workforce to projected future workforce demand in terms of cost and skills. Based on available workforce data and benchmarks, the solution allows you to assess the company's readiness to execute various strategies (i.e., talent and reward strategies), forecast the impact of business decisions (i.e., mergers and acquisitions, development of new product line), mitigate the risk, and take specific actions that the solution proposes from library of strategies and actions. Multiple what-if scenarios can be modeled based on set parameters to analyze cost impacts. Predictive capabilities are available to support capability analysis in the context of current trends.

15.4.3 SAP SuccessFactors and SAP S/4HANA

From SAP's perspective, SAP SuccessFactors (as opposed to an SAP S/4HANA version of SAP ERP HCM) is the go-forward human capital management solution for SAP S/4HANA and the go-forward solution for the HR category within SAP's diversified cloud strategy. With adoption of the SAP HANA platform for foundation, integration, analytics, and application development, and with SAP Fiori for UX, the SAP SuccessFactors suite is the firmly established solution in the SAP solution portfolio and the future SAP S/4HANA roadmap.

SAP S/4HANA delivers significant simplifications and innovations compared to the previous-generation SAP ERP solution in which the SAP ERP HCM component resided. Currently, SAP doesn't plan to take the SAP ERP HCM component through the same simplification and innovation process, and there are no plans to invest in new functionality and innovations in SAP ERP HCM. SAP S/4HANA doesn't have an on-premise version of an HR transactional system. However, it requires a simple set of HR data fields to support finance and other SAP ERP processes.

According to SAP, the current SAP ERP HCM portfolio will be updated and maintained until at least 2025, and SAP will continue to make double investments—minor on-premise investments and significant cloud investments. The SAP ERP HCM on-premise solution will be updated primarily within core HR localization, compliance, SAP Fiori unification, and UX areas.

The SAP SuccessFactors solution can be integrated easily from the data and process perspective with on-premise and other cloud systems via prepackaged and SAP-

maintained integrations, predefined integration templates, and APIs and custom integrations. Although customers have multiple options available for integrating SAP SuccessFactors with other solutions, SAP's preferred solution for SAP SuccessFactors integration middleware is SAP Cloud Platform Integration, an integration-as-a-service platform specifically designed to support integration of SAP's range of cloud solutions with other on-premise and cloud systems. SAP is significantly investing in extending the range of prepackaged integrations with SAP cloud applications and other vendors' solutions.

For companies using on-premise SAP ERP HCM that want to implement talent management solutions, SAP SuccessFactors is an obvious choice because no enhancements are planned for talent management on-premise solutions. For companies that want to implement an HR information system with SAP, the SAP ERP HCM on-premise solution is still a viable option (i.e., it will still be tweaked for specific industry regulations, compliance localizations, and language support); however, from the long-term strategic perspective, SAP SuccessFactors Employee Central is a safer route.

In the end, companies that want to implement SAP S/4HANA or SAP S/4HANA Cloud that also require a human capital management suite will likely focus on the SAP SuccessFactors solution due to the current and planned SAP investment level and innovation in cloud human capital management solutions, as follows:

- Prepackaged integrations are available now, so companies can connect SAP SuccessFactors Employee Central with SAP S/4HANA Cloud and SAP Success Factors Employee Central integration with SAP S/4HANA. Integration capabilities are available via SAP Cloud Platform web services, via SAP PO for SAP S/4HANA, and via SAP Cloud Platform and web services for SAP S/4HANA Cloud.

  Companies that want to implement SAP S/4HANA, are using SAP ERP HCM on-premise, and aren't yet ready to implement SAP SuccessFactors can continue to use SAP ERP HCM, running in a separate instance or a single instance together with SAP S/4HANA. SAP has plans for prepackaged integrations to enable both scenarios.
- One SAP roadmap for SAP S/4HANA Cloud and SAP S/4HANA integration will likely expand in the areas of employee integration, time sheet integration, total workforce integration with SAP Fieldglass, SAP SuccessFactors Employee Central, SAP ERP HCM, and SAP Ariba for the integration of contingent workforces. SAP also plans an interface for payroll postings to SAP S/4HANA Finance and an inte-

gration of supplier data from SAP S/4HANA to SAP SuccessFactors Employee Central to support the contingent worker assignments there.

15.5 Customer Relationship Management: SAP Hybris

In the age of digitalization, the demand for a customer-centric and everywhere-accessible buying experience is increasing. As part of SAP's own customer-focused strategy, the SAP Hybris portfolio addresses this demand and completes SAP S/4HANA.

The SAP Hybris portfolio includes four key offerings: SAP Hybris Commerce/SAP Hybris Commerce Cloud, SAP Hybris Marketing/SAP Hybris Marketing Cloud, SAP Hybris Billing and SAP Hybris Revenue Cloud, and SAP Hybris Cloud for Customer (including SAP Hybris Sales Cloud and SAP Hybris Service Cloud). As a portfolio, these offerings are fundamentally centered on customer engagement and commerce. Offerings include a combination of digital strategy, implementation services, and support services, which are integrated across multiple channels—but what use does this portfolio have within the world of modern business?

Today, business is about more than just business-to-business (B2B) or business-to-consumer (B2C) activities. The new buzzword is *customer-to-business* (C2B). Empowered customers are reshaping how business works and are expecting a new, deeper kind of engagement and experience. Consider the cases of Woolworths and Blockbuster: Once dominating forces, they were forced into decline after failing to adapt fast enough to significant changes in technology and being unaware of how influenced these changes should be by the perceived experience of the customer. Organizations are now starting to put customer experience at the core of their digital focus in the absence of physical stores via virtual style advisers, for example, and have hence secured a strong following. C2B business is about understanding and acting on customer signals and derived trends, building relationships, and delivering experiences that make customers ask for more. Customer engagement is reshaping industry dynamics and how businesses are run. The SAP Hybris portfolio can empower businesses to take control of their digital transformation journeys and preempt their customers' behavior to secure the most appropriate response and to keep them engaged.

In this section, we'll discuss the offerings behind the core of SAP Hybris: SAP Hybris Commerce, SAP Hybris Marketing, SAP Hybris Billing and SAP Hybris Revenue Cloud, and SAP Hybris Cloud for Customer (including SAP Hybris Sales Cloud and SAP Hybris Service Cloud).

15.5.1 Commerce

Industries across the globe are investing in commerce and backend systems to meet the demands of today's increasingly sophisticated customers. Companies from all sectors are seeking backend systems that provide an integrated view of their core business processes.

SAP Hybris Commerce offers the following features:

- Fully integrated solution for commerce, sales, and service
- SAP Hybris catalog and storefront access for agents
- Customer and address data synchronization
- Integrated SAP Hybris customer ticketing system
- Integrated SAP Hybris assisted service module

Together, these key features enable businesses that run SAP Hybris Commerce to do the following:

- Enable personalized customer engagement
- Improve customer relationships
- Make sales processes more efficient
- Provide exceptional customer service across channels
- Gain a 360-degree view of customers

SAP Hybris Conversion

Leverage online browsing behaviors and purchase intent to retarget your customers and make it easy for them to convert. For instance, if a customer abandons a shopping cart, you can send him an email with a reminder to complete the purchase with one click or deliver display ads based on recently viewed content.

The integration of SAP Hybris with other SAP solutions provides a standardized, ready-to-use framework that connects SAP Hybris Commerce's omnicommerce capabilities with SAP products, including SAP S/4HANA; SAP Configure, Price, and Quote; and SAP Hybris Marketing Cloud applications. This means that implementation partners no longer need to build integrations from scratch. With fewer custom configurations, the integrations can be implemented faster and at lower cost. It offers integration options in several areas, including transfer of master data, integration

with SAP Hybris Marketing Cloud and SAP Customer Activity Repository, and solution and services configuration, to name a few.

Alongside these key features, there are several accelerators available for SAP Hybris Commerce: B2B, B2C, China, and several industry-specific accelerators.

15.5.2 Marketing

The evolution of the digital economy has seen a change in buyer behavior, and marketers have been challenged to keep up. The trend is toward contextual marketing, which systematically delivers mass personalization of customer interactions by leveraging insights about each individual customer to shape the customer's experience as each interaction unfolds. Contextual marketing allows marketers to engage customers in an intelligent way that nudges them toward a purchase rather than distracting them if they're already on that path.

SAP Hybris Marketing goes beyond customer relationship management to help marketers develop the full context of individual customers and deliver highly personalized content and interactions at every stage of the customer journey. It also helps marketers understand the performance of all marketing activities to optimize resources, drive customer advocacy, and stimulate growth.

SAP Hybris Marketing helps marketers do the following:

- Capture all customer engagement data along each customer's journey
- Leverage advanced analytics to gain deeper customer insights into behaviors and motivation for accurate targeting and personalization
- Enable real-time marketing with increased marketing transparency and internal collaboration
- Play what-if scenarios and use predictive capabilities to optimize offers in the moment
- Unify the customer view and create a single, always-current source for customer information

SAP Hybris Marketing is a comprehensive marketing solution built on the digital platform and has the following offerings:

- **SAP Hybris Marketing, data management**
  Leverage customer profile information to gain deep insights into a customer's intent and motivations. Leverage advanced analytics to discover and visualize hidden trends, customer sentiments, and customer journey insights.

- **SAP Hybris Profile**
  Capture relevant customer information across multiple sources and enrich customer information to provide the real-time intent of customers. Gain insights about known and unknown customers in real time. Proactively identify customer opportunities.
- **SAP Hybris Marketing, segmentation option**
  Slice and dice data on the fly using this high-performance customer-segmentation tool with insightful visualization and exploration tools. Use the waterfall UI with its rich set of targeting operations to build complex segmentation trees easily with real-time counting.
- **SAP Hybris Marketing, recommendation option**
  Provide context-relevant smart recommendations based on previous purchasing behavior in real time to leverage predictive analytics. Self-learning models optimize recommendations to the best offers. Increase conversion rates and average sales order size by cross-selling and up-selling.
- **SAP Hybris Marketing, planning option**
  Align marketing with transparent marketing plans. Manage the complete budgeting process and gain insights into real-time budgets and expenses. Manage campaigns from a single calendar view of all relevant marketing activities. Keep track of key campaign figures.
- **SAP Hybris Marketing, insight option**
  Gain a real-time understanding of your marketing performances with a management dashboard that shows all relevant marketing KPIs across the organization. Quickly identify opportunities and drill down to discover the key insights for segments, products, channels, budgets, campaigns, and assets.
- **SAP Hybris Marketing, acquisition option**
  Plan and execute personalized and targeted multichannel wave campaigns through email, SMS, direct mail, and other channels. Receive aggregated campaign performance information and detailed analytics at individual engagement levels.
- **SAP Hybris Loyalty**
  Plan and execute personalized loyalty programs and rewards. Capture customer insights through loyalty programs, and leverage the insights to deliver relevant loyalty marketing engagements. Convert customers into loyal brand advocates.

The combination of these offerings provides needed functionality in the digital era.

15.5.3 Revenue and Billing

We increasingly see a move to subscription and consumption business models and increased growth of partnerships across all industries. Companies are exploring new business models across all processes and industries with very different approaches. Many products and services are being repackaged, reengineered, or developed exclusively for monetization via a subscription model from companies ranging from OnStar and HBO Now to Zipcar and Match.com.

SAP Hybris Billing connects the front office with product and services monetization, offering a consistent experience across all channels and touch points. Companies must deal with an increasingly larger customer database, for which customer experience is critical. In addition, an increasing number of businesses are incorporating new models that are focused on providing middleman/brokerage services, for which, in principle, the same platform and solution is being used for business-to-business-to-customer (B2B2C).

As shown in Figure 15.6, SAP Hybris Billing covers the complete exchange-to-exchange process, as described here:

- **Design**
  Design bundles of products and services, defining the pricing policies and allowances, model of subscription contracts, and agreements with customers and consumers.
- **Sales**
  Manage quotations and contracts.
- **Deliver**
  Deliver sales bundles and services, register the usage events, identify the contract/client, and rate the services.
- **Billing**
  Handle billing and invoicing, with great flexibility for how invoices are issued, revenue assurance processes, and advanced collection managements.

SAP Hybris Billing connects to the other products in the SAP Hybris suite, such as SAP Hybris Commerce and SAP Hybris Marketing. It can also help with the following:

- Enhanced customer experience with a complete subscription selling, solution bundling, monetization, billing, and self-care solution
- Better context and predictive pricing, with rich customer profiles based on real-time usage information, billings, and payment behavior tracking

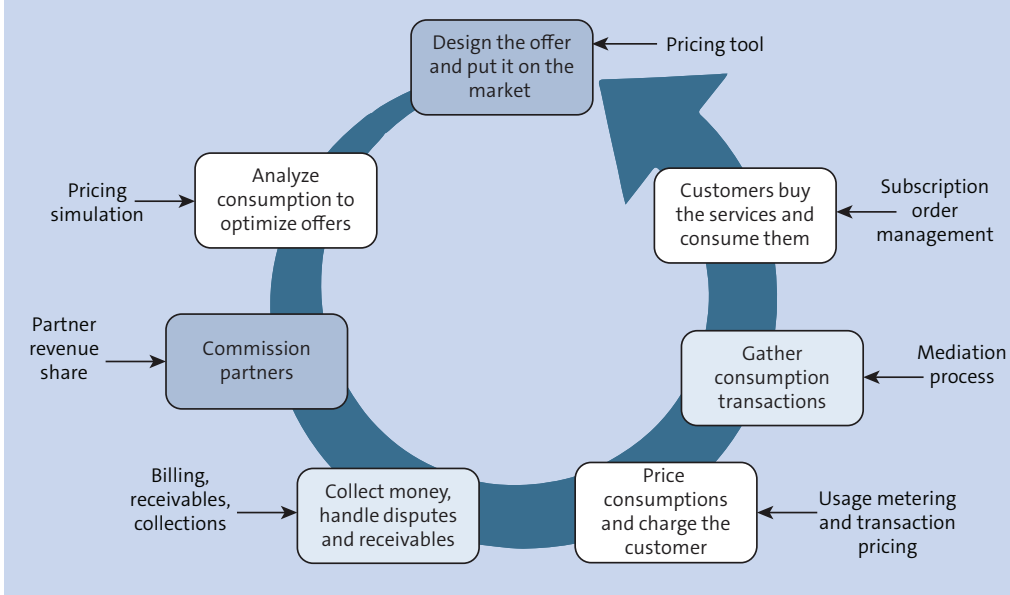


Figure 15.6 SAP Hybris Billing Solution Overview

SAP Hybris Billing is a modular solution, and, depending on the client's needs, the integration scenarios can vary from a lean subscription model to a complex subscription management scenario. In the complex scenario, a system is required to manage all changes to subscriptions (product change, extensions, etc.); integration with services activation systems or logistics systems, including sophisticated call center scenarios, for which it can also integrate with third-party customer relationship management/output management systems; and integration with SAP CRM and SAP ERP SD functionality.

SAP Hybris Revenue Cloud is a comprehensive cloud-based solution for configure, price, and quote (CPQ), order management, and subscription billing. Built completely on SAP Hybris as a Service, SAP Hybris Revenue Cloud is based on a microservices architecture. With this solution, you can deploy highly effective and innovative sales and monetization processes in an agile, flexible, and scalable environment. It's built on the flexible SAP Cloud Platform and is available in the public cloud through SAP Hybris as a Service.

15.5.4 Sales and Service

SAP Hybris Cloud for Customer is a full cloud solution that covers the two main areas of sales and services; it completes the SAP Hybris front-office solution and is fully integrated into SAP S/4HANA.

SAP Hybris Sales Cloud reflects the key requirements for selling in the digital era:

- Account management and intelligence to provide 360-degree customer information and intelligence
- Mobility support and personalization for any device
- Real-time and predictive analytics functionality to build up custom dashboards and ad hoc reports or forecasts based on SAP HANA
- Prebuilt integration scenarios for SAP S/4HANA
- Collaboration and social capabilities

SAP Hybris Service Cloud helps companies serve their customers on every channel and is suitable for first-level support and field-service support. It provides the following functionalities:

- Contextual collaboration for fast support
- Omnichannel service—for example, social media, chat, email, phone, and so on
- Native integration into SAP S/4HANA and SAP Hybris Commerce
- Solution finder capabilities for improved productivity that can integrate with different sources
- Real-time analytics based on SAP HANA

Together, these solutions comprise SAP Hybris Cloud for Customer, which forms an important part of the SAP Hybris portfolio and serves as a frontend layer to personalize and improve customer experience with SAP S/4HANA.

15.5.5 SAP Hybris and SAP S/4HANA

SAP Hybris extends the SAP S/4HANA suite for customer-centric activities. Because SAP Hybris consists of several subproducts, it has a separate license model that isn't included in the SAP S/4HANA license. You can purchase and run most of the SAP Hybris products separately. Nevertheless, they are tightly integrated; for example, SAP Hybris Marketing is built on SAP HANA and leverages the full capabilities of the platform.

Implementation of SAP Hybris products isn't dependent on SAP S/4HANA, but they can complement the implementation in different scenarios; for example, you can use SAP Hybris Cloud for Customer to support smaller sales subsidiaries or business units and integrate it into SAP S/4HANA.

From an integration perspective, several scenarios will be available in future releases that aren't yet confirmed and assigned to any release. The integration of SAP Hybris Cloud for Customer with SAP S/4HANA Cloud and SAP S/4HANA with the SAP S/4HANA Marketing Cloud via SAP Cloud Platform or via SAP PO depends on the deployment model. Prepackaged content is available that supports the opportunity-to-order process between SAP S/4HANA and SAP Hybris Cloud for Customer.

15.6 Master Data Management: SAP Master Data Governance

So far in this chapter, we've primarily discussed the cloud-based solutions that complement the SAP S/4HANA core, but it's important to switch gears for a moment to cover SAP Master Data Governance (SAP MDG). Beginning with SAP S/4HANA 1610, SAP MDG is embedded into SAP S/4HANA, in addition to being available on any database (including the SAP HANA database).

SAP MDG is an SAP NetWeaver-based product built on top of SAP ERP to help organizations enable governance processes for master data, ensure data quality, and remove data duplication. Master data can be created, changed, and approved centrally in SAP MDG and distributed to enterprise-wide systems. This product works in conjunction with other products, like SAP Information Steward to analyze data quality or with SAP Data Services, which has multiple features for extract-transform-load (ETL) functions, data quality enhancement, and even data consolidation.

SAP MDG 9.0 comes with prebuilt master data models for business partners (supplier and customer), materials, FI-related master data like profit center, profit center hierarchy, cost element/hierarchies, cost center, cost center hierarchy, and G/L accounts, and other master data from partners for enterprise asset management, retail, and fashion management. With every release, SAP develops more content for the data models.

SAP MDG also allows consolidation of master data in a governed manner. In this scenario, data can be loaded into SAP MDG; duplication checks and data merges are now possible.

The following features make SAP MDG the master data governance tool of choice for SAP-centric landscapes:

- Built-in data models and the possibility of extending standard data models and creating new data models for master data objects.
- Improved UX with Web Dynpro-based UIs and an increasing number of SAP Fiori-based UIs.
- Requests for master data creation normally undergo approval cycles; with SAP MDG, different types of workflows are easily enabled with validation rules through the BRF+ framework, and ABAP workflows and parallel workflows are also possible.
- Once the change request for a master data creation/change is approved, it's distributed to the downstream systems using the Data Replication Framework via standard ALE technologies, but other integration technologies like web services are also supported. SAP MDG provides out-of-the-box integration capabilities with SAP S/4HANA, SAP Ariba, and SAP Hybris Commerce.
- Analytics for process KPIs are also available for SAP HANA databases.
- Data quality enhancements through integration with SAP Data Services or Integration Steward or for SAP HANA-based SAP MDG using SAP HANA platform services for quality enhancements are possible.
- For the same master data, SAP MDG's key mapping concept maps the unique identifier for a system to the unique identifier in SAP MDG.

SAP MDG can be deployed on-premise or in the cloud. There are a couple of things to think about when it comes to SAP MDG and SAP HANA:

- SAP MDG can support codeployment with SAP S/4HANA *and* be deployed as a hub model that distributes data to SAP S/4HANA (as shown in Figure 15.7).
- The key mapping function of SAP MDG can play an important role in Central Finance deployments to map financials master data from different systems.
- The consolidation scenario works better on SAP HANA, especially for large volumes of data.
- You can use the SAP HANA SDI service to connect to various source systems.
- Smart data quality services in the SAP HANA platform offer evolving data quality enhancement capabilities like address cleansing and records matching.

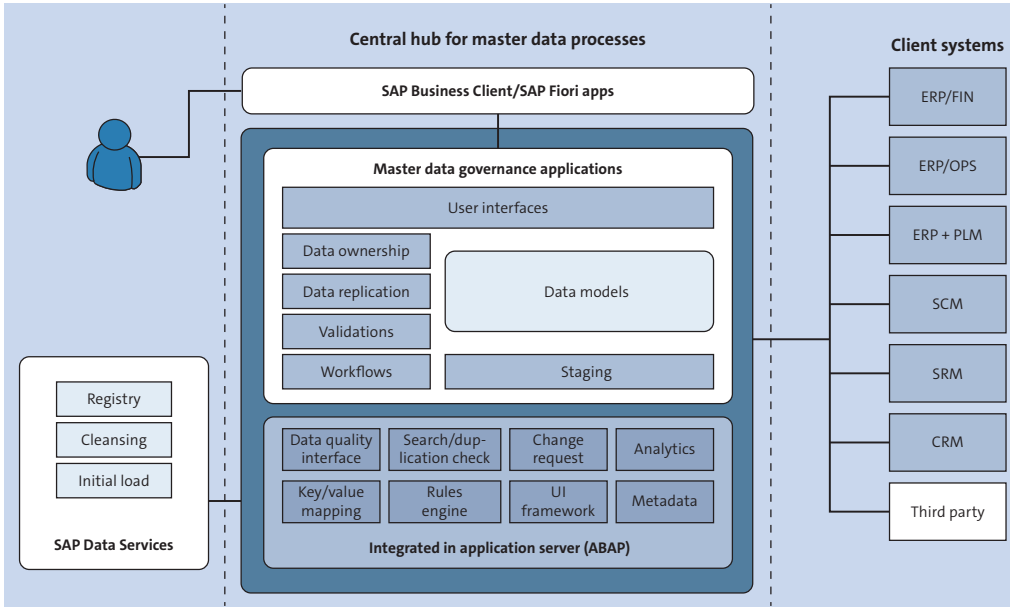


Figure 15.7 Sample Landscape with SAP MDG

15.7 Supply Chain Planning: SAP Integrated Business Planning

SAP Integrated Business Planning (SAP IBP) is a cloud-based planning solution that rolled out as a native SAP HANA solution. In the following subsections, we'll discuss the functionality available in each of SAP IBP's individual solutions:

- SAP IBP for sales and operations (S&OP)
- SAP IBP for inventory
- SAP Supply Chain Control Tower
- SAP IBP for demand
- SAP IBP for response and supply

We'll end this section by discussing SAP IBP in the context of SAP S/4HANA.

15.7.1 Sales and Operations Planning

The purpose of the S&OP process is to balance demand and supply and to plan at a high level involving all stakeholders, including marketing and finance and the operations team.

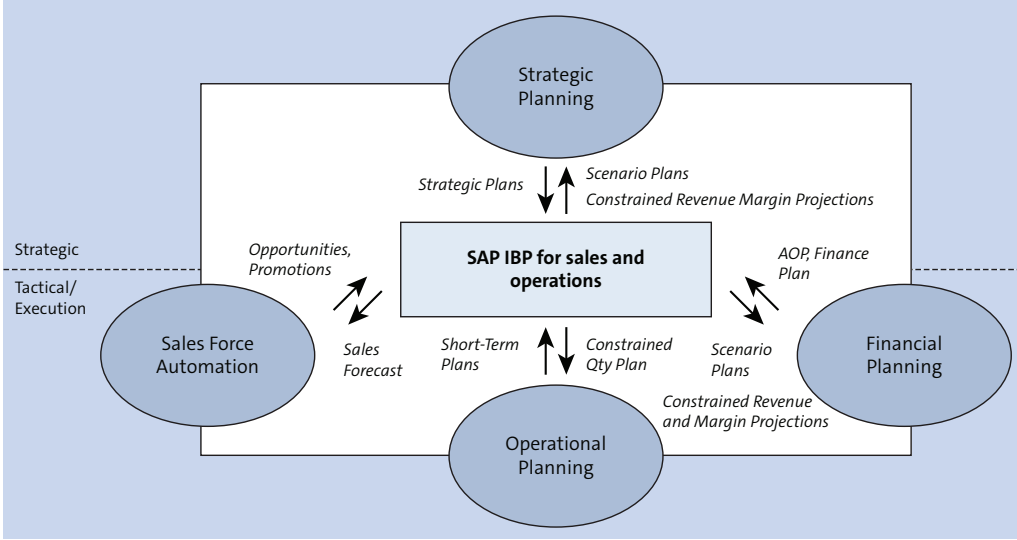


Figure 15.8 S&OP Interacting with Other Functions

Key aspects of the SAP IBP for sales and operations are as follows:

- **Planning**
  It helps deliver a cross-functional operations plan using demand and supply algorithms and considering the impact on inventory, service levels, and profitability. It considers financial impact on planning and helps make decision-making faster and easier. Planning involves functions for sales, marketing, supply, and finance.
- **Combining company strategy with customer and product strategy**
  It helps translate a company's financial plan to align with the marketing/product management group and demand planning. It also helps formulate demand-driven planning based on key customer inputs.
- **Consistent data model**
  S&OP has close integration with SAP S/4HANA and the ability to provide a single source of truth. It can provide a single set of numbers for all areas of operations planning across supply chain and real-time analytics helps with faster decision-making.
- **Effective collaboration**
  Close integration with SAP Jam helps promote effective collaboration among stakeholders with good transparency in decision-making during the whole lifecycle of the planning process.

- **User interface**
  Using Excel for planning via an add-on is a big advantage for user communities; using an Excel worksheet it provides comfort and familiarity when handling planning data.

A high-level depiction of the S&OP process in SAP IBP, collaborating with other functions, is shown in Figure 15.8.

15.7.2 Demand Planning

SAP IBP for demand contains all the traditional demand planning features and includes newer features, like demand sensing, which will be useful for the business/supply chain that can adapt to a changing demand situation on a short-term basis. Overall, SAP IBP for demand is still maturing, mainly in the area of product lifecycle planning.

SAP IBP for demand has the following features:

- **End-to-end demand planning for mid- and long-term planning**
  This helps perform traditional demand planning using different statistical algorithms, very much like SAP APO.
- **Demand sensing**
  Demand sensing is a forecasting method with the capability of demand signal management, leveraging new mathematical techniques and near-real-time information to create/adjust a forecast on a short-term basis, based on the current realities of the supply chain.
- **Automated alerts**
  Provides alerts for monitored situations for which forecast accuracy targets are not met.
- **Collaboration**
  It can collaborate and communicate about the most recent, updated, and accurate demand plan.

15.7.3 Inventory Planning

SAP IBP for inventory helps optimize inventory norms across the supply chain. Its algorithm is adopted from SmartOps. Inventory targets are set up in such a way that the overall inventory carrying cost for the whole network is minimized while achieving required service levels for the customer. The variability due to uncertainty in a

network leads to an increase in safety stock. This further results in building of safety stocks in every pocket of the supply chain node, which ultimately increases the cost.

SAP IBP for inventory's multiechelon model optimizes the internal service level(s) of each upstream stage and calculates its impact on each downstream stage using stochastic mathematics.

15.7.4 Response and Supply Planning

SAP IBP for response and supply can help an organization plan supply and respond to orders received. It can also help analyze orders missed or rescheduled due to various factors. This means that an organization can work toward removing such bottlenecks.

SAP IBP for response and supply (see Figure 15.9) helps an organization plan supply using unconstrained heuristics or optimize a supply plan using the optimizer. This capability works on time-series data. It also supports order-based supply planning, such as generation of production, procurement, and transport orders for distribution. Other features include unconstrained planning and constrained priority-driven heuristics planning. Optimization-based planning of individual orders is in the roadmap for future implementation. You can generate allocation to ATP and reschedule sale orders. SAP IBP for response and supply's order-based data model can be near-real-time replicated from SAP S/4HANA.

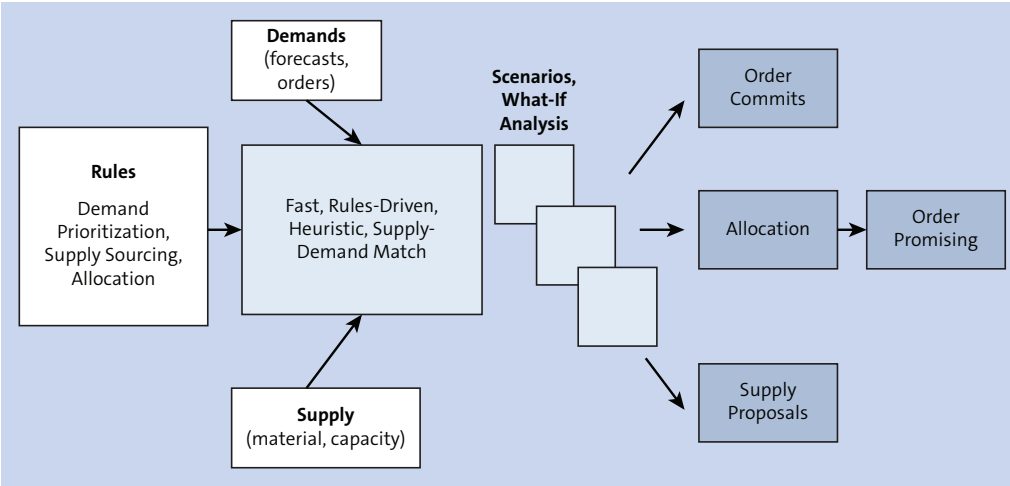


Figure 15.9 SAP IBP Response and Supply Planning—Key Capabilities

Supply planning can be used to plan supplies using either unconstrained heuristics or an optimizer in a constraint planning situation. With the optimizer, you can optimize the supply planning situation using either a profit maximization or cost minimization algorithm. It integrates requirements from demand, considers the norms determined using inventory optimization, produces rough-cut capacity planning requirements, and allows for procurement planning in a supply chain. The user can review and work on the scenarios using either Excel or SAP Fiori apps, which means that it can be viewed on mobile devices, tabs, and in a browser. It also allows for what-if scenarios and allows users to work in an Excel interface from end to end, starting from master data maintenance and batch job scheduling and moving through evaluation of planning scenarios and updating/manipulating planned requirements.

Response planning helps prioritize sales orders by ranking customer orders by priority. This is done by creating rules. Optimization-based ranking is in the product roadmap and will be available in the future. It also helps perform what-if analysis for an order coming in the future or an unforeseen event on the supply side. Once a potential solution is determined and finalized, this functionality can be used to update the plan. The gating factors are analyzed, which will help an organization view various constraints in the supply chain and plan for longer-term solutions. For example, if the gating factors say that due to overload in a resource most orders are rescheduled, an organization can plan to augment the capacity of that work center and improve supply ability.

Supply and response planning can be used to perform the following processes in the supply chain management landscape:

- **Supply planning**
  - Capture inputs such as demand and supply
  - Sequence demand by priority
  - Constrained planning run
  - Scenario planning using what-if analysis
  - Create or update supply planning and allocation
- **Response planning**
  - Capture inputs such as sales orders, shipments, and allocation
  - Sequence demand by priority
  - Constrained planning run
  - Scenario planning

  - Update supply proposal or order confirmation
  - Analyze gating factors for long-term bottleneck removal
- **Demand prioritization**
  Depending on business requirements, orders can be prioritized based on rules. The rules can be created and changed easily. This helps in prioritization of orders; thus, an organization will always fulfill high-priority orders first.
- **Constrained forecasts**
  The planning process can anticipate orders and perform constrained planning based on the constraints from resource capacities, supplier commitment of orders, material availability, and lead time.

15.7.5 Control Tower

SAP IBP has good built-in analytics in SAP Supply Chain Control Tower. The key enablers of SAP Supply Chain Control Tower are end-to-end monitoring, alerts, and collaborative environments. We can analyze data in the same dashboard, extracting from demand, supply, inventory, and so on, and no additional data processing/extraction for any other analytics tool is needed. This helps with real-time tracking and decision-making by monitoring KPIs for the business. Some benefits of the SAP Supply Chain Control Tower include the following:

- All functions of SAP IBP use the same data from the SAP HANA database on the cloud. This helps users make decisions based on a single source of truth.
- Embedded analytics allows analysis of planning results.
- Simulation can help clarify various assumptions.
- High usability is achieved due to advanced UIs and because users feel comfortable handling their data in Excel. The same planning output can be saved in an offline workbook and sent to other stakeholders.
- SAP Supply Chain Control Tower includes the ability to collaboration using SAP Jam.
- Integration using SAP Cloud Platform Integration, SAP Data Services, and SAP HANA smart data integration.
- Near-real-time integration with SAP S/4HANA and reuse of data for reducing redundancy.

With S&OP process integrating with all other supply chain planning process helps as follows:

- A collaborative approach for better transparency among all stakeholders and planning functions
- Key processes are well connected
- Financial integration/financial visibility into planning
- Built-in analytics

15.7.6 SAP IBP and SAP S/4HANA

SAP is providing the SAP IBP license only on the cloud using an SaaS model, but SAP S/4HANA is available both in the cloud and on premise. Both can be integrated using SAP Cloud Platform Integration and SDI depending on the nature of the data. Note that SAP IBP can be operated only using SAP Fiori applications; there is no access to SAP GUI as the same is available for SAP S/4HANA along with SAP Fiori applications. Most of the transaction data between SAP IBP and SAP S/4HANA is integrated in SAP IBP in time-series data via SAP Cloud Platform Integration except for orders in SAP IBP response via SDI. The integration is not online/in real time, but it can be set up in near-real-time mode. Both new dimension products are built on the SAP HANA platform, so they're expected to work faster than traditional RDBMS products. However, both products are maturing and as customers slowly adopt them, we can see the effectiveness of the integration aspects between these two products in large and complex business environments in days to come.

15.8 Summary

This chapter provided an overview of the overall SAP portfolio and the LOBs that extend the SAP S/4HANA core solution to complete the requirements of the digital platform.

We introduced SAP Ariba and discussed the sourcing and procurement portfolio and how it relates to SAP S/4HANA Enterprise Management. We also discussed possible hybrid procurement scenarios and how the overall procurement portfolio fits together. We provided an overview of SAP Fieldglass and the capabilities of the VMS for contingent workforce and service procurement, then reviewed the capabilities of Concur for travel and expense management as an extension to SAP SuccessFactors. From there, we segued into a more detailed view of the SAP SuccessFactors functional capabilities and how they fit into SAP S/4HANA and the other LOB solutions. Then,

we looked at SAP Hybris and the customer engagement and service portfolio that ranges from commerce via marketing to billing and beyond.

We detoured briefly to cover how SAP Master Data Governance fits into the SAP S/4HANA portfolio. As of the most recent version of SAP S/4HANA, embedded SAP MDG functionality will help organizations handle critical governance processes for master data.

This is a good starting point to take a closer look at the analytics and reporting options of SAP S/4HANA in the next chapter.

Chapter 16
Analytics and Reporting

This chapter provides the current options for reporting in the context of the SAP S/4HANA. This chapter touches on various products from SAP for analytics, such as embedded SAP BW, embedded analytics, and embedded SAP BPC, as well as the data and data lakes.

SAP S/4HANA forms the digital core of an IT landscape (current or future) for an SAP customer. However, when it comes time to choose analytical tools, selecting the right product—from the right backend reporting tool to the front-end dashboard and integration tools—from among several options can cause a lot of confusion in the minds of clients' analytics and enterprise architecture teams. Where to invest, how to estimate the future of existing investments, how to cater to different types of data requirements: these are some of the key questions we'll address here.

Based on the usage or the type of data on which analytics is carried out, we can classify the reports into the following two categories:

- **Operational reporting**

  Operational reporting deals with the transactional data at real-time or near real-time, either in the transactional system itself or in another system where this data is replicated. Now, with the advent of advanced tools, advanced analytics are also possible. These reports will help businesses make quick decisions and changes.

  For example, with operational reporting a plant manager can see at real-time which production orders have been completed in the past seven days, or the production cost of a particular product.

- **Enterprise-wide reporting**

  Enterprise-wide reporting leverages data from multiple sources across the enterprise and performs reporting and analytics across functional areas and systems. The data may be at different levels of granularity. Enterprise-wide reporting can also be used for historical data analysis and trend analysis.

For example, if the CFO of an organization wants to have a glimpse of the overall budget spent across all markets for a particular brand, and then drill down to particular markets, countries, or periods, such analytics would typically be done through the enterprise data warehouse.

Note

While the gaps between operational analytics and enterprise-wide analytics is going to decrease gradually, we still see the trend to keep different systems for different types of reporting.

In this chapter, we describe the various options from SAP that are present today, for different use cases and different source data, in the context of a landscape with an SAP S/4HANA core.

16.1 Evolution of Analytics

From the perspective of seeking insights, the world of analytics has changed from descriptive analytics to cognitive analytics. Some basic operational analytical requirements have been consistently there, such as finding out which vendor performed well to meet all KPIs related to timely delivery, what sales orders are to be delivered in the next seven days, what inventory is available for a given material across warehouses/storage locations, and so on. In recent years, the analytics requirements have become diverse, and with the maturity of the analytics tools, various types of analytics came into being.

Figure 16.1 shows the six stages of data analytics. Let's walk through each stage:

1. The first stage is *data acquisitions*, sometimes called *data foundations*. At this early stage, the focus is on integrating data sources and on addressing data governance.
2. During *descriptive reporting*, the emphasis is on creating a single source of truth for reporting/structured KPIs.
3. *Data exploration* involves "democratizing analytics" and facilitating access to quick insight.
4. *Predictive modeling* creates actionable insights and tests hypotheses.
5. Next, *prescriptive modeling* embeds analytics into the decision-making processes.

6. Finally, *cognitive computing* allows you to elevate the analytics experience for maximal business benefits, serving up real-time insight at key points of engagement.

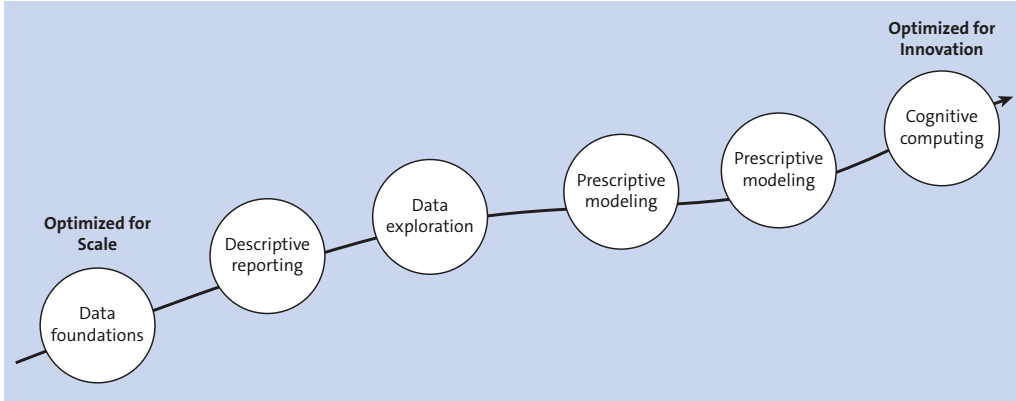


Figure 16.1 Analytics Journey

Now, with the advent of new types of data—its inflection point being the huge amount of social media and their pervasiveness in building the opinions of the masses—the intelligence of the instruments (along with the options to get data from smart meters in real time) provides new challenges to the analytics world. Moreover, the challenges are increasing every day. Thus, the next step in the picture (data exploration) depicts different data that needs to be explored.

Then comes the predictive analytics, which is based on different types of algorithms, depending on the data type and its variance. The predictive analytics lead the way for the prescriptive variety, through which a clear set of instructions can emerge for analyzing the data based on an event trigger. For example, if the data set for some related parameters for a piece of equipment shows a specific trend, then the predictive analytics may specify at which point the equipment will break down; hence, predictive maintenance will be triggered before such an alarm level. The prescriptive analytics will suggest actions to mitigate such a breakdown point altogether. Therefore, prescriptive analytics is a combination of predictive and descriptive analytics and helps determine whether to act and, if yes, what actions to take. This is of course a bigger umbrella and can even utilize the next genre of analytics, which leverages cognitive computing.

For all these types of analytics, actionable insights are achievable with vastly differing types of data, including structured and unstructured, high volumes of data, data within the enterprise, or data combining outside intelligence or information. Reporting now can be agile, with hugely improved performance with many types of flexible analysis and with a much-improved UX with SAP Fiori or SAP Fiori-like (SAPUI5-based) applications.

Figure 16.2 shows the overall analytical landscape for an enterprise where the operational reporting uses embedded analytics on SAP S/4HANA. Analytical SAP Fiori apps can also be used on top of the SAP S/4HANA data. SAP analytics tools, such as SAP Analytics Cloud or the on-premise tools of the SAP BusinessObjects BI suite, can enable additional dashboards and visualization. The data gets replicated to the SAP BW/4HANA to meet the enterprise-wide reporting requirements. This system works as part of the data lake as well (see Section 16.5.1 for more information on data lakes), since it can pull the data from Hadoop. It can also combine the data from Hadoop with the data from other systems through SAP Vora.

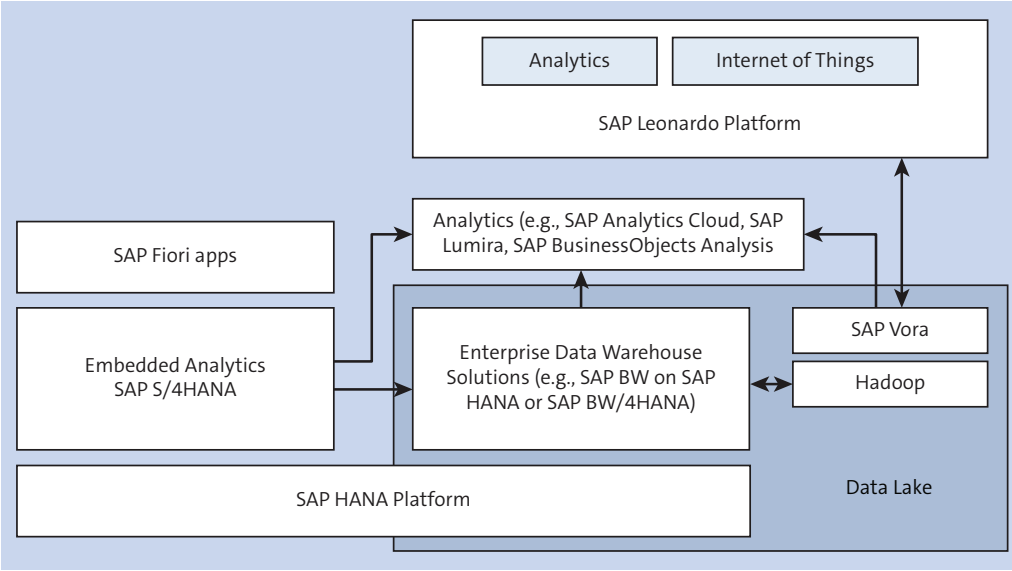


Figure 16.2 Analytics with SAP S/4HANA

SAP Leonardo also provides services for analytics, as well as services for integrating big data, such as Internet-of-things data (the data feed from sensors or connected systems). This data can be stored in Hadoop as well.

Finally, the cognitive analytics using Watson APIs, which can be exposed using the IBM Bluemix platform, can also be integrated. Further cognitive computing, including sentiment analysis, image recognition, and more, can be leveraged to gain insight from data as well. Still, this is just one example of one variation of the analytics landscape; there can be several other such variants.

In this chapter, we will introduce various products from SAP in the analytics area and touch on the types of analytical activities they support for SAP S/4HANA customers. We will also touch on the concepts of big data and data lakes.

16.2 Operational Reporting

The classical examples of descriptive analytics are the different types of operational reporting required on top of the transactional system data. Traditionally, in the pre-SAP HANA days, operational reporting was required to be run on the SAP ERP system itself, taking data from the transactional SAP ERP system. When the data was too much to handle, this data was replicated to the SAP BW system and aggregated and reported against.

For any reports that had to be run in SAP ERP and that dealt with huge amounts of data, the only option was to run these reports in batches. Batch job failure was a common issue, and would result in daily frustrations of IT support and an inability to take some business actions in a timely manner. Think of a large retail customer that needs to move stock from the inventory at the warehouse to the stores in the morning based on a batch job-based report of the store inventory. If the batch job fails, the entire business is impacted in multiple ways: the stock sits in the warehouse, increasing the inventory carrying costs; the trucks are underutilized; and the stores have no stock, resulting in dissatisfied customers. The same situation can be completely turned around by SAP HANA-based reporting, which will take seconds to execute. These stock reports can be generated every day and on demand, thereby planning and executing the stock movements from the warehouses to the right stores in a timely manner.

Exception reporting for situations such as excess inventory after running materials requirement planning (MRP) could be run in batches on the traditional SAP ERP systems. However, with the advent of SAP HANA, reporting has become a lot easier, can be run in real time, and doesn't require any batch runs or any other data warehousing tools. There are a few options are to create these operational reports, discussed in the following sections.

16.2.1 ABAP-Based Reports

The traditional ABAP-based operational reports should be run via the main processing involving the larger dataset in the SAP HANA database layer (code pushdown), through use of ABAP CDS views. The frontend can use SAP Fiori apps (for standard views) or SAPUI5 for custom views, which can consume the CDS views.

16.2.2 Embedded Analytics

Embedded analytics is a set of analytical features directly embedded in the SAP S/4HANA system to work on top of the transactional data. This is the most popular way of performing operational reporting in the current SAP S/4HANA world, and it doesn't require additional installations or licenses.

Let's consider the architecture of embedded analytics. The virtual data model in the form of CDS views (explained earlier in Chapter 9) forms the base of this analytics. The architecture is as follows:

- Visualization layer
  - SAP Fiori
  - SAP analytics products (visualization)
- Analytics layer
  - Embedded analytics
  - SAP Analytics Cloud/SAP Lumira/SAP BusinessObjects Analysis, etc.
- Access layer
  - OData
  - Transient analytical queries
- Virtualization/modeling layer
  - CDS views
- Persistence layer
  - SAP S/4HANA

SAP has classified many tools under the umbrella of embedded analytics. The classification is based on the user type, as well. Figure 16.3 from SAP provides a good depiction of the current set of tools and the types of users who would use them.

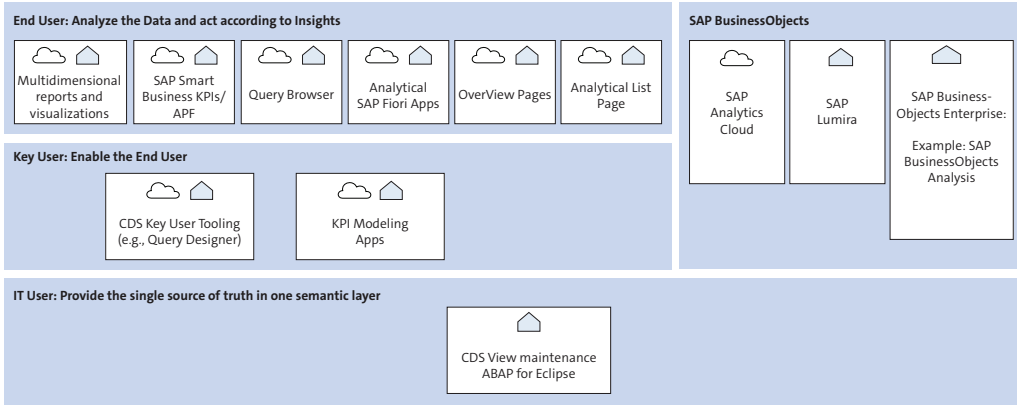


Figure 16.3 Embedded Analytics Tool Overview

Now, let's discuss the key embedded analytics tools and how they operate on the transactional data of the underlying SAP S/4HANA system.

Multidimensional Reports and Visualization

This type of reporting is again accessible through SAP Fiori apps, has the ABAP Web Dynpro application as its backend, and exposes analytical CDS views. These reports are very similar to the analytical SAP Fiori apps both in terms of look and feel and in their use of configurable key figures and dimensions.

SAP Smart Business KPIs and the Analysis Path Framework

SAP Smart Business applications can display the business KPIs calculated based on the transactional data in your SAP S/4HANA system. The KPI Modeler is used to configure these KPIs, and you can create the tiles in the SAP Fiori launchpad, which shows the analytical SAP Fiori apps for a KPI. A KPI is the first entity that needs to be created, and the data source of that KPI is the SAP HANA view or the corresponding OData service. A few analytical apps support drilling down to the next set of visualizations.

Figure 16.4 shows how an app has been configured and which CDS view it uses in the KPI Modeler.

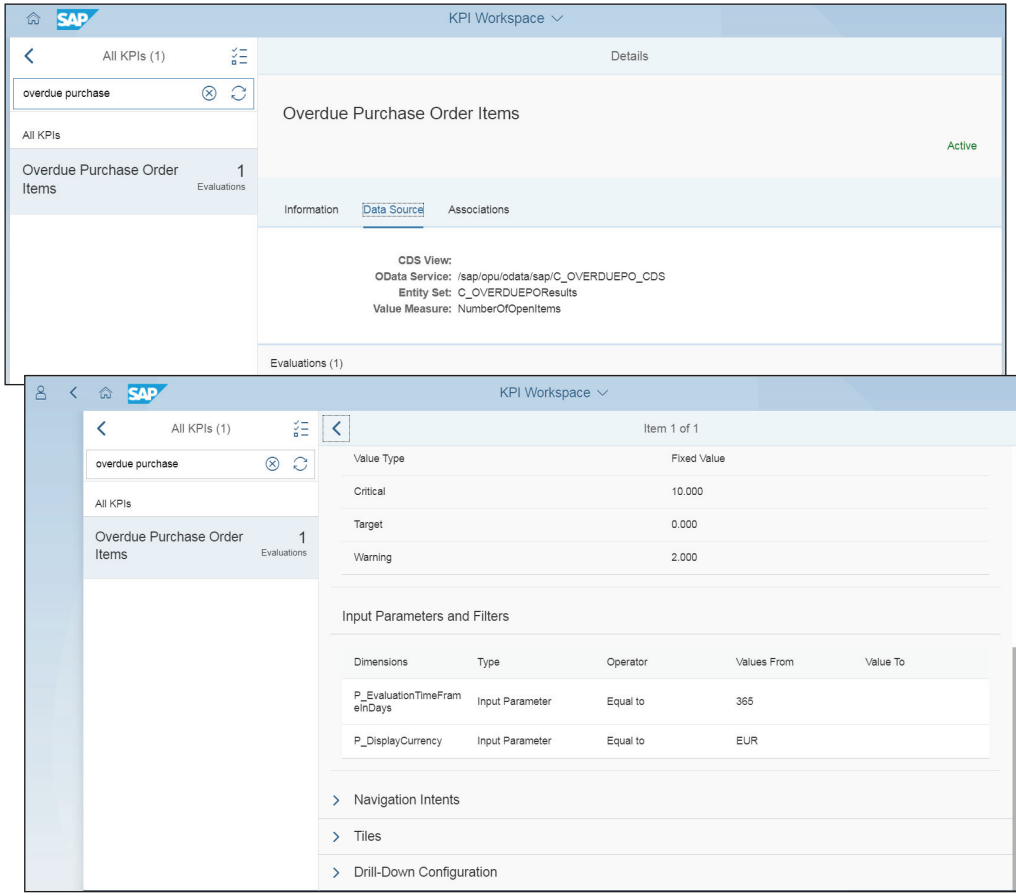


Figure 16.4 Embedded Analytics Reporting Example

Analysis Path Framework (APF) is the framework in SAP Fiori through which you can configure interactive, chart-oriented analytical drilldown apps. APF-based apps enable the user to view and analyze the data of several KPIs from different data sources. Users can interactively explore data step by step from different perspectives to analyze and investigate root causes. In each analysis step, you can investigate KPIs/measures and select relevant data to filter the information provided in subsequent steps. By combining different analysis steps and applying filters, you interactively create your own flexible analysis path.

Query Browser

This tool displays the results of a query based on CDS views. As shown in Figure 16.5, it is available through an SAP Fiori app. The Query Browser displays the available CDS views, and the user can choose to display and execute any of the CDS views, once they are configured.

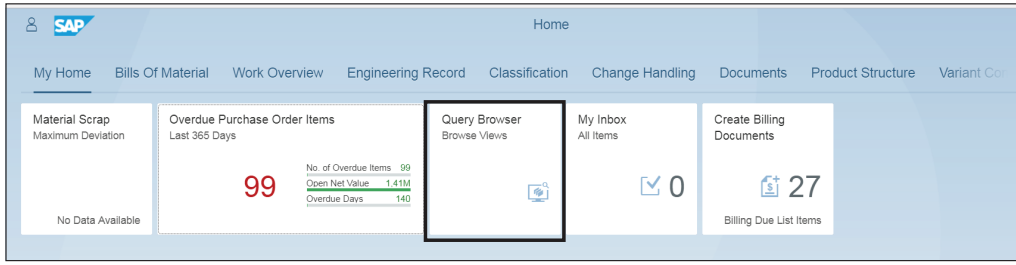


Figure 16.5 Query Browser Tile in SAP Fiori Launchpad

Analytical SAP Fiori Apps

Analytical SAP Fiori apps provide role-based insight into the KPIs of your business processes. These can be configured on top of SAP S/4HANA, consuming VDMs, and set up as tiles in the SAP Fiori launchpad, as shown in Figure 16.6. The SAP Fiori launchpad shows the apps which are applicable for a specific user role.

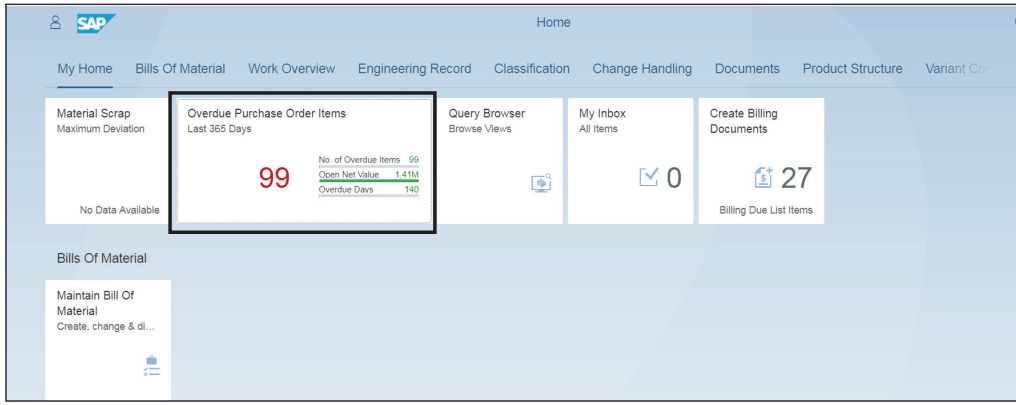


Figure 16.6 SAP Fiori Launchpad Showing Analytical Apps

Thus, these apps provide real-time information about large-volume data via a simplified frontend for better monitoring and hence offer better control of these KPIs. You

can configure several predelivered KPIs and insight-to-action scenarios, or create new ones based on the KPI modeling framework. These apps consume OData services, which can be generated from the ABAP CDS views. These apps have dimensions and measures, and you can apply filters on certain fields that can be configured. For example, Figure 16.7 shows open purchase orders for multiple vendors over a set period. In this case, the period is set to last 365 days, but it could be set for a week or a month, for example. In the top-left corner, you can see that **Plant** is one of the filter criteria for the app. The bottom screenshot in Figure 16.7 shows the results of applying that filter.

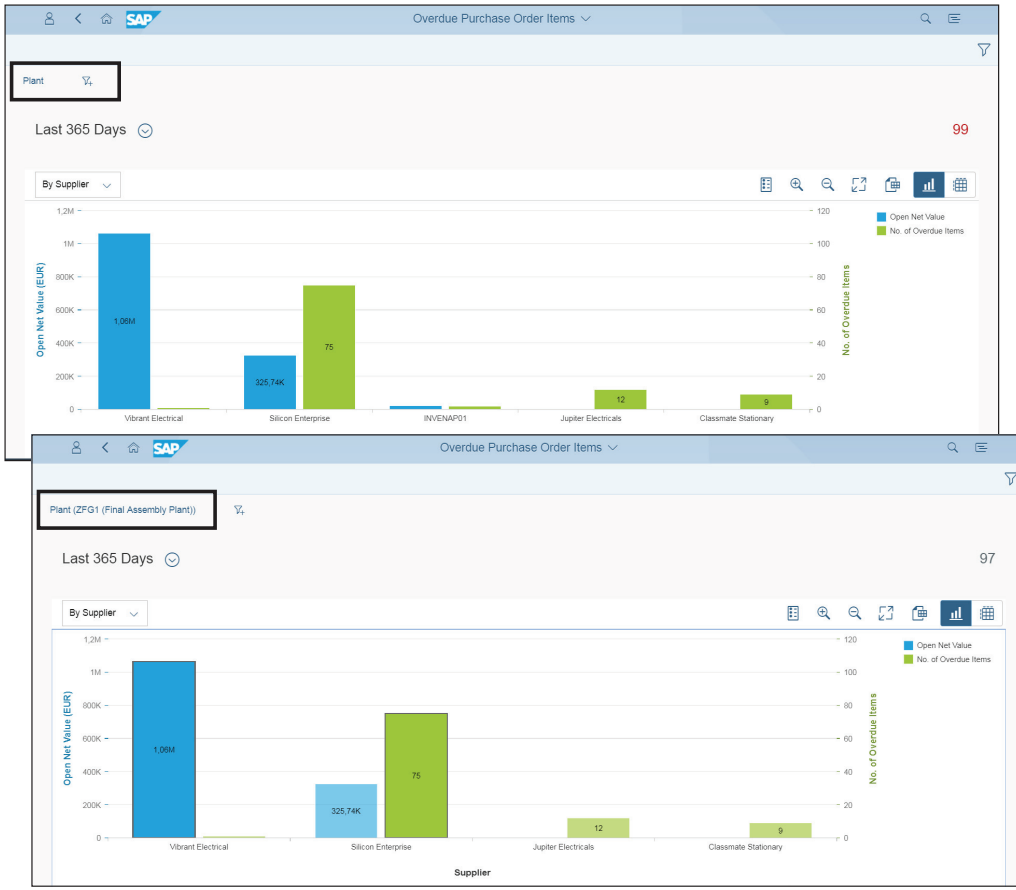


Figure 16.7 Analytical App Example: Overdue Purchase Order

Overview Pages and Analytical List Page

In an SAP Fiori-based embedded analytics environment, it's important to understand that apps follow certain design principals as per the SAP Fiori floorplan design. As such, user transitions start from the homepage in the SAP Fiori launchpad (which is based on roles; hence, only relevant apps appear); then move to an overview page on which the user has an overview of an analytical app and his or her responsible areas; then to the analytical list page, which is helpful to list the relevant items and which in turn can be filtered per requirements. The user then would typically navigate to the actual object page from the list page to take necessary actions.

Note

For more information about embedded analytics and SAP Fiori 2.0, we recommend the following blog post: *http://bit.ly/2xFZboi*.

16.2.3 Native SAP HANA Applications

Now, we'll touch on the native SAP HANA application, because it caters to different types of reporting or different types of analytical scenarios and is an important aspect of the analytical landscape.

When it comes to operational reporting, we can create data models from SAP HANA Live views or CDS views from SAP S/4HANA or any other system through SAP Landscape Transformation (SLT) replication or other replication tools like SAP HANA smart data integration, SAP HANA smart data access, or SAP Data Services designed for getting the data into the data model in near real time and building the reports out of this sidecar.

There are several such examples of operational reporting out of native SAP HANA applications. For example, a UK-based retail company had several hundred warehouses and stores across the world. By running inventory reports across these warehouses and stores, it now has much better planning of stock movements from the right stores to the right warehouses, so stores have the right stock, thus ensuring that customers get what they require when they require it. All this results in satisfied customers, better sales, and optimized inventory costs and stock movement planning.

Other reports were created for tracking the operational costs for manufacturing its products and cost optimization. Another report shows the instar-stat VAT report for goods movement across European countries. There are thousands of these use cases,

with companies employing applications that use new data models or reuse part of the SAP ERP data models and gather data from disparate sources.

This product has advanced analytics capabilities and can integrate predictive analysis libraries which are in the SAP HANA platform itself or other libraries, such as the R library for predictive models.

16.2.4 Embedded SAP BW and SAP BPC

OLAP (analytical) capabilities were introduced in the form of embedded SAP BW in SAP ERP as of SAP NetWeaver 7.0. Now, with the advent of SAP S/4HANA, it plays a more significant role as a feasible alternate for providing analytical insights. SAP BW (OLAP engine) is included in the SAP S/4HANA system and is known as embedded SAP BW. However, we don't recommend implementing this option as a full-fledged enterprise data warehouse. Instead, this option is for those multidimensional reports that would need a percentage of the SAP S/4HANA data to be replicated to the OLAP engine. A good rule of thumb mandates that 20 percent of the total overall data volume of the system should include data replicated from SAP S/4HANA or integrate data from other sources or planning applications.

Embedded SAP BW relies on a separate authorization concept. Authorizations from SAP Business Suite on SAP HANA/SAP S/4HANA don't apply; if you require these authorizations, they must be mapped separately.

Embedded SAP BW can be installed either on the same client as the SAP S/4HANA system or on a separate client, depending on the scenario (e.g., if the embedded SAP BW would require data replication from another source, SAP recommends installing it on a separate client).

There are two main advantages of using embedded SAP BW. First, SAP S/4HANA CDS views are automatically exposed as operational data provisioning (ODP) transient InfoProviders and can be used in the SAP Business Explorer (SAP BEx) Query Designer to define custom queries. The BEx queries should be based on SAP S/4HANA embedded analytics CDS consumption/query views. Second, you can add SAP BW functionality without using SAP BW modeling objects.

A different use case scenario would use the embedded SAP Business Planning and Consolidation (BPC) functions for planning purposes, running on the embedded SAP BW. This requires a separate license. Thus, SAP BPC optimized for SAP S4/HANA is an add-on on top of embedded SAP BW; this model frees you from performing any data loading because it leverages the underlying data in SAP S/4HANA. It comes with prebuilt

content such as series of InfoProviders, input-ready queries, and planning functions and workbooks based on SAP BusinessObjects Analysis for Microsoft Office. This content covers planning areas that include the following:

- Cost center planning
- Internal order planning
- Project planning
- Cost of sales planning
- Profit center planning
- P&L planning
- Market segment planning
- Balance sheet planning
- Liquidity planning

SAP has delivered multiple SAP Analysis for Microsoft Office workbooks; once activated, they can be consumed directly out of the box. You also can set up standard and custom reports to compare planned versus actual data, taking the data from the underlying SAP S/4HANA transactional system.

Figure 16.8 shows an embedded analytics-based app that compares actual sales against planned sales for each profit center and breaks various components down along the same lines.

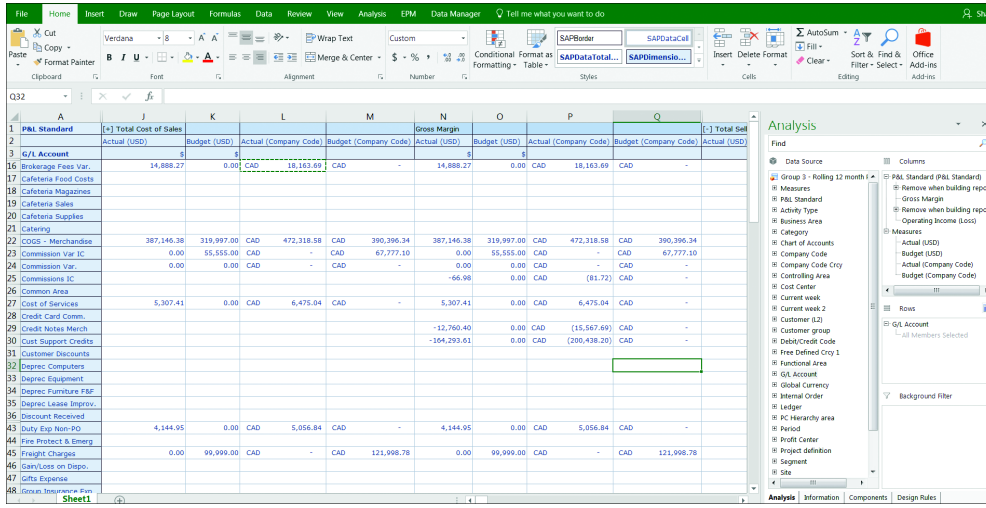


Figure 16.8 Planned versus Actual Comparison with Embedded Analytics on SAP S/4HANA

16.3 Enterprise-Wide Reporting

The enterprise-wide reporting options have broadened, with quite some doubt in clients' minds about which option to invest in further, especially if they've invested heavily already into some older products like SAP BW on SAP HANA. The right choice depends on each client's landscape scenario. A simplified decision tree is shown in Figure 16.9. Real-world scenarios may be more complex, and more factors may need to be considered, including integration with various sources of information and integration with different types of libraries for algorithms.

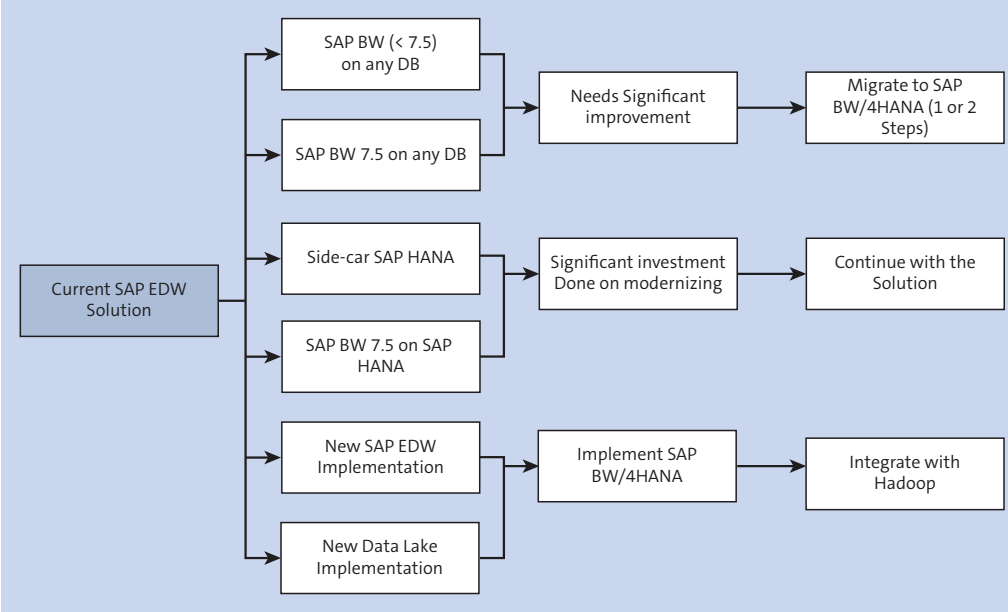


Figure 16.9 Sample Decision Tree for Choosing Right Data Warehousing Tool

Example

Consider a client who implemented SAP BW a decade ago. They may have done some technical upgrading, but never leveraged the new features and the simplified data flows of an SAP BW 7.5 solution. Now, the client decides to move to the SAP HANA database, and wants to choose the right product and the right roadmap. The cleaner option may be to implement a new SAP BW system from scratch. However, that wouldn't be a practical approach. The business may see no substantial benefit for

such huge investments, and may not even have the budget or skills in their organization. The easier option for them would be to migrate to SAP BW/4HANA, and in the process, change the data flows and optimize the solution.

16.3.1 SAP HANA Enterprise Analytics

SAP HANA enterprise-related analytics uses the SAP HANA platform, and its applications are known as native SAP HANA applications. One usage scenario for this product is as a data mart. When this product became available, some SAP customers started implementing their enterprise-wide reporting on this platform, some clients used it in a hybrid mode with their SAP BW on SAP HANA solutions, and others started a journey to consolidate their reporting on the SAP HANA platform.

Although this platform uses the three types of SAP HANA views—attribute views, analytic views, and calculation views—SAP is strongly encouraging customers to use only calculation views when modeling analytical requirements. In fact, SAP even provides tools to convert other views to calculation views, from SAP HANA 1.0 SP 10 onward. Figure 16.10 shows an example of a calculation view for a scenario. The graphical model has been created by dragging and dropping multiple functions such as the union and joins from multiple projection views.

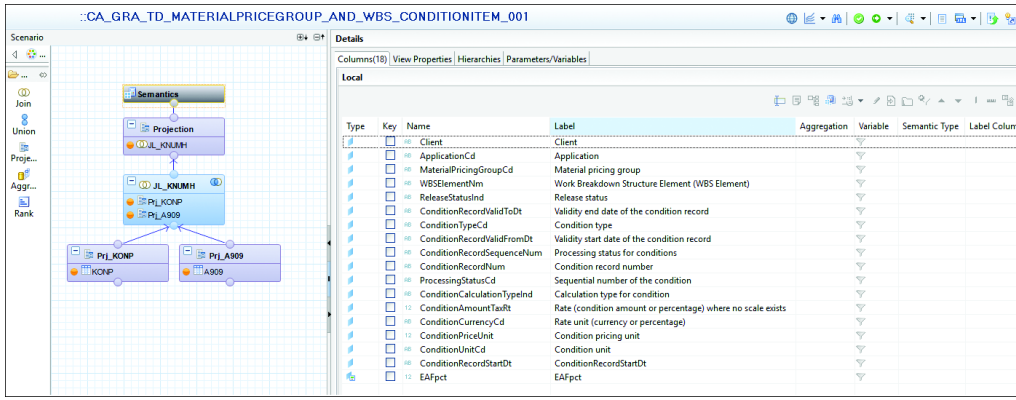


Figure 16.10 Calculation View in SAP HANA

16.3.2 SAP Business Warehouse on SAP HANA

The classical SAP Business Warehouse was the first SAP application to move to the SAP HANA database, but since then it's evolved into a more powerful data warehous-

ing product with SAP BW 7.5 on SAP HANA. Layered Scalable Architecture (LSA) was once the recommended architecture for SAP BW before SAP HANA, but a new architecture is recommended for SAP BW on SAP HANA: LSA++.

Let's understand the transition from LSA to LSA++. LSA was introduced in SAP BW to provide a flexible and comprehensive framework for designing data flows. This helps ensure a structured approach of SAP BW implementation with better accuracy, scalability, completeness, and maintainability. The data in LSA moves through various layers before being made available for reporting.

LSA stores data in multiple layers and often stores redundantly. On one hand, this improves performance, scalability, and maintainability—but on the other hand, it increases the time for data loading and increases the size of the SAP BW database. However, with the power of SAP HANA, some of these layers can be omitted and an even simpler architecture can be developed. SAP has developed LSA++ with the following objectives:

- Keeping the number of persisted storage layers to a minimum
  - Reduces data-loading time and makes near-real-time data replication possible using SLT.
  - Reduces the size of the SAP HANA database.
- Reporting from any layer
  - In SAP HANA, the data is stored in column-based tables and data resides in main memory, so reporting is very fast from any table-like structures; only dimensionally modeled objects are not necessary for reporting performance.
  - Helps with near-real-time acquisition of data if sourced via real-time replication.

In LSA++, most reporting is done through advanced DSOs, which almost eliminates the need for InfoCubes, except for special cases such as noncumulative key figures and planning applications.

The key advantages of this architecture lie in its simplified design and implementation, with fewer layers and hence fewer SAP BW objects, resulting in better maintainability. It also ensures reduced data redundancy and data footprint, reduced data latency, and improved performance. It also makes it possible to have near-real-time reporting.

16.3.3 SAP BW/4HANA

SAP BW/4HANA is the latest data warehousing product from SAP. It's built for SAP HANA-optimized processes and leverages the SAP HANA platform. It's important to note that in terms of product versions, SAP BW/4HANA is not a successor of SAP BW, but rather a new product altogether. Hence, it doesn't support all the old SAP BW objects but still uses the similar concepts of InfoObjects, InfoProviders, and CompositeProviders to merge data from SAP BW InfoProviders with data from SAP HANA views and Open ODS views to integrate data sources into SAP BW/4HANA. SAP BW/4HANA has its own standard content for SAP S/4HANA.

It supports LSA++ (discussed in the previous subsection), with some additional nuances. There's a lot of commonality in terms of features and functions between SAP BW 7.5 on SAP HANA and SAP BW/4HANA, and most of the features introduced earlier in SAP BW 7.5 (or earlier versions like SAP BW 7.3) are available in SAP BW/4HANA.

Let's consider some of the enhanced features that are leveraged in both SAP BW 7.5 and SAP BW/4HANA:

- The advanced DataStore object (ADSO) is the new persistence object used in SAP BW/4HANA. InfoObjects still manage their own persistence. It's possible to perform queries and reporting on this layer without undergoing any transformation.
- Open ODS views are reusable SAP BW data warehouse semantics on field-based structures.
- Virtual data marts (using CompositeProviders that combine InfoProviders or Open ODS views) and logical warehousing are powerful functions with several advantages. Thus, unless it's absolutely required for example, in multiple queries with high frequency), you don't need to load data in the SAP BW system and can instead use in a logical data warehouse with virtual integration of data. Sometimes, a combination of approaches for physical data load and virtual data integration is required.
- Integration of different data sources is possible using Open Hub services because SAP BW/4HANA has an open architecture. New extraction services such as the operational delta queue (ODQ) make it possible for data to be loaded or replicated to an ADSO object directly. Integration with SAP HANA SDI also means that many new adapters are available, which makes it simple to include data sources such as Twitter and Hadoop.
- Code pushdown to the SAP HANA layer improves the system performance to a large degree and reduces the ABAP application layer to a slimmer version.

- Data tiering is the concept of storing data depending on various factors like data temperature, regulatory compliance, and so on in different storage types. Data temperature is a way to label data based on recency, frequency of usage, and other business needs. Because SAP HANA uses main memory and hence is high performing, there is a high cost associated with this memory usage, which thus must be optimized. Therefore, data that's less frequently required can be stored in other storage, such as in extended tables in the SAP HANA dynamic tiering solution (non–SAP HANA database) or in Hadoop (for cold data). However, this data can be brought into SAP HANA as and when required. SAP BW/4HANA comes with an adapter for Hadoop, which can be used as near-line storage.

Note that the suite of BEx tools, such as Query Designer, Analyzer, Web Analyzer, and Web Application Designer, isn't supported for SAP BW/4HANA. SAP's recommendation is to move to SAP Analytics frontend tools.

16.3.4 SAP Analytics Cloud

SAP Analytics Cloud is a SaaS solution for SAP Analytics that includes business intelligence, predictive analytics, and planning and is built on SAP Cloud Platform. SAP provides business content for several industries and LOBs with this solution; in fact, the Digital Boardroom solution is available on top of SAP Analytics Cloud. SAP Analytics Cloud can connect to data sources such as SAP BW on SAPL HANA or SAP BW/4HANA on-premise or SaaS solutions, either online or through data replication.

Next, we'll explore cognitive analytics.

16.4 Cognitive Analytics

The analytics world benefits from advances in artificial intelligence, in part because services can now be consumed directly, which enables us to advance beyond the world of structured data. Although artificial intelligence is a very broad term, the cognitive (or learning) capabilities of systems are growing.

Cognitive systems are built to emulate the cognition capabilities human beings possess to learn from their surroundings. Cognitive analytics based on natural language processing and machine-learning capabilities, for example, are now showing insights into different types of nontraditional data and helping to create meaning from big data, including social media data, data from sensors or the Internet of Things (IoT), geospatial data, and so on. These insights will help drive responses to users in a

personalized manner, by taking in data and analyzing and understanding the geospatial and temporal context for users. It's easy to imagine where this kind of cognitive analytics will make an impact, from the medical services field to efforts to combat terrorism and beyond.

Some of SAP's biggest partners are developing new functionality in this area. For example, IBM's Watson APIs are a great example which can be used in conjunction with any mashup platform to provide advanced analytics. IBM Bluemix is the platform from which these APIs are available. IBM's Conversation API introduces a natural language interface for applications such as virtual agents or chat bots to automate interactions with end users, and Tone Analyzer is a service that employs linguistic analysis to detect emotional, social, and language tones in written documents, even down to the sentence level.

Note

You can find more details about Watson APIs and related use cases at *https://www.ibm.com/watson/products-services/*.

In Chapter 12, we discussed the new machine-learning services provided as part of the SAP Leonardo platform. You can use these services in a similar way to those used by the Watson APIs; the ways your SAP S/4HANA system consumes data are very similar. Of course, when planning for any implementation you should take into consideration how mature these services are at this point and the effort of training users on the APIs.

Cognitive analytics considers various types of data from various sources and uses advanced cognitive functions to derive the right interpretation of such data. Let's consider a few examples: Imagine that you can measure the sensor data from a car for acceleration rate, frequency of braking, road conditions, weather, traffic, case history of traffic infractions, and so on to draw conclusions about an individual driver's driving patterns. This helps during any investigation of an accident and related insurance claims. Similarly, for connected cars, you can use analytics to determine when a car needs maintenance, based on run time rather than a fixed number of miles or months.

Another example might be the automatic detection of cyber threats. Cyber threats are a great cause of concern because they cause huge loss of productivity and revenue and because they're difficult to predict; there's no way to manually read and analyze the huge volumes of structured and unstructured data that security analysts

need to process every day. AI and machine learning allow systems to continuously learn by constantly analyzing billions of data points to detect patterns and even predict attacks before they occur.

For a third example, you can measure the condition of any piece of equipment in a manufacturing line at run time, through sensor data coming from the sensors or the control systems, and thus optimize the maintenance activities and reduce planned and unplanned downtime. This could then trigger the creation of a work order for a maintenance activity, predict a faulty part replacement, and create a requisition for that spare part in the backend SAP S/4HANA system.

From these analytics, some prescriptive steps—such as creating a maintenance order for a piece of equipment, creating a work order for production, changing the campaign parameters for a new product, increasing oil well production, or triggering a faulty product recall from social media analytics—are created that need to be fed back into the transactional system.

In the next section, we'll dive into big data analytics and discuss both data lakes and SAP Vora.

16.5 Big Data Analytics and Data Lakes

In a data lake, data from different sources are brought together in such a way that it's cleaned, its source is identified, it follows common business semantics for an organization, and it's made accessible to the right users for further analytics, often in a self-service mode.

The concept has evolved along with the advances of the big data concepts, because this big data brings new challenges to the world of analytics in terms of unstructured data types, very high volumes of data/streaming data, and events that need to be used as triggers for some analysis of that data. In the following sections, we will look at data lakes and big data as well as SAP Vora.

16.5.1 Data Lake

The term *data lake* has suddenly gained a lot of popularity and is applied to mean different things. The following are some of the key motivations behind the data lake concept:

- Data needs to be analyzed, but huge amounts of data makes it difficult to store in high performance and advanced analytical systems like SAP HANA; the storage cost would be extremely high, and not all the data is important to store in this way. This then requires data storage beyond the data warehousing systems, like SAP BW on SAP HANA or SAP BW/4HANA, and more cost-efficient yet easy-to-integrate systems, like Hadoop clusters.
- There needs to be an infrastructure that can store these analytical repositories without dependency on a specific data format. In other words, you need an infrastructure that can handle structured, unstructured, or semistructured data.
- The data lineage from the source system should be traceable. This is also useful from the point of view of regulatory compliance.
- You need to enable business users to use the data for self-service analytics.
- Application rationalization needs data to be in a well-architected format in a few systems, rather than all over the landscape with several different types of data warehousing solutions and visualization tools and even more custom-built solutions, which make maintenance a nightmare for IT and ease of use a nightmare for business users. A structured approach makes it possible to use the data in a publish-subscribe mode.
- The data will eventually move into the transactional systems and hence needs to be of guaranteed quality; thus, the governance framework plays an important part.
- Proper metadata management capability is important for analysts to understand the data they're consuming and a must-have for the data governance processes and data management processes.

Figure 16.11 shows how the data lake sits in an application landscape and interacts with other systems and how users interact with it.

Now you know why you need data lakes. Next, let's discuss how to make them.

The theory behind the data lake concept is that the data repositories at the core of the data lake should be designated to fit the criteria we've just defined. Each organization must formulate the data management and data governance principals they want to follow and include the metadata model to use, which should be easy to extend and have a set of semantics that is common across the business. The data repositories would include the traditional data warehouse systems and have options to store unstructured or semistructured data. In an SAP environment, this would mean including an existing (or migrated) SAP BW on SAP HANA system or a newly implemented SAP BW/4HANA system along with Hadoop clusters.

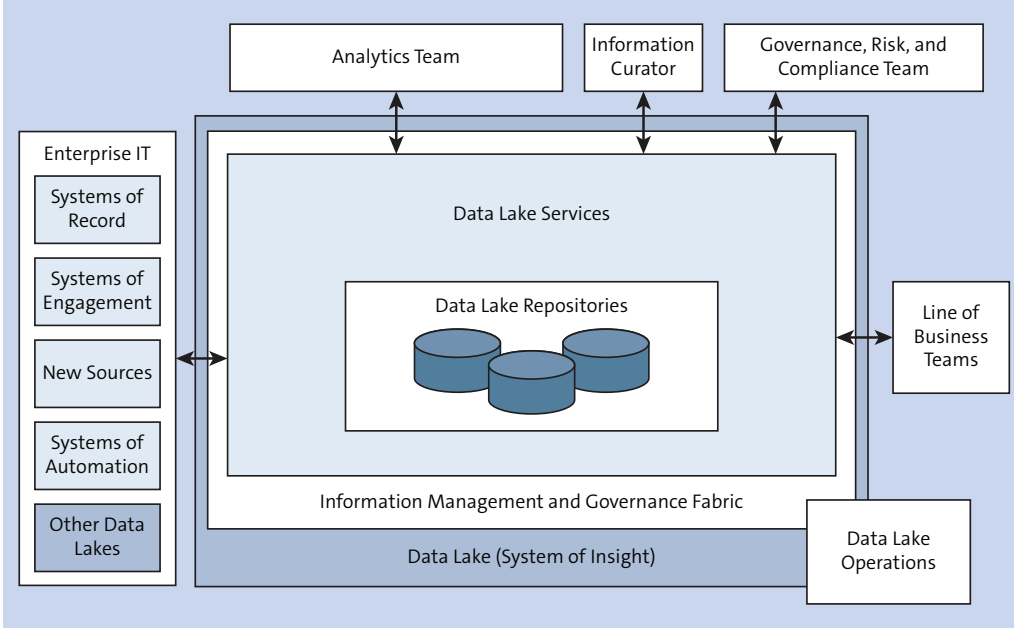


Figure 16.11 Data Lake

The data lake needs to be connected to the data sources throughout the enterprise through suitable governance—thus ensuring consistency and controllability of data. This can be assured by using integrated services and through implementation of workflows to ensure suitable governance and data quality as and when required, depending on the source and type of data. SAP HANA has these integration services, and many of these functions are also provided by SAP Data Services.

In addition, the data lake needs to have access control, monitoring, and audition capabilities to ensure proper governance and compliance.

The outer edge of Figure 16.11 shows the various users of the data lake:

- The analytics team is a group of users, including data scientists, responsible for carrying out the advanced analytics across the data lake.
- The information curator is responsible the management of the data catalog, which will be used by users to find the relevant data elements within the data lake.
- The governance, risk, and compliance team is responsible for defining the overall governance program of the data lake and any associated reporting functions to demonstrate compliance.

- The data lake operators are responsible for the day-to-day operations of the data lake.
- The line of business users might have roles such as the manufacturing line users, finance users, sales team, and so on.

Let's turn our attention to another important SAP product: SAP Vora, which plays an important role in the big data analytics area, on top of the Hadoop layer. This will help explain what the reference architecture for data lakes can look like in the SAP world.

Note

For more details on data lake architecture and design principals at IBM, see *Designing and Operating a Data Reservoir* (Chessell et al., IBM Redbooks, 2015; *http://www.redbooks.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg248274.html?Open*).

16.5.2 SAP Vora

SAP Vora is a distributed computing solution that is deployed on Apache Hadoop and Spark clusters. It doesn't require any additional hardware. Because it provides a semantic layer on your big data, which is stored in the Hadoop layer and provides integration with the SAP HANA platform, you can run combined analytics across enterprise and Hadoop data.

All operations in SAP Vora can be accessed, executed, and extended through SAP HANA. SAP Vora itself can handle different types of data from different sources through open-source applications and libraries and provides high-performance sophisticated analytics against relational, time-series, graph, and JSON data. It can also handle hierarchies, enterprise-ready calculations, and currency conversion and provides support for units. It has a simple web-based UI and supports SQL for querying data on Hadoop. Advanced users like data scientists can leverage programming languages such as SQL, Python, Scala, C++, and Java and can create mashups from different data sources.

From the user's perspective, SAP HANA and SAP Vora act as a single system with joint query optimization and automatic storage decisions that caters to big data analytical needs.

16.6 Summary

This chapter touched on the various products available from SAP today that can be leveraged for different analytical needs of an enterprise running SAP S/4HANA as its digital core. A combination of products and services—rather than any single product—is needed, depending on the different analytics requirements and various types of users.

Let's now move on to Chapter 17 where we will discuss what it takes to build a transformation roadmap for SAP S/4HANA.

Chapter 17
Building a Transformation Roadmap

In this chapter, we'll provide key considerations for moving from your current mode of operation to the future mode of operation. We'll also look at the wider considerations for a holistic roadmap and provide a framework for addressing the prerequisites, requirements, and key considerations for each stage of the journey.

When we look at our transformation roadmap, we need take into consideration the multiple, interrelated IT domains so that we can create a holistic IT roadmap. For the underpinning IT roadmap, there are also other considerations. Although the target future mode of operations (FMO) may be relatively clear based on some of the solutions shown in Figure 17.1 (e.g., SAP S/4HANA, cloud PaaS and SaaS, mobile- and cognitive-enabled processes, advanced analytics, etc.), you need to understand the options and considerations for the roadmap based on the current mode of operations (CMO) as is and the business strategy.

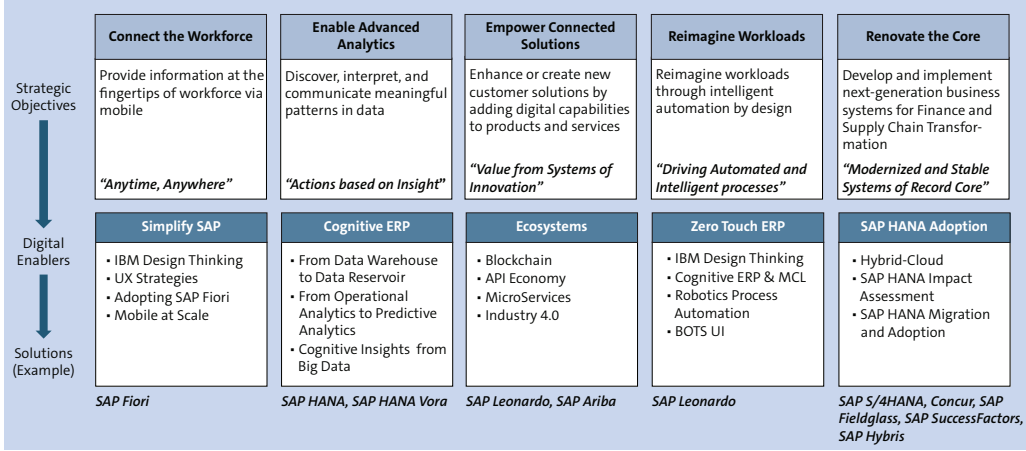


Figure 17.1 Digital Reinvention—A Technology View: SAP S/4HANA

You can't separate the SAP S/4HANA transformation roadmap from the business roadmap for digital reinvention; they're intrinsically linked, as you'll see shortly. In addition, you need to look at the digital transformation drivers and start defining a strategy with the business to understand how these drivers map to the business vision. Finally, you need to understand the technology components that enable this vision and then start defining the integrated IT roadmap as part of the transformational journey.

When looking at the transformation roadmap, there are other considerations to keep in mind from a business perspective, as follows:

- Global and local technology and regulatory and economic drivers generating industry-specific challenges (as well as blurring boundaries)
- Growth in a low-growth, digitally disrupted world
- Seeking innovation as a basis for new growth
- Structural cost take-out for competitiveness and to fund investment in growth
- The war for new talent
- Transforming enterprise processes and systems to enable growth and competitiveness

On the positive side, these challenges are also creating significant transformation opportunities. This is leading to organizations having a series of C-suite imperatives:

- To undertake a full-fledged digital transformation that impacts multiple aspects of their current business models
- To reinvent customer engagement along the multiple touch points of a newly configured digital and social customer lifecycle
- To reimagine the core processes that drive the business, leveraging cognitive capabilities, deep analytics, and applied insights
- To innovate and migrate the application suites and broader technology architectures that enable the business, leveraging the flexibility and agility of the cloud

As CEOs start increasingly to embrace the need to change, they are asking three critical questions about their wider digital transformation strategy:

1. Is my strategy ambitious enough?
2. Is my execution fast enough?
3. How do I transform my people and their capabilities?

Before you can map out the roadmap, you need to consider the following:

- External factors and drivers leading to an SAP S/4HANA adoption scenario
- The key IT and business benefits and value of SAP S/4HANA
- Other technology components and dependencies
- How to define a holistic SAP S/4HANA transformation roadmap aligned to business drivers

17.1 Envisioning the What and the Why

It's clear that the digital economy is here across all industries, and in many cases, it's having a disruptive impact. Let's look at why organizations need a strategy for digital transformation. We'll look at aspects that key stakeholders take into consideration before briefly summarizing the business value that SAP S/4HANA brings to the table. Although we've discussed the business value of SAP S/4HANA in earlier chapters, we want to restate our case before diving into the current landscape.

17.1.1 Digital Transformation

We'll explore two related key questions in this section:

1. What does *digital transformation* mean?
2. Is SAP S/4HANA a prerequisite for digital transformation?

To build a transformation roadmap enabled by SAP S/4HANA, it's important to understand the answers to these two questions. This will lead to the conclusion that when looking at the transformation roadmap for SAP S/4HANA, you need to take a wider and more holistic view to ensure that your business vision is addressed. In other words, the underpinning IT roadmap, which will include SAP S/4HANA, needs to take a wider and more holistic view of the other technology enablers, options, priorities, and dependencies.

Let's first look at what digital transformation is. This has been covered in detail in Chapter 1, so we'll only briefly summarize the most relevant points here.

Digital transformation includes new technology, a new way of engaging with customers, and, for many, it represents an entirely new way of doing business and defining new business models. In many cases, there are a diverse range of perspectives from across and within organizations that ultimately leads to a lack of alignment and

common vision about where the business needs to go. This often results in piecemeal initiatives or misguided efforts that lead to missed opportunities, false starts, and regret costs when organizations look at building their digital transformation roadmap. Ultimately, however, customer value needs to be central and key.

Clearly, emerging new technologies (e.g., big data, social media, IoT, and mobile, cloud, and cognitive computing) are driving this disruption. Although some of these newer technology areas focus on the systems of innovation and systems of differentiation domains based on Gartner's pace-layered application strategy, the modernized digital ERP approach in the systems of record domain is a key enabler, removing many constraints from today's ERP systems.

Note

Gartner's pace-layered application strategy is a methodology for categorizing, selecting, managing, and governing applications to support business change, differentiation, and innovation. See *www.gartner.com/it-glossary/pace-layered-application-strategy/* for more information.

Today's ERP systems can be regarded as monolithic and inflexible to business change, restricting business innovation with aged UIs and a lack of real business insight. On the other hand, SAP S/4HANA is regarded as a digital ERP core.

What we're seeing is that technology is the foundation for organizations transforming to digital; we saw some of the applicable technology solutions in Figure 17.1.

As described in Table 17.1, businesses no longer view technology as a means to an end but as an enabler to address business outcomes and vision.

Technology	Benefits
Cloud computing and services	Can be in the form of either SaaS solutions (e.g., SAP SuccessFactors for HCM processes, SAP S/4HANA Cloud) or PaaS platforms providing APIs for development of new applications and extensions to core applications (e.g., SAP Cloud Platform, IBM Bluemix). Benefits include more speed and agility, lower capital expenditure and operating costs, more productive use of IT resources, easier collaboration, accelerated time to value, higher adoption of new technologies, and value chain connections in real time.

Table 17.1 Key Technology Factors

Technology	Benefits
Mobile and UX	Benefits include access to real-time data and decision-making, as well as opportunities to improve customer experience. Mobile is the preferred method of exchanging information and services for organizations and professionals of all kinds anytime, anywhere, especially for business to consumer (B2C).
IoT and big data, including data insights	IoT digitizes our world, providing prolific amounts of data. Along with other new structured and unstructured data sources above and beyond the traditional systems of record, new delivery models can be developed that allow businesses to engage in new value creation. For example: ■ Use assets better ■ Unlock new revenue from existing products/service ■ Inspire new working practices or processes ■ Change or create new business model or strategy ■ Provide better insights into all aspects of operations ■ Gain better understanding and engagement of customers Use of data is only one part of it; the more important part is the analytical tools and capabilities to make sense of this data to provide real business insight.
Cognitive computing	Cognitive computing is the key to unlocking value because it enables reinvention of existing business models and development of new business models. ERP systems (transactions and analytics) are fundamentally transformed by embedded cognitive methods to deliver insights and recommendations at the point of impact. Unstructured external data processing and continuous machine learning help these ERP systems evolve continuously with changes in the external environment. Cognitive computing can help make sense of the exploding data created by the Internet of Everything (IoE).

Table 17.1 Key Technology Factors (Cont.)

Technology	Benefits
Redesigned business processes based on digitally enabled ERP core (e.g., SAP S/4HANA and SAP Cloud Platform)	Intelligent and automated business processes lead to greater efficiency, cost savings, potential for mass customization, easier experimentation and opportunity to react to business requirements, and deeper insight into business through advanced analytics capabilities. As an example, see how the IBM SAP Partnership for Digital Transformation has developed a cognitive automation solution for the finance month-end process, a typical ERP pain point: *https://www.youtube.com/watch?v=dr4HjGMm58E*.
SAP's LOB solutions for human capital management, commerce, procurement, and so on (e.g., SAP SuccessFactors, SAP Hybris, SAP Ariba)	New deployment models are available for traditional systems of record transactional processing.

Table 17.1 Key Technology Factors (Cont.)

Although each technological advance is expected to deliver significant benefits on its own, it's the confluence of these different technologies that holds the greatest promise and delivers the biggest value across all industries, creating exponential impact through technology combinations.

If we look at this from an SAP-centric worldview, we see that SAP aims to cover all aspects of the systems of record domain and the traditional ERP processes, but with SAP Leonardo (enabled by SAP Cloud Platform) SAP also looks to address the new use cases in the systems of differentiation and innovation domains, as shown in Figure 17.2.

What's clear is that old technology can't keep up with the speed of digital transformation. Traditional enterprise systems of record were never designed to be systems of flexible engagement. No matter the industry, competition armed with advanced technology can emerge literally at any time based on disruptive business models.

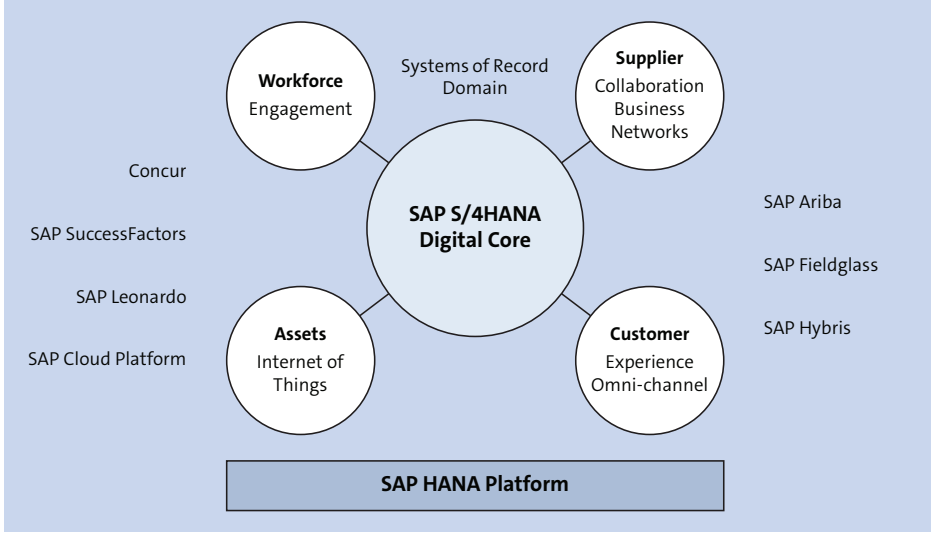


Figure 17.2 SAP's Vision of Postmodern ERP

SAP S/4HANA is one of the technology-enabling components, along with other technologies. Zooming in, we can see that the following are the key business levers for addressing this new focus and new ways of working with new expertise:

- Creating differentiating experiences for customers, employees, and others
- Driving how the organization works (people, process, and technology)
- Developing new ways of realizing and monetizing value
- Managing value, finance, and risk
- Spawning new business models, financing, and risk assessment
- Creating a strategy and execution plan for delivering experiences to the market
- Engaging and monetizing customer relationships
- Employing predictive, prescriptive, and advanced analytics
- Leveraging cognitive analytics to create deep and advanced competitive differentiation
- Digitizing products, services, and processes to redefine experiences with customers
- Leveraging cognitive computing, IoT, and automation
- Embedding situational awareness throughout the value chain
- Decapitalizing infrastructure and leveraging partner and full-network strengths

- Developing novel relationships that unleash new sources of value
- Identifying, retaining, and building the right talent for a digital organization
- Creating a culture of design thinking, agile working, and experimentation

Although technology—and especially SAP S/4HANA as the digital ERP core—can be an enabler to address business outcomes and vision (e.g., engaging customers in the digital age, delivering first-class UX, driving demand and revenue, changing business models through technology, etc.), it must be mapped to business strategy and levers on the inner ring.

This leads us to the second issue when considering whether SAP S/4HANA is a prerequisite for digital transformation. It's clear that the characteristics of SAP S/4HANA (which removes many of the constraints of today's SAP ERP solution) and the wider SAP HANA platform (e.g., analytics with SAP HANA Live, SAP Cloud Platform, integration with big data, the SAP Fiori UX, etc.) are key enablers. However, as indicated previously, it's the confluence of different technologies that changes the game, not SAP S/4HANA alone. In many cases, some early value and benefits of organizations on a digital transformation journey can be achieved before SAP S/4HANA adoption.

Now, let's look at SAP S/4HANA as the modern digital core and exactly what that means. Figure 17.3 illustrates the concept, while breaking it down into various dimensions:

- The outer ring looks at some of the key CxO challenges in today's digital era.
- The middle layer looks at some of the digital transformation technology enablers, focusing on the systems of innovation and systems of differentiation domains in Gartner's pace-layered application strategy model mentioned previously.
- The inner ring focuses on the systems of record enablement layer with SAP S/4HANA, SAP's ERP digital core, and the other industry and LOB solutions (as addressed in Chapter 15) that make up the SAP landscape across the systems of record domain.

Therefore, SAP S/4HANA isn't specifically a prerequisite for digital transformation; there are several initiatives and opportunities across all domains of the pace-layered application strategy that will facilitate an organization's transformation to a digital enterprise. In fact, even within the systems of record, SAP S/4HANA is just one part. However, when you look at the SAP S/4HANA vision, it removes many of the constraints of today's ERP systems and has many of the following characteristics that will modernize and renovate the core systems of record for the SAP ERP system to facilitate the digital reinvention:

Figure 17.3 SAP S/4HANA: Transforming SAP ERP Core into Digital Enterprise Core

- **Reimagined business models**
  Connections to people, devices, and business networks are made simple through the SAP HANA platform and integration with SAP S/4HANA.
- **Reimagined business processes for real-time business insights**
  Batch processing is no longer necessary because all processes are in real time, and analytics are embedded in transactions.
- **Flexibility, agility, and speed to value**
  SAP Cloud Platform can be used for agile DevOps in the cloud.
- **Reimagined UX**
  Any device can be used to get the job done with SAP Fiori UX and other UXs for interactive graphics (e.g., SAP Lumira) and for mobile iOS applications with selected Apple apps.

As you can see, SAP S/4HANA and modernization of the core ERP system will be a key part of the journey.

17.1.2 Business Value

What does this mean in terms of SAP S/4HANA's benefits for the enablement layer? In summary, SAP S/4HANA is a new generation of ERP solution running in real time and integrating predictive analytics, big data, and mobile computing, which will change how we work, how we run our businesses, and how we consume information. What is to be gained here? Consider the following benefits:

- **Real time**
  Having data in real time will change how you work, do business, and organize your enterprise.
- **Power of prediction and simulation**
  Every employee can leverage real business insights to drive perfect decisions, improve productivity, and increase profitability.
- **Agility**
  Agility is required in the digital economy. It allows you to rapidly enter new markets, onboard new companies, and reflect organizational changes in a tenth of the usual time.
- **Deployment choice and lower TCO**
  Deployment options include in-house or in the cloud, which frees up more budget for innovation.
- **Consumer-grade UX**
  The modern UX drives adoption, user engagement, and productivity.

17.1.3 Making the SAP S/4HANA Case

When making the case for moving to SAP S/4HANA, you should first focus on the business outcomes and business benefits as follows:

- Understand the existing pain points, including industry-specific and horizontal solutions (e.g., finance, sales, logistics), as described in Table 17.2.
- Provide examples of the business processes that derive value from SAP S/4HANA (qualitative and quantitative).
- Show quick demos (with the new SAP Fiori UX, big data, analytics, and cognitive computing).

- Look at opportunities to align the SAP S/4HANA adoption with other business initiatives such as digital transformation or other LOB initiatives such as finance or marketing transformation.

Examples of Customer Challenges	What SAP HANA Enables
■ Data latency issues for operational reporting ■ Long lead time for new developments and reports ■ Aged UI preventing "anytime, anywhere" access ■ Multiple sources of truth, non-value-adding processes ■ Highly customized core, which leads to high TCO ■ Incomplete information to make insightful business decisions	■ Move of operational analytics back to OLTP and real-time reporting ■ Self-service reporting, SAP Cloud Platform for DevOps in the cloud ■ Mobile-friendly UIs: SAP Fiori, SAP Lumira, and design thinking ■ Simplified data model: no aggregates, indices, and so on ■ SAP Activate (content lifecycle management), SAP Cloud Platform ■ Cloud analytics, SAP Vora, and advanced analytics

Table 17.2 Operational Pain Points Mapped to SAP HANA Enablers

The flowchart in Figure 17.4 helps illustration the navigation of and some key decisions to consider when looking at the move to SAP S/4HANA.

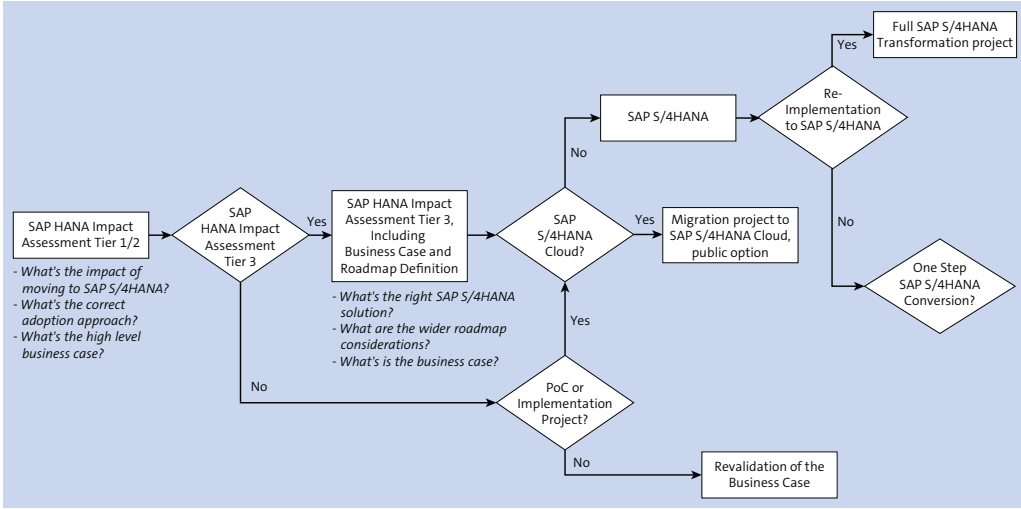


Figure 17.4 SAP S/4HANA: Adoption Decision Matrix

The next step is to build your case for business simplification and creating business value using the following resources:

- Consider the industry and LOB solution viewpoints created by the IBM SAP Partnership for Digital Transformation initiative as additional sources of input to help make the business case for SAP S/4HANA and other technologies as part of a digital transformation. See *http://www.ibm-sap.com/digital_transformation* for these thought-leadership viewpoints.
- Look at use cases by industry (e.g., consumer packaged goods, retail, banking, industrial products) that can be enabled by the SAP HANA platform to drive business value. See *http://www.ibm-sap.com/digital_transformation* for examples of digital transformation solutions and assets being codeveloped by IBM and SAP around industry-focused use cases powered by SAP HANA and other technology, such as IoT and cognitive computing.
- Execute SAP S/4HANA business scenario analysis to look at areas of potential value for SAP S/4HANA adoption. With the business scenario recommendations for SAP S/4HANA, IBM will help provide tailored recommendations based on your current productive system usage to show where you can benefit most from SAP HANA, SAP Fiori, and SAP S/4HANA.
- Use the report at the following site to see which business scenarios are most relevant for you based on the data you submitted for analysis, including an indication of potential IT and business value: *http://bit.ly/2xlg87o*.
- Use SAP's Transformation Navigator (see *https://go.support.sap.com/transformationnavigator/#/welcome*) to help define the end-to-end process map and solutions for the transformation roadmap.

Table 17.3 provides a summary across the key areas of considerations based on a specific customer example. No relative weighting has been applied, which should be factored in based on your priorities and IT/business context.

	SAP ERP AnyDB	SAP Business Suite on SAP HANA	SAP S/4HANA Finance (e.g., 1605)	SAP S/4HANA (e.g., 1610)
Alignment to stated SAP roadmap	○	◔	◑	●

Table 17.3 SAP S/4HANA Comparative Analysis

	SAP ERP AnyDB	SAP Business Suite on SAP HANA	SAP S/4HANA Finance (e.g., 1605)	SAP S/4HANA (e.g., 1610)
Functionality (e.g., core LOB and industry solutions)	◕	◕	●	◕
Innovation and optimization (new functionality, enterprise-wide reduction of business model complexities)	◔	◔	◕	●
Operational benefits (e.g., removal of batch processing)	○	◔	◕	●
Analytics benefits (e.g., real-time operational reporting)	○	◔	◕	●
Usability and UX (e.g., improved SAP Fiori UX)	◔	◑	◕	●
Implementation costs, time line, etc.	●	◕	◕	◑
Longer-term TCO (e.g., custom developments, migrations, support)	○	◔	◑	◕
Risk/maturity	●	◕	◕	◔
Legend: ○ = Worst → ● = Best				

Table 17.3 SAP S/4HANA Comparative Analysis (Cont.)

Take a close look at the asterisk in the functionality row in Table 17.3. Although new SAP innovations will be developed "SAP HANA-first," there needs to be an assessment of required functionality (e.g., LOB solutions, industry solutions, country versions, and so on) to confirm that the functionality is available in the relevant SAP S/4HANA release.

Although it's still a work in progress to fully transform all processes, SAP S/4HANA is the only in-memory, end-to-end solution that covers all business processes across 25 industries. The release of SAP S/4HANA 1610 provided a solution that addressed most

core processes in use by organizations today, and 1709 adds functionality that both addresses gaps and is new functionality.

Although SAP S/4HANA 1709 might not provide a 100 percent match for every piece of functionality in SAP ERP 6.0, EHP 8, the processes that SAP S/4HANA 1709 doesn't cover are likely to be niche processes in Enhancement Pack functionality that have been activated by only a few organizations.

17.2 Developing Your Roadmap

In this section, we'll show you how to develop your transformation roadmap. Ideally, the approach for defining the roadmap should be based on the Open Group architecture framework (TOGAF) method. TOGAF is a framework for enterprise architecture that provides an approach for designing, planning, implementing, and governing an enterprise information technology architecture modeled at four levels: business, application, data, and technology. SAP Enterprise Architecture Framework is a TOGAF-based approach.

Figure 17.5 shows the overall approach for creating a transformational IT roadmap and some of the considerations along the way. A key consideration is that the move from the CMO is based on a combination of IT and business inputs, industry best practices, and benchmarks, with a target model company for a specific industry in mind for assessment. Also, the journey to an FMO is based on a series of iterative steps (interim mode of operation). One of the key principles in defining the roadmap is understanding the building blocks (i.e., solutions) that will form the FMO and understanding the priorities, sequences, and dependences to ensure that any regret costs are understood and minimized.

For example, if a move to SAP BW/4HANA is a predecessor to SAP S/4HANA, there will be an element of operational analytics built into the former that will subsequently move back to the latter via embedded SAP BW. If this is understood, then the design in SAP BW/4HANA for these data flows and reports can be addressed in such a way as to minimize the rework when moving back into SAP S/4HANA at a later stage.

Similarly, there may be some immediate benefits of including cognitive process automation into certain SAP ERP processes today to remove pain points, but the solution should be built in such a way that it also can be leveraged when the SAP ERP system is moved to SAP S/4HANA.

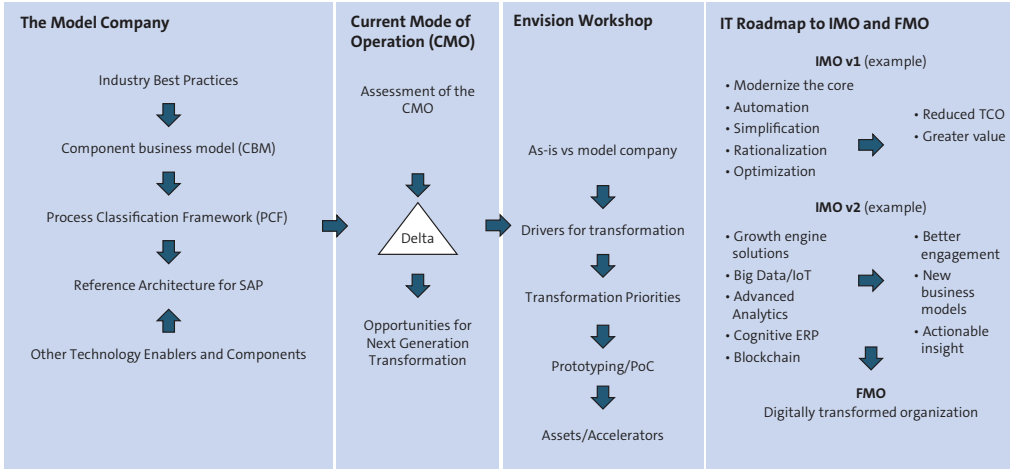


Figure 17.5 Understanding Business Imperatives to Move from Current Mode of Operations to Future Mode of Operations

We'll use extracts of the IBM Better Transformation method as a guide and basis for roadmap definition. The IBM Better Transformation method (illustrated in Figure 17.6) for roadmap *definition* and *execution* provides a framework that leverages assets to help with "as is" analysis and "to be" envisioning. This framework leads to the development of an IT roadmap that can be delivered to transform the organization. The roadmap addresses individual IT initiatives, priorities, dependencies, options, business cases, sequencing and timing, and activities to execute the delivery of the roadmap's component parts.

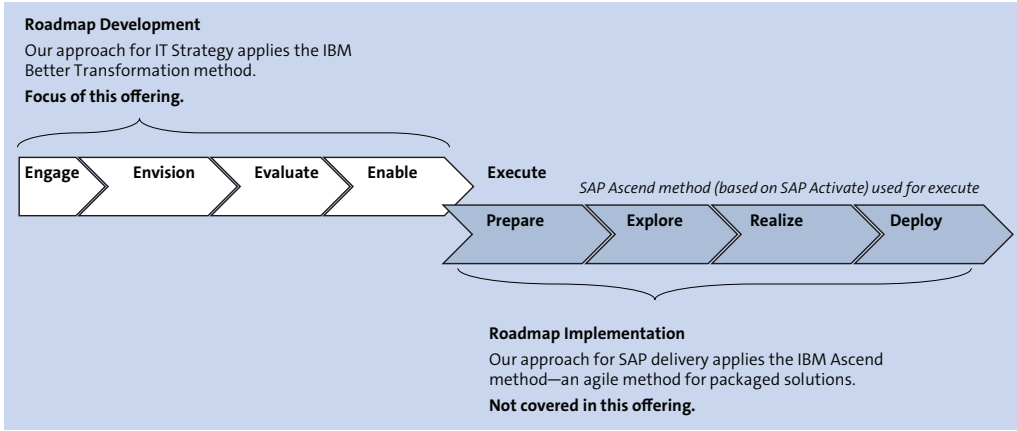


Figure 17.6 Complete End-to-End Approach from Roadmap Definition to Execution

The roadmap development stage includes the following four distinct phases that are described in detail in subsequent sections:

1. **Engage**
   Analyze the CMO.
2. **Envision**
   Explore the target operational model (TOM).
3. **Evaluate**
   Dive deep into the transformation approach.
4. **Enable**
   Build the roadmap.

After the transformation roadmap has been defined successfully, you can carry out the execute phase. For this, we propose the use of IBM Ascend, which leverages the SAP Activate methods and tools to deploy the target solution. The integration of an IBM Ascend (SAP Activate) method for execution of the roadmap provides a complete and integrated end-to-end approach from roadmap definition to project execution while providing the following benefits:

- The enable phase within the digital transformation roadmap develops the business case.
- A clear view of how the transformation can be delivered is developed.
- The outputs of the roadmap work accelerate the prepare and explore phases of the execute phase.

In this section, we'll look at the detailed phases and outcome objectives of the approach to defining an IT roadmap that supports organizations on their digital reinvention journeys. Each phase is based on the SAP Enterprise Architecture Framework. Each section shows an indicative but not comprehensive view of the objectives, activities, and outcomes by phase to deliver the transformational IT road map based on extracts of key activities. At a very high level, we'll attempt to achieve the following:

- **Landscape**
  - Simplify on-premise landscapes by moving applications to the cloud.
  - Rationalize on-premise SAP applications, looking at areas for migration to a preferred instance.
  - Optimize and consolidate SAP instances via technical merge and harmonizations.

  - Consider changes in how employees consume data via mobile devices and the transition to the "individual enterprise."
- **Platform**
  - Assess the value of and readiness for SAP HANA adoption.
  - Understand the options for the IT platform (e.g., SAP Customer Relationship Management [SAP CRM] versus SAP Hybris Cloud for Customer, SAP Integrated Business Planning versus SAP Supply Chain Management [SAP SCM], SAP S/4HANA Cloud versus SAP S/4HANA, or use of SAP Cloud Platform as part of an agile DevOps strategy).
- **Process**
  - Modernize the SAP ERP core to enable the digital transformation of the business.
  - Consider changes in how employees consume data via mobile devices and the transition to the individual enterprise.

Note

As you work through the phases, it's important to keep in mind that the move from the CMO to a target state FMO needs to travel via multiple iterations or interim modes of operation (IMOs). In fact, it could be considered that the FMO is a state that's never actually achieved, because it's a moving target that will be reviewed and revised during the transition journey at the different IMO stages and then tested against the ever-evolving business strategy.

17.2.1 Engage Phase: Analyzing the Current Mode of Operations

The first phase of the IBM Better Transformation framework is known as the *engage phase*, in which you look at and analyze the application landscape as is and propose a vision for the desired end state.

The activities of this phase are as follows:

- Collect the following data in the current environment:
  - The as is IT landscape
  - Application portfolio
  - IT strategy

- Understand the following parts of the business vision:
  - Target operating model
  - Pain points
- Compare CMO versus target FMO of the model company for a specific industry by doing the following:
  - Identifying opportunities for digital transformation initiatives
  - Setting up the envision phase workshop to identify participants, logistics, and so on

The goals for this phase are as follows:

- Documented understanding of the current IT landscape and application portfolio
- Gaps identified between the CMO and the FMO
- Workshop to be run in the envision phase driven by the identified gaps

17.2.2 Envision Phase: Exploring the Target Operational Model

The second phase of the IBM Better Transformation framework is known as the *envision phase*, in which we explore the TOM in the context of the business and IT strategy, the current pain points and business expectation gaps, and the business case for digital transformation.

The activities of this phase are as follows:

- Explore the findings of the engage phase.
- Explore the opportunities identified in the context of the client's business ambition and IT strategy.
- Demonstrate how current business expectation gaps are closed.
- Establish digital transformation priorities around key technology components.
- Decide to proceed with the evaluate phase.

The goals for this phase are as follows:

- Envision the workshops completed.
- Align qualified digital transformation opportunities with technology enablers and value propositions.
- Decide to proceed and set contract in place to move into the evaluate phase.

17.2.3 Evaluate Phase: A Deep Dive into the Transformation Approach

The third phase of the IBM Better Transformation framework is known as the *evaluate phase*, in which you define an approach to address the priorities identified in the envision phase to modernize the core of the enterprise applications and deliver digital transformation. During this phase, you demonstrate solutions and iteratively build agile POCs/proofs of value.

The activities of this phase are as follows:

- Evaluate the current IT strategy and its ability to deliver the FMO and identify gaps.
- Run initiatives to dive deep into the identified transformation opportunities.
- Model business components to identify operational versus differentiating applications.
- Identify application consolidation opportunities.
- Identify application rationalization opportunities.
- Define key architecture principles and decisions for the IT roadmap.
- Identify alternative options, and make assessments based on business- and IT-ranked evaluation criteria.
- Run iterative POCs/proofs of value based on immediate priorities.

The goals of this phase are as follows:

- Assess current strategy, identify improvements, and articulate business values.
- Define a prioritized set of actions to deliver business value.
- Identify tools and accelerators for roadmap delivery.

17.2.4 Enable Phase: Build Your Roadmap

The fourth phase of the IBM Better Transformation framework is known as the *enable phase*, during which you define the roadmap to introduce the FMO and close business expectation gaps based on prioritization of business capabilities.

The activities of this phase are as follows:

- Develop a prioritized portfolio and IT roadmap to achieve business objectives.
- Develop a supporting business case.
- Develop a plan to deliver the transformation and associated business objectives.
- Plan the approach for architectural vitality.

The goals of this phase are as follows:

- Define the roadmap and supporting plan showing the path to the FMO via an IMO.
- Define the approach for periodic application reviews of the roadmap against business ambition and needs.

17.3 Understanding the Current Mode of Operations

It's very rare to be faced with a greenfield situation in which you can start from a blank canvas, so you need to take into account the constraints of the CMO and any inhibitors that may prevent moving to the target FMO end state. However, you do need an FMO strawman in mind for testing the various hypotheses against when looking at the target end status based on business drivers and business benefits.

In this section, we'll discuss the CMO—taking a quick look at existing pain points before diving into some analysis tools from SAP and from IBM and other third-party providers. This corresponds to the engage phase of the IBM Better Transformation framework.

17.3.1 Pain Points

Ultimately, there needs to be a reason to act. Although this needs to be mapped to the business vision, to make a change at the technology layer it needs to be mapped to a pain point on the existing technology domain; even if that's as simple as compliance factors (e.g., older versions of software), it ultimately needs to be mapped to business value.

Table 17.4 provides some examples of LOB questions in the CMO and marketing domains.

Questions to Ask	Pain Points to Be Addressed
Do you have a comprehensive view of your customers? Are you able to engage customers consistently across channels?	Real-time customer insights aren't available to understand customer intentions (a customer can be a final consumer or a company).
Are you able to develop a dialogue with all your customers?	The company can't connect with or engage customers.

Table 17.4 Key Considerations for Drivers to Innovation

Questions to Ask	Pain Points to Be Addressed
Are you proactive with your sales and marketing?	The sales and marketing process is too long and inflexible to react quickly.
How well are your commerce and marketing technologies integrated with one another? Is there seamless process automation across key processes?	The technology landscape is complex, and there are too many silo systems.

Table 17.4 Key Considerations for Drivers to Innovation (Cont.)

Your specific pain points will vary based on your industry, but identifying those that are relevant to your business is part of the engage phase.

17.3.2 Objectives

The objective of the engage phase is to analyze the CMO application landscape so that a vision can be put forward for the desired end state based on the client's current landscape.

This phase of the engagement is key to gather the information required to prepare for the envision phase workshop. The workshop needs to be tailored to assess the client's SAP landscape and gather relevant information prior to initiating this session.

To maximize the information gathered and to reduce time lines, a set of SAP, IBM, and third-party tools have been identified, especially around the SAP HANA Readiness Assessment, to help understand the CMO and the impact of the transition to SAP S/4HANA. The results of the assessment will influence the options that SAP recommends.

17.3.3 Approach

Now, we'll look at tasks and activities, as well as tools (accelerators), that can be used to carry out the two main pieces of work of the engage phase: analyzing the CMO and proposing a vision for the desired end state.

The analysis is carried out in the organization's current landscape, focusing on the application landscape:

- **Workshops**
  General and specific sessions with application owners, IT, and business owners are held to understand and document the range and depth of the application architecture and landscape for both SAP and non-SAP systems. In many instances, the organization already will have a lot of this information documented in various forms. Consolidating this understanding is an important part of the workshops and subsequent follow-up sessions.
- **Technical assessments**
  Detailed analysis and statistics from existing systems and applications, such as analysis of the SAP EarlyWatch Alert reports, can be used to document existing challenges and provide a view of the CMO.
- **Interviews and questionnaires**
  These methods are used to gauge a more detailed understanding of key areas following the workshops with key IT and business stakeholders.

You'll also need to propose a vision for the desired end state based on the CMO analysis with the FMO in mind. To do this, we propose the use of some or all of the following activities:

- Compare the CMO with the FMO target in mind to identify opportunities and innovations.
- Provide relevant business cases for identified digital transformation opportunities.
- Recommend opportunities to address the digital transformation roadmap.

Some accelerators are available to help with this stage of the transformation roadmap:

- Target FMO reference architecture
- Technology questionnaire
- SAP S/4HANA business case and roadmap creation
- SAP Journey Maps
- SAP UX Explorer
- SAP Enterprise Architecture Explorer
- IBM Technical Healthcheck
- SAP HANA Readiness Assessment
- Business scenarios recommendations

17.4 Defining the Future Mode of Operations

In this section, we'll discuss the FMO—that is, how to achieve the digital transformation discussed in Chapters 1 and 2 and how to address the pain points identified there and in Section 17.3.1. We'll discuss the principles of enterprise architecture and show you how to map a business strategy and TOM to your processes and applications. In short, we'll show you how to plan your future landscape. This corresponds to the envision phase of the IBM Better Transformation framework. The objective of the envision phase within the digital transformation roadmap is to start defining the options and considerations for the target FMO.

17.4.1 Considerations

There are two key challenges in defining a successful digital transformation strategy:

1. **Lack of business alignment and vision**
   A diverse range of perspectives from across and within organizations may lead to a lack of alignment and common vision about where the business needs to go and how it can get there. This lack of alignment can often result in piecemeal initiatives or misguided efforts that lead to missed opportunities, false starts, and regret costs.
2. **Lack of IT alignment and vision**
   A lack of alignment and common vision about where IT needs to go to support the business, partly caused by the plethora of technologies, can also lead to piecemeal IT initiatives that fail to support the real business vision, with missed opportunities, false starts, and regret costs.

Ultimately, though technology is an enabler to achieve business outcomes and vision, a successful roadmap must be created to support the realization of the business strategy. There also needs to be a framework for helping customers on their journey.

17.4.2 Approach

Now, we'll look at the tasks and activities to carry out the main pieces of work during the definition of the CMO. We'll begin by envisioning the FMO and running a series of workshops to explore the FMO in the following contexts:

- **Business and IT strategy**
  Identify how closely the IT strategy and business strategy are aligned, identify any piecemeal anomalies and proposals to close the gaps, and identify how the FMO fits into the IT and business strategy.
- **Current pain points and business expectation gaps**
  Using information from the CMO analysis (via the workshops, questionnaires, interviews, and technical assessment), define how pain points can be addressed in the FMO and how gaps in business expectations can be plugged.
- **The business case for digital transformation**
  Begin the process of defining the key elements of the business case for digital transformation. Identify key qualitative and quantitative measures.

The key inputs of this phase are as follows:

- **Outputs from the engage phase**
  The CMO analysis, pain points, business expectation gaps, and opportunities identified in the engage phase
- **Current IT landscape**
  The current application landscape identification
- **IT strategy**
  Description of how the IT strategy is aligned to support the current business strategy
- **SAP technology road map**
  The latest technology roadmaps from SAP with regard to the SAP applications in the current application landscape
- **Relevant point of view**
  The business case viewpoint for digital transformation

The main activities of this phase are as follows:

- **Facilitate workshops to achieve the following:**
  - Present the context and business case for digital transformation opportunities to reduce TCO and better meet requirements.
  - Review the findings of the analysis in the engage phase.
  - Present initial recommendations on the opportunities for digital transformation initiatives based on SAP value engineering and the IBM CxO studies contextualized for SAP.

  - Discuss these recommendations in the context of the client's business ambition, IT strategy, perceived business expectation gaps, and current pain points, as well as the SAP technology roadmap.
  - Qualify and prioritize the opportunities for digital transformation mapping solutions to solve problems and pain points and, if applicable, reduce TCO.
  - Tailor the initial business case for the digital transformation initiative to make it even more specific to individual organizations.
  - Plan the evaluate phase.
- **Tailor your business case**
  Present a tailored business case for digital transformation, including a set of desired business outcomes to be met by the digital transformation activity.
- **Identify opportunities**
  Identify qualified opportunities for digital transformation that include tailored use cases. These use cases identify candidate processes that can be simplified with initiatives aligned to the latest technology roadmaps, including industry and solution points of view:
  - Platform optimization and advanced analytics with migration to SAP HANA
  - Migration to the cloud and taking advantage of SaaS (e.g., SAP Ariba, SAP Hybris, SAP SuccessFactors)
  - Mobile solutions and UX modernization for user engagement

Some accelerators are available to help with this stage of the transformation roadmap, as follows:

- Target FMO reference architecture
- IBM viewpoints on the business case for implementing new technologies aligned to a technology roadmap
- IBM component business model (IBM CBM)
- SAP HANA adoption scenarios
- SAP S/4HANA business case and roadmap creation
- SAP Journey Maps
- SAP UX Explorer
- SAP Enterprise Architecture Explorer
- IBM Explore SAP HANA

17.5 Choosing How to Adopt SAP S/4HANA

In the following sections, we'll discuss your options for how to get SAP S/4HANA based on business priorities and IT dependencies. This section corresponds to both the evaluate and enable phases of the IBM Better Transformation framework.

Each SAP landscape is different, so before moving to SAP S/4HANA, it's important to understand how LOB processes from SAP ERP in the past are currently covered between SAP S/4HANA and SAP cloud solutions.

17.5.1 Evaluate Phase

In this phase, you'll perform the following activities that can help you to evaluate your options:

- **Rationalize**
  Use component business modeling (e.g., IBM CBM) to align applications that support each component of the Gartner pace-layered application strategy model. This will help identify opportunities for rationalization and determine sourcing (build vs. buy) recommendations.
- **Consolidate**
  Conduct application consolidation analysis to identify where benefits can be realized from process harmonization and technical consolidation.
- **Modernize**
  Carry out application modernization analysis to define the ideal current and future states for the current and ported applications. Look at the new versions of SAP—for example, SAP S/4HANA and hybrid ERP (a mix of on-premise and cloud SaaS applications).
- **Determine the individual enterprise**
  Carry out user productivity analysis—perhaps using design thinking client workshops—to identify use cases in which a "consumer-grade" UX will increase user adoption and productivity can be increased with the use of SAP UX modernization (SAP Fiori, SAP Screen Personas) and mobility.
- **Identify target component architecture**
  Complete product evaluations to identify the most appropriate technical component to deliver the business ambition. This activity will define the target component architecture: the FMO.

- **Perform demos and create prototypes**
  Build and demonstrate prototypes to bring the roadmap to life. Use time-boxed iterations to maintain momentum.
- **Address key issues**
  Develop approaches for the key issues associated with digital transformation, integration, security, and data governance.

17.5.2 Enable Phase

Some of the additional activities that can be carried out to design the path to value by finalizing the roadmap to introduce the FMO are as follows:

- Develop and finalize the deployment roadmap. Use a framework such as the IBM application lifecycle management (IBM ALM) framework shown in Figure 17.7 to break down the transformation journey into a series of manageable steps. This will set out an approach and time lines for the technology transformation from the CMO to the defined IMO and finally to the FMO.

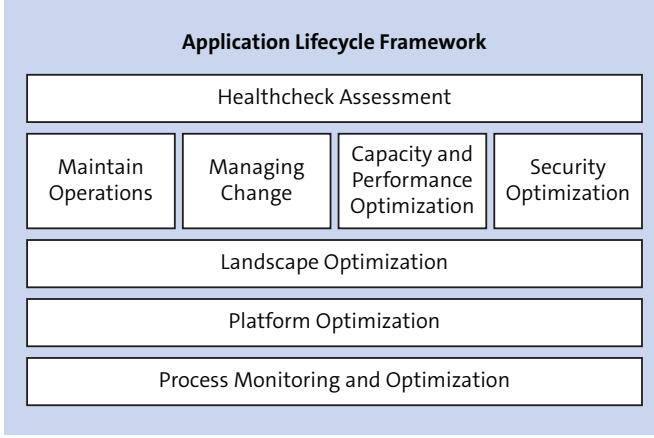


Figure 17.7 IBM Application Lifecycle Management Framework

- Develop an implementation plan to validate the transformation time lines. This will also feed into the execute phase.
- Develop an approach to maintain architectural vitality. Periodically review the FMO in the light of advancements in technology or business ambitions.

17.6 Summary

In this chapter, we discussed an approach to developing a digital transformation roadmap and some of the considerations required. We proposed the use of the IBM Better Transformation framework method to guide you through the journey of identifying and analyzing your CMO, documenting associated pain points and business gaps vis-à-vis the FMO vision, and then identifying IMOs based on priorities to define a roadmap.

Realistically, the FMO should be something that evolves during the two- to three-year roadmap definition because it needs to be flexible to accommodate changes in business priorities or technology. For example, a roadmap defined two years ago probably wouldn't have considered new aspects such as blockchain or SAP Leonardo. Although blockchain still may be limited to POCs in many cases, there's an emerging list of uses cases that should be considered.

Chapter 18
Customer Case Studies

Many SAP ERP customers still find it difficult to define the business case for SAP S/4HANA. In this chapter, we'll show you the value that was realized by SAP S/4HANA in real-world projects to help you build your own business case.

Don't forget that implementing SAP S/4HANA and taking advantage of the IT, finance, and logistics business benefits it offers isn't the destination, but simply a stepping-stone that will help you along your journey to digital transformation. Technological advances are disrupting the status quo and creating huge turbulence. Industries are converging, and new competitors are emerging at breakneck speed. The pressure to innovate has never been greater, nor has managing the risks been more difficult. How are CxOs carving a path through the chaos and helping their enterprises pursue profitable growth?

Let's look at a series of case studies that help showcase recent and ongoing SAP S/4HANA implementation projects. Of course, it's important to mention that for each business case, the focus should be not only on the cost of implementing SAP S/4HANA but especially on the business benefits it brings (e.g., the finance organization becoming a real business partner for the CEO, supporting him with real-time insights).

18.1 Multinational Industrial Company

A multinational industrial company is operating in a *multi-ERP system landscape*, which means that instead of having a single ERP instance running its business, the company has a landscape with multiple versions of SAP instances and non-SAP instances. To report financials on a global scale, the company usually develops global financial data standards such as a global chart of accounts or develops a common definition of profit centers, cost centers, and so on.

However, this approach requires a high degree of governance and reconciliation between all systems that use common global master data. The only place where financial data comes together on a global scale is in a financial information warehouse and the consolidation system itself. However, this isn't a real-time process; data can be accessed one day later after a nightly upload or, sometimes, only after a month-end closing process has been finished. Further, most of the time this consolidated financial information is delivered on an aggregated level only and not always uploaded via an automated interface to the consolidation system; this makes it impossible to drill down to the details behind these consolidated figures. In many cases, the closing process timelines are jeopardized as well because the upload to the consolidation system fails due to master data issues.

This kind of financial architecture and data flow is common in many multinational organizations. In this architecture (see Figure 18.1), an SAP BW system is often used as a kind of *financial data warehouse* to collect financial information from various source systems before sending the data to the corporate consolidation system.

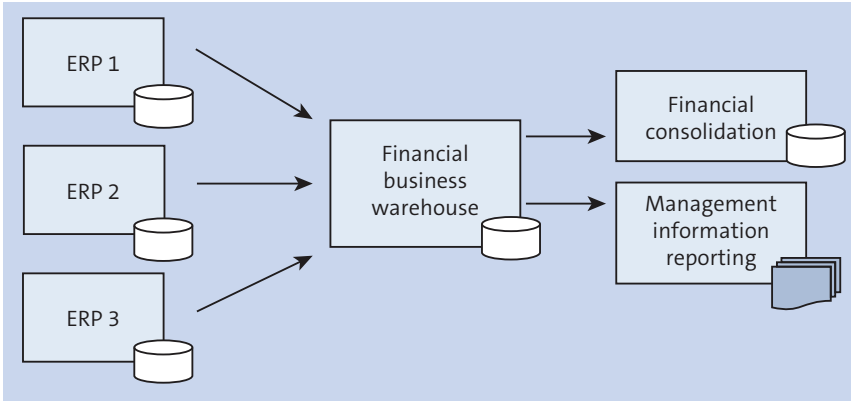


Figure 18.1 Typical Financial Architecture and Data Flow

However, because the load of data to a central system is irregular, this architecture causes the following problems:

- Because inconsistencies can only be detected late in the closing process, intercompany reconciliation issues arise that add to the time needed for the closing processes.
- There is a lack of instant insight into cash flow and working capital movement on the group level.

- With financial data in the local ledgers *and* in the consolidation ledger, there are multiple versions of truth, which causes transparency issues.
- Most of the time, the load to the consolidation system is a nonstandard solution containing massive data-mapping constructs, which results in high TCO.

Can this be rectified with SAP S/4HANA? Let's find out.

18.1.1 Vision

To overcome these problems, this customer was looking for a way to consolidate its financial system environment and create a single source of truth for finance by implementing SAP S/4HANA Finance via the Central Finance deployment model. The company envisioned that the end-state architecture would look like Figure 18.2.

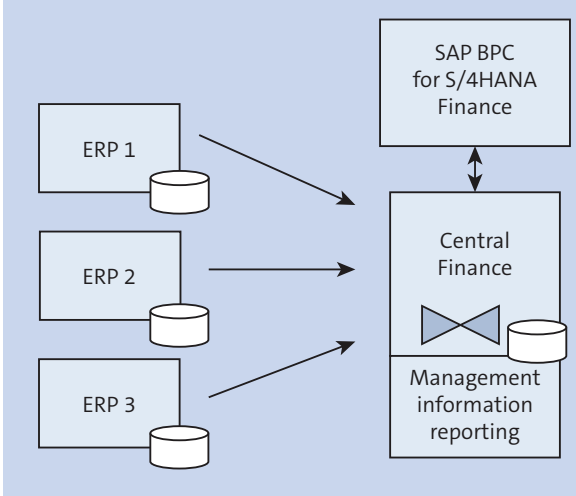


Figure 18.2 SAP S/4HANA Finance End-State Architecture

In this architecture, detailed financial transactions will be *replicated* in real time to a Central Finance box. In this process, the mappings needed between source and target systems will be handled by SAP Master Data Governance (SAP MDG) functionalities. This function can be used, for example, to make source data that employs different financial data standards compliant with global financial data standards. (In this scenario, we can assume that consolidation functionalities are provided by SAP BPC for SAP S/4HANA Finance.)

Therefore, in this architecture, we expect that most of the management information reporting requirements can be satisfied from the Central Finance system in real time, which would eliminate the need for management information reporting via SAP BW.

18.1.2 IT Project

The main driver for this Central Finance project was to implement SAP S/4HANA without any disruption, which is only possible using the sidecar approach. This also enabled the client to integrate and consolidate multiple SAP ERP systems into one SAP S/4HANA system. The client was able to test the SAP S/4HANA Finance simplification (Central Journal) easily, paving the way to upgrade existing SAP ERP to SAP S/4HANA Finance in the future. A lot of large corporations are looking at Central Finance as a noninvasive way to introduce SAP S/4HANA in the landscape.

18.1.3 Benefits

Having all financial transactions in one SAP S/4HANA system provides the following benefits:

- Instant insight in cash flow and working capital movements on the group level
- Intercompany reconciliation process in real time to accelerate the month-end close process
- Improved transparency due to the realization of a single source of truth for finance via the Universal Journal concept

Universal Journal

Recall from Chapter 2 that the Universal Journal acts as the single source of truth in an SAP S/4HANA Finance system and needs to be based on your global and local operational financial reporting requirements.

- Improved user experience (UX) with SAP Fiori screens for core finance functionality in SAP S/4HANA
- Soft close in SAP S/4HANA as opposed to hard close in SAP ERP
- Operational reporting directly in SAP S/4HANA
- Better insight into costs and revenues due to the introduction of account-based Profitability Analysis (CO-PA) as part of the Universal Journal

Currently, Central Finance can only replicate data the SAP General Ledger (G/L) level and clearing information for Accounts Receivable (AR) and Accounts Payable (AP), but in a pilot version we're using in a proof of concept for this multinational industrial customer, it's possible to replicate open items as well. This will open the opportunity to use Central Finance as the single source for shared services operations.

18.1.4 Path Forward

Central Finance can be activated without a lot of risk. One option is to activate Central Finance using a sidecar scenario (see Figure 18.3), meaning that it would act initially as the source for feeding the current consolidation and corporate finance reporting environments for a limited number of sources only.

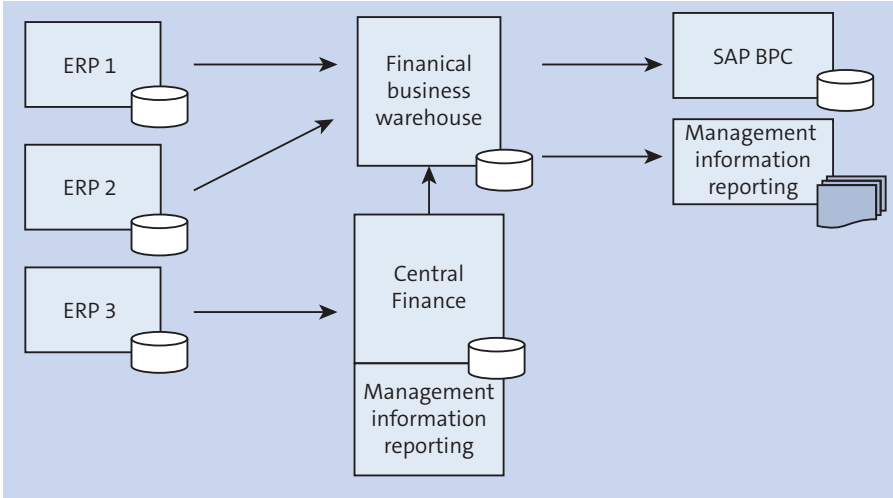


Figure 18.3 Central Finance as Sidecar Scenario

Later, when more organizations are connected to the Central Finance box and it works satisfactorily, we could route all sources via Central Finance so it will become the single source for feeding the consolidation and group reporting systems.

In the future, we expect SAP BPC to work directly with Central Finance as well, with the application landscape as shown earlier in Figure 18.2.

Next, many of our customers today manage their cash position using Microsoft Excel. Because they operate multiple ERP systems rather than one ERP system, they don't have a standard process for long-term cash planning; the result is manual cash

planning and laborious reconciliation efforts. The effect is that many customers lack insight into their daily cash positions, which makes it very difficult to centrally manage risk and exposure across regions/geographies.

This customer and many others show a lot of interest in bringing cash data together in a central repository such as Central Finance. To solve the issue of the lack of a centralized financial system environment, various proof of concepts started to explore this capability of SAP S/4HANA Finance in more detail. It can provide global cash positions in real time—even in the presence of heterogeneous backend systems. New analytical capabilities provide detailed analysis of forecasted cash flows to bring greater levels of consistency to cash balances, cash requirements, and liquidity strategies.

Many large organizations are considering the Central Finance scenario as a viable option for optimizing their system landscapes. Some of them already started the journey because having all their G/L-level data in one system was already enough of a business benefit to choose this scenario. Central Finance offers a centralized, real-time data-reporting instance that can be used as single source for the consolidation process as well. It allows them to harmonize data on the fly and will support full data mapping and document drill-back.

Central Finance provides a low-risk, nondisruptive path to adopt the latest SAP finance simplification and innovations for customers with multi-ERP system landscapes. It provides a consolidated financial and management reporting instance to centralize process execution, planning, and reporting based on the same (single source of truth) data. Central Finance is also an excellent vehicle to implement financial shared services more quickly and will be a fast track for digitally reinventing your finance function.

18.2 Multinational Service Company

The customer in our next case study recently embarked on a multiyear transformation program to enable improved reliability, agility, and efficiency across all its business segments. This global SAP implementation project for SAP S/4HANA Finance included the following functional domains: corporate finance, supply chain, customer engagement, manufacturing, quality management, human resources, enterprise asset management, and product and services delivery processes. It had been live for six months at the time of writing.

18.2.1 Vision

Due in part to a continual series of acquisitions, this customer had a lack of consistent structure and streamlined business processes across different segments, functions, and business units. The company needed to integrate key processes across multiple functions, including corporate finance, supply chain management, customer engagement, manufacturing, human resources, enterprise asset management, and product and service delivery. To do so, the company selected the SAP S/4HANA Finance add-on.

18.2.2 IT Project

The client was already running its SAP Business Suite on SAP HANA and getting the benefits of being on the latest suite from SAP, so it was natural to upgrade to SAP S/4HANA Finance to benefit from further simplification and innovation. The key to TCO was reducing the data footprint, which was achieved due to the simplified data model.

18.2.3 Benefits

Let's look at some of this customer's pain points and how SAP S/4HANA was deployed to overcome them through the lens of the following financial business elements.

Financial Reporting and Analysis

Running detailed operational reports, such as CO-PA reporting, on the SAP ERP system had an unacceptable impact on system performance. It forced the company to extract this operational data to an SAP BW environment, which caused a delay in reporting. During a given month, extracts to SAP BW normally occurred only once per day, and during month end they could be performed on demand. Furthermore, not all business data required was available on the spot; the company often had to run month-end closing jobs to make the data available on the level needed to satisfy financial reporting requirements. The company also needed to perform a complex reconciliation task to guarantee reliable financial reporting because it had no single version of truth in its SAP landscape. Instead, the company had to deal with various ledgers such as the G/L, asset ledger, Material Ledger (ML), CO-PA ledger, and so on. A lack of access to real-time data led to significant manual effort being required in internal financial reporting and analysis.

SAP S/4HANA Finance took away most of these pain points by providing one access point for all financial reporting requirements. Now, finance team members never need to wonder where to report their financial data from; the Universal Journal contains all the financial information they need. It took away the necessity of reconciling the various ledgers as well.

Next, due to SAP S/4HANA's technical capabilities, such as in-memory processing and columnar storage, this service company no longer needs to run operational reporting in an SAP BW environment. The company can simply define and run operational reports in the SAP ERP system without jeopardizing its performance.

In a nutshell, SAP S/4HANA Finance combines financial and management accounting, as well as profitability data, into one Universal Journal. It abolishes totals, indices, and other predefined aggregates and relies on line items as a single source of truth to provide an intuitive UX, reduce operational reporting efforts, and accelerate financial processes. It significantly reduced the finance business operation and analysis costs for this specific customer.

Managing Month-End Close

Beyond the described financial reporting and analysis pain points, the customer experienced more month-end misery:

- End-of-period bottlenecks due to many activities needing to be run at the same time, but not enough manpower available to execute all tasks in parallel
- Manual workarounds for loading data in the system due to lack of automation
- High cost of audit due to lack of transparency of the data and audit trail

The good news is that a soft close with SAP S/4HANA Finance supports the following:

- Real-time execution of closing activities
- Intramonth execution of month-end activities such as intercompany reconciliation
- Accelerated month-end batch processes and real-time reporting
- Self-service analytics, which eliminates the requirement to develop specific reports to satisfy reporting needs

This customer eliminated one-third of its month-end closing processing. By combining financial, management accounting, and profitability data into one Universal Journal and offering a real-time intuitive UX, SAP S/4HANA reduced operational reporting efforts considerably.

Managing Receivables

This customer was struggling with the fact that AR-related data is only visible within the AR department. Sales and account managers talking to their clients were often equipped with outdated open item and payment history reports, making it cumbersome to discuss open item issues with their customers.

SAP S/4HANA Finance offered all this information in real time, easily accessible via mobile applications. Next, it provided a lot of analytical SAP Fiori apps that enable exception-based management reports, allowing for proactive responses and decisions. In addition, SAP S/4HANA Finance offers the following:

- Real-time simplified analysis to help determine a customer's top-line contribution
- Improved search facilities to support detailed analysis

Receivables management functionality in SAP S/4HANA improved working capital and financial health by using real-time receivables data to assess customer credit risk, streamline billing, resolve disputes, and prioritize customer collections.

Managing Payables

As in the receivables process, payables processing suffered from delays caused by batch-oriented processes in SAP ERP. The multinational service company was bogged down by the following obstacles:

- Often manual, error-prone, and time-consuming invoice processes
- Open items only visible within AP teams, which causes delays in the issue-resolution process
- Inaccurate view of days payable outstanding (DPO) due to lack of understanding of exceptions and duplicates
- Missed opportunities to take advantage of cash discounts

SAP S/4HANA Finance boosted the payables process significantly by allowing real-time, detailed information. It offered our customer the following benefits:

- Automating invoice management and increasing speed of payment proposal runs
- Full visibility of relevant AP invoice content
- Real-time insight into AP open items and details
- On-demand forecasting of available cash for using discount opportunities and payment term adjustments
- Improved working capital and financial health via real-time payable data

Managing Assets

The current architecture of SAP ERP was causing inefficiencies in financial asset processing and required a reconciliation between the asset subledger and the G/L. The details of this customer's assets weren't visible in a central place, which caused the following problems:

- Lack of hierarchical views of depreciation areas
- Cost center asset postings only on the accumulated level, meaning the customer couldn't drill down to the individual asset
- A complex way of running deprecations for the various depreciation areas

The Universal Journal in SAP S/4HANA Finance removed the need for reconciliation. All detailed asset data can be viewed from here, and depreciation can be run much more simply due to simplified processing logic and data structures. Multiple parallel documents for all valuations are posted in real time to ensure correct values from the beginning.

18.2.4 Path Forward

For both customer engagements, SAP S/4HANA Finance showed clearly it has the potential to remove pain points that couldn't be resolved with SAP ERP functionality. This client was one of the very early adopters of SAP S/4HANA 1503; the next step would be to upgrade to SAP S/4HANA 1709 to benefit from the latest updates. Now that migration from 1503 and 1605 to 1709 is possible, the client will eventually migrate to SAP S/4HANA 1709 and start enjoying the benefits of logistics simplification and innovation as well.

18.3 Manufacturing Company

This next logistics case study will describe the implementation of SAP S/4HANA Enterprise Management for a manufacturing company.

The company wants to run its business processes through an integrated and standardized platform that offers transparency and accountability across its different LOBs: manufacturing, procurement, and order-to-cash. The company also wants to drive margin-efficiency improvement through cost-optimization.

This company was experiencing some of the common key challenges associated with these LOBs. In manufacturing, this meant the following:

- Lack of real-time inventory data and inaccurate inventory stock levels, resulting in inaccurate production planning and stock-out situations
- Inability to report on costs, resulting in incapability to optimize costs
- Process and data redundancies, resulting in inefficiencies (e.g., long lead time for running material requirements planning [MRP] process)

In procure-to-pay, the company was burdened by the following obstacles:

- Lack of transparency and inability to hold and track supplier information
- Inefficient and error-sensitive process due to manual intervention and usage of different documents through the entire process

Finally, in order-to-cash, the company needed to overcome the following problems:

- Inability to see issues over the entire end-to-end process quickly, resulting in late actions for order exceptions, which can lead to customer complaints
- Lack of collaboration due to lack of real-time data and inability to run analytics across the entire process

18.3.1 Vision

The company's vision is to gain operational efficiencies by enhancing critical processes across various departments in the company and to drive growth by using real-time data insights, with the ultimate goal of gaining market share. Due to the capabilities of SAP S/4HANA as the digital core, the company has selected it as its preferred solution to manage the day-to-day operations and to support the company's strategy for growth.

The implementation project for SAP S/4HANA Enterprise Management took six months, and SAP S/4HANA was deployed across multiple plants and distribution centers simultaneously.

18.3.2 IT Project

The client is benefiting from faster MRP because it can now run across multiple plants—something that wasn't possible in SAP ERP. Real-time operational reporting is driving the business, which is something else that wasn't possible earlier when transactional data had to be sent to SAP BW servers overnight. The company has reduced its legacy ABAP code, and many of its business processes are now using the SAP S/4HANA standard code and configuration. This has reduced the company's TCO

for maintenance. Many similar clients are using the SAP S/4HANA transformation to go back to standard and reduce their custom-development footprint.

18.3.3 Benefits

SAP S/4HANA offers functionalities that will support some of the company's key requirements at a lower TCO. The company has gone live very recently, so it's still early to quantify the benefits. However, the following are some of the key benefits of SAP S/4HANA, which will resolve some of the key pain points of the company by LOB per the business case. In manufacturing, the company made the following gains:

- Real-time inventory reporting, resulting in more accurate production planning and fewer stock-outs
- Increased transparency due to the availability of real-time analytics, enabling the company to make better decisions based on real-time business insights
- Improved performance due to several simplifications and elimination of process and data redundancies (e.g., MRP is running more than 10 times faster)

There were two key benefits reaped by the SAP S/4HANA implementation in the procure-to-pay area:

- Standard integration with SAP Ariba, enabling seamless collaboration scenarios and improved process transparency
- Improved process efficiency due to better integration, less manual intervention, and usage of only a single document

Finally, there were much-needed improvements in order-to-cash:

- Introduction of the order cockpit, allowing the company to monitor issues across the entire end-to-end process easily via dashboards, enabling internal sales representatives to get full insight into the order-fulfillment process and immediately take action (e.g., orders that are on credit block, incomplete orders, and delays in delivery and shipping)
- Real-time inventory levels and data across the entire chain, allowing more accurate order promise dates and better collaboration among manufacturing, sales, and the supply chain

With SAP S/4HANA, SAP offers an integrated platform through which the company can optimize its processes across different LOBs and use real-time business insights to make better decisions and drive growth.

Beginning with SAP S/4HANA 1610, the embedded production planning/detailed scheduling (PP/DS) and SAP Extended Warehouse Management (SAP EWM) was activated. This has enabled the client to decommission its current SAP Supply Chain Management (SAP SCM) system and further reduce its TCO.

18.3.4 Path Forward

The client will continue to upgrade to SAP S/4HANA 1709 to benefit from new functionality in sourcing. The client also plans to activate the embedded SAP Transportation Management (SAP TM) module that it needs. This will enable the client to decommission its current SAP TM system and further reduce its TCO.

18.4 Food Industry Group

This group is one of the major players in the food industry. The company has been involved in a quick growth path by acquisitions that led to a very broad product portfolio distributed in more than 80 countries.

18.4.1 Vision

A project was launched last year as a strategic initiative to support the company's transformation and innovation strategies. This project is paramount to foster the group growth strategy that will lead to double the product turnover by 2025. The company will benefit from the project in many ways: streamlining and redesigning the core processes, defining the new organization, and implementing leading-edge SAP solutions that will enable the company to compete and win in the marketplace.

The company aimed to achieve the following:

- Increase the efficiency of its activities.
- Rethink processes, starting from the needs of the client and factoring in best practices of its sector and products.
- Make real-time information available to support its activities and decision-making process.
- Measure process performance via KPIs.
- Be flexible and quick in response to change.

- Comply with international financial standards such as International Accounting Standards/International Financial Reporting Standards (IAS/IFRS).

The company has successfully completed the first two phases of the project, comprising the following initiatives:

- Business process reengineering
- Review of the organizational model
- Design of the performance-management system, on both an operational and a management level
- Change-management support
- Design and implementation of the transactional SAP S/4HANA enterprise system
- Design and implementation of the operational reporting and planning of the SAP S/4HANA enterprise system

Through the functionality of the SAP S/4HANA 1511 Enterprise Management system, the company has activated the following processes: finance and administration, controlling, purchasing and related invoice verification, sales invoicing, and management of non-product-related sales orders. The company has recently completed its upgrade to 1610 successfully. It's rolling out its solution to India. The template is being extended to incorporate India's goods and service tax (GST).

Operational reporting, including real-time analysis, was implemented directly in SAP S/4HANA by activating the embedded business intelligence models via SAP BusinessObjects and SAP Fiori. Finally, the purchase requisition and order-approval processes were activated using SAP Fiori apps, enabling the company managers to approve purchase requisitions and purchase orders form their smartphones or tablets.

18.4.2 IT Project

The company implemented SAP S/4HANA to replace its legacy ERP system to leverage the digital core and integrate with cloud solutions such as SAP SuccessFactors. The company will also gain real-time insight into business performance via SAP Fiori and embedded analytics, which reduces TCO; operational reporting via SAP S/4HANA (no SAP BW required); and mobility via SAP Fiori (SAP Fiori frontend server and SAP Gateway server required).

18.4.3 Benefits

This initiative has supported the company in its transformation into an organization focused on streamlining processes, eliminating paper and manual activities, and enabling specific processes to be performed in full mobility (smartphones and tablets). The company has also optimized its target operating model, centralizing SAP processes and various systems and releasing reporting tools in areas formerly not covered by any application (e.g., analysis of purchasing services).

The company also has optimised its target operating model, centralizing SAP processes and various systems and releasing reporting tools in areas formerly not covered by any application (e.g., the analysis of the purchasing of services).

The implemented financial model ensures full compliance with international financial standards and supports the company's globalization strategy.

The controlling model is an advanced multidimensional model that uses the block-postings capability in table ACDOCA to simultaneously synchronize the sales, procurement, and financial data flows. This enables the company to manage its complex analytical dimensions in real time.

18.4.4 Path Forward

In Q4 of 2017, the remaining processes, like production management, stock management, quality management, and material movements, will be implemented. Further rollouts are planned for 2018 when more countries come on board.

18.5 Automotive Company

Our next case study follows a manufacturer, assembler, distributor, and importer of vehicles, spare parts, and accessories. The company operates a vast dealership network and generates gross annual revenues exceeding 1 billion USD.

18.5.1 Vision

To compete with a surge of foreign entrants to their market, the company wanted to improve customer experience by delivering high-quality vehicles rapidly and at the lowest cost. It had a legacy SAP ERP system that was batch-driven and didn't provide its managers with visibility into stock or production. The company needed a system that would be online and enable its management to make instant decisions.

18.5.2 IT Project

For more than a decade, the company had relied on SAP ERP enterprise applications to manage its workflows for manufacturing, production planning, finance, and controlling. To achieve its business goals, it decided to build on its success with SAP ERP solutions by seamlessly integrating its entire value chain using SAP S/4HANA.

18.5.3 Benefits

The company achieved the following general benefits from its SAP S/4HANA project:

- A 10 percent improvement in sales order accuracy will ensure that the company can manufacture the optimal quantity of each model—reducing the risk of a customer's chosen model being out of stock and delivering a seamless purchasing experience.
- A 20 percent reduction in defects per unit will reduce the risk of delivery delays and nurture increased customer satisfaction. Instrumented vehicles will enable the company to track customer deliveries in real time, ensuring they are within service-level agreements—delighting customers with a highly responsive service.
- Ninety-five percent faster materials requirements planning will enable greater agility to switch to alternate vendors in the event of supply-chain disruption, reducing sourcing risks. Instrumented manufacturing equipment will help reduce unplanned downtime, maximize manufacturing capacity, and minimize costs.
- In the past, it took months to deliver reports to managers about what was happening on the ground, which was simply too long to make competitive decisions. The company realized it needed to collect information about forecasting, manufacturing, and suppliers faster and—crucially—deliver reports to decision-makers immediately. SAP S/4HANA was the answer; it delivered both OLTP and OLAP without any lag.
- Embedded analytics enabled real-time operational reporting.
- SAP Fiori apps enabled access to the system via mobile devices.

18.5.4 Path Forward

With its new business systems now live, the company will ensure complete front-to-back integration—enabling sales forecasts from its dealerships to flow seamlessly to the primary suppliers and manufacturers in its value chain. Combined with real-time insight into the results of parts inspections, the company will gain the ability to

detect defects at the earliest possible opportunity, reducing the risk of costly delays downstream in the manufacturing process. Regular upgrades to the latest versions of SAP S/4HANA will enable the company to leverage the latest innovation from SAP, which includes embedded PP/DS, SAP EWM, SAP Product Lifecycle Management (PLM), and SAP Transportation Management. This will further reduce the TCO because additional hardware and integration won't be required.

18.6 Summary

This chapter has explored several recent and ongoing SAP S/4HANA implementation projects to showcase real companies' paths to digital transformation. The number of SAP customers beginning these transitions is growing every quarter, and we expect the trend to continue in the coming years.

The Authors

Devraj Bardhan is a senior enterprise architect with IBM Germany and has led several large SAP transformation projects, designing and implementing SAP global templates and growing IBM's SAP HANA capability. He has more than 24 years of IT experience, and is a global subject matter expert for SAP S/4HANA at IBM. He heads the SAP Garage and is part of the global SAP Center of Competence at IBM. Devraj can be reached via Twitter *@devbard* or via the SAP Community.

Axel Baumgartl is part of the Center for Digital Leadership at SAP, where he leads the area of asset and method development. In his current role, he provides thought leadership and best practices for C-level customers based on his more than 18 years of experience with SAP transformation projects. He is the author of several publications and books about SAP products and developed a method for enterprise architecture blueprinting.

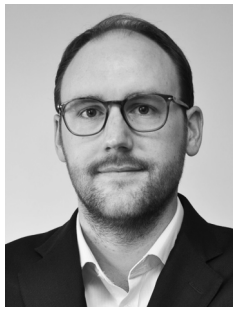
Dmitry Chaadaev is an SAP ERP Financials consultant and project manager for IBM Russia. He has more than 10 years of SAP project implementation and rollout experience in several industries. He earned a physics engineering degree from Moscow Engineering Physics Institute (Russia) in 2005 and a degree in economics from Moscow Aviation Institute (Russia) in 2010. Dmitry actively participated in the development of innovative solutions within IBM for SAP S/4HANA.

Nga-Sze Choi is the SAP S/4HANA logistics subject matter expert in the IBM Global Center of Competence. She has more than 13 years of experience in global business transformation programs, leading design and implementation of SAP solutions in the areas of order-to-cash and procure-to-pay.

Mark Dudgeon is the global SAP CTO of IBM Global Business Services, SAP Service Line. He has more than 20 years of experience in architecture, design, and delivery for some of IBM's largest SAP deployments. Mark's role includes ensuring that IBM has the right partnerships, capabilities, and offerings to support its customers in their digital transformational journey with SAP at their core. Mark can be reached via Twitter *@MarkPDudgeon*.

Asidhara Lahiri is an SAP Executive Architect at the IBM India Client Innovation Center and has led its SAP HANA competency, designing and reviewing client architecture, defining IBM services and growing IBM's SAP HANA capability. She has 17 years of IT experience, architecting solutions in several global implementations. She is a solution architect in SAP for one of the largest oil and gas companies, and is a global subject matter expert for SAP S/4HANA in IBM. Asidhara has filed two patents and is a member of IBM Academy of Technology. Asidhara can be reached via Twitter *@AsidharaL*.

Bert Meijerink is the SAP S/4HANA Finance lead in the IBM SAP Global Center of Competence. He has more than 30 years of working experience in implementing financial systems worldwide and over 20 years of experience in designing and implementing SAP global templates.



Andrew Worsley-Tonks is the European SAP S/4HANA migration lead for IBM Global Business Services. He has extensive experience in complex SAP upgrade and migration projects, having led IBM's upgrade initiatives in Europe for more than four years. In his current role, he helps existing SAP customers define their SAP S/4HANA migration strategy and implementation projects. Andrew can be reached via Twitter *@A_WorsleyTonks*.

Index

A

ABAP 70, 487
ABAP Development Tools (ADT) 303
ABAP Test Cockpit 340
ABAP-based reports 430
Account-based CO-PA 73, 86–87, 90, 480
Accounts Payable (AP) 169, 481
Accounts Receivable (AR) 481
Accounts receivable manager 48
Actionable insights 428
Adobe Document Server 168
Adobe Forms 168
Adoption scenario 451, 473
Adoption strategy 215
Advanced analytics 449
Advanced ATP (AATP) 146
Advanced DataStore object (ADSO) 441
Aggregate table 249
Agile implementation method 372
ALE technologies 416
Analysis Path Framework (APF) 432
Analytical app 248, 250
Analytical landscape 428
Analytics 210, 425, 458
Application enablement 313
Application layer 248
Application lifecycle management (ALM) 203, 365, 475
Application programming interfaces (APIs) 407
Application rationalization 445
Application services 242
Archiving 355
Ariba Network 162, 167, 169, 391–392, 397
ASAP methodology 370
Asset Accounting 78, 344
Asset maintenance mobility 182
Asset management 175, 486
challenges 177
key functionality 181
outlook 184
Asset networks 185
Asset resource scheduling 181
Asset strategy 184
Assign Product to Product Allocation app 152
Asynchronous 232
Atomicity consistency isolation durability (ACID) transactions 243
Auctions 392
Audit logging 247
Authentication 246
Automated Test Tool app 290
Available to promise (ATP) 109–110, 123
check 153

B

B2B2C 412
Backorder processing (BOP) 147
Backup and recovery 227
BAdI 92
Bank Account Management 79
Bank Account Management Lite 80
Bank Accounting (FI-BL) 79
Bank automation 396
Batch data communication (BDC) 339
Batch processing 101
Big data 33–34, 50, 321, 389, 444, 452–453, 458
Bill of materials (BOM) 115
Billing 412
Blockchain 309
Bring your own language (BYOL) 310
Brownfield implementation 358
Build SAP Like a Factory 235
Building block 383
Bundles 412
Business Function Library 249
Business model 30, 457
traditional 31
Business partner 163, 169, 189
addresses 189
Business performance 64, 68
Business process 458

Business process as a service (BPaaS) 32, 263
Business Process Model and Notation (BPMN) 387
Business Rule Framework plus (BRFplus) ... 168
Business rules 94
Business scenario recommendations report 38, 323
Business to consumer (B2C) 453
Business value 36
Business-to-business (B2B) 408, 410
payments 396
Business-to-consumer (B2C) 408, 410

C

Capacity planning 106, 112
Capacity requirements 64
Career development planning 405
Case study 477, 482, 486, 489
Cash flow analysis 65
Cash Management 65, 79–80
Cash Operations 80
Catalog 392
Catalog management 392
Catch weight management 191
CDS views 430, 433
Central Finance 92–93, 97, 103, 360, 416, 479, 481
lift and shift 100
reconciliation reports 96
unified system 99
Central Journal 480
Change management 490
Change Request Management (ChaRM) 258
Cleansing 355
Cloud adoption 271
Cloud computing 32, 452
Cloud computing reference architecture ... 261
Cloud Foundry 310
Cloud readiness 271
Cloud vendor 275
Cloud-first strategy 60
Cluster manager 232
Code Inspector 337–338, 340, 343
Code optimization 329, 340
Code pushdown 143, 441
Code remediation 339
Coding block 71
dimension 72
measure 72
Cognitive analytics 442–443
Cognitive computing 34, 427, 452–453, 458
Collaboration 140
Collaboration and activity management 172
Column partition 219
Columnar storage 216, 484
Columnar structure 219
Commerce 139
Common Object Layer Framework 156
Complex manufacturing 115
Compliance 401
Component business model (CBM) 473
CompositeProviders 441
Compressed data 217
Concur 47, 212, 396
Concur Data Insights 402
Concur Expense 401
Concur Invoice 401
Concur Travel 401
Condition contract settlement 145
Configure BOP Segment app 147
Configure BOP Variant app 147
Configure Product Allocation app 152
Consolidation 416, 478
Content lifecycle management 291
Contingent workforce management 398
Continuous improvement 183
Contract Accounts Receivable and Payable (FI-CA) 156
Contract lifecycle management 392
Contract Line Item app 170
Contract management 170, 392
Contract repository 392
Contract worklists 162
Contracts 412
Core Data Service (CDS) view 57, 210, 249, 327
Core Data Services (CDS) view 204
ABAP-based 204
Cost Center Accounting 66
Cost component 89
Cost of goods sold (COGS) 71
posting 88

Costing-based CO-PA ... 87
Costs ... 215
Country regulatory templates ... 402
CPU utilization ... 242
Create Optimal Orders for Shipment app ... 114
Create Purchase Requisition app ... 167
Current mode of operations (CMO) ... 449, 465, 468–469, 475
Custom code ... 346
Custom code migration worklist ... 338
Custom code remediation ... 197
Custom Fields and Logic app ... 302
Customer centricity ... 39
Customer engagement ... 410
Customer engagement executive (CEE) ... 292
Customer insight ... 46
Customer journey ... 410
Customer orders ... 140
Customer relationship management ... 408
Customer ticketing system ... 409
Customer/vendor integration ... 169, 189
Cutover ... 378

D

Dangerous goods ... 131
Dashboards ... 68
Data acquisitions ... 426
Data aging ... 253
Data collation ... 200
Data Dictionary (DDIC) ... 339
Data exploration ... 426
Data flow ... 478, 491
Data footprint ... 46
Data foundations ... 426
Data harmonization ... 97
Data integration services ... 243
Data lake ... 444–445
Data lifecycle management ... 253
Data migration ... 371
Data migration strategy ... 328
Data model ... 203
Data model simplification ... 142
Data redundancy ... 128, 131, 487
Data replication ... 305
Data Replication Framework ... 416
Data selection ... 216
Data synchronization ... 409
Data temperature ... 442
Data tiering ... 442
Data volume ... 215
Data volume management (DVM) ... 365
work center ... 365
Database hint ... 341
Database layer ... 248
Database migration option ... 365
Database Migration Option (DMO) ... 335
Software Update Manager (SUM) ... 332
Database Shared Library (DBSL) ... 232
Database size ... 268
Days payable outstanding (DPO) ... 395, 485
Days sales outstanding (DSO) ... 395
Decentralized SAP EWM ... 131
Decision Wizard ... 399
Delivery request (notification) ... 131
Delivery schedules ... 117
Dell Boomi ... 278
Delta shipping ... 232
Demand-driven MRP ... 116
Deployment path ... 321
Depooling/declustering ... 342
Depreciation posting ... 78
Descriptive reporting ... 426
Design thinking ... 33, 474
Device personalization ... 414
DevOps ... 254, 259, 457
Digital backbone ... 46
Digital core ... 209, 389, 452, 456
Digital strategy ... 35
Digital transformation ... 29, 31, 37, 389, 450–451, 454, 472
definition ... 31
objectives ... 35
strategy ... 450
Disaster recovery (DR) ... 270
Discontinuation ... 112
Discount management ... 395
Discrete Industry Mill Products (DIMP) ... 58
Dispute case ... 65
Disruption ... 480
Document Relationship Browser ... 95
Domain Names Service (DNS) ... 232

Drilldowns 50
Drivers 450
Dunn & Bradstreet (D&B) 172
Dynamic data tiering 253
Dynamic tiering 245, 254

E

Electronic data interchange (EDI) 350
Embedded analytics 430, 437, 490
architecture 430
Embedded SAP BW 436
Embedded SAP EWM 127, 131, 134, 138
Employee data 403
Employee suggestion box 183
Enable phase 464, 467
Encryption 247
End of life (EOL) 213
End user training 378
Engage phase 464–465
Enterprise Search 166
Enterprise-wide reporting 425, 438
Envision phase 464, 466
Evaluate phase 464, 467, 474
Event scheduling 157
Exception handling 169
Execute phase 464
Expected goods receipt (EGR) 131
Expert configuration 384, 386
Extended production operations 115
Extensibility Cockpit 291

F

Fact sheet app 248, 250
Fashion management wholesale 193
Feature Package Stack (FPS) 336
Field service 158
Financial architecture 478
Financial Closing app 102
Financial Closing Cockpit 67
Financial reporting 101–102, 480, 483
Financial standards 490
Financial statement 65
Fit/gap workshop 377, 382
Fit-to-standard 285
Focused Build 256
Foreign trade/customs 141, 154
Freight order management (FOM) 134
Functional core 107
Future mode of operations (FMO) 449, 465, 468, 475
Future-proofing 213

G

Gartner pace-layered application strategy 452, 456
Generally accepted accounting principles (GAAP) 126
Geospatial processing 312
GitHub repository 258
Global benefits 403
Global filter 149
Global master data 478
Goods receipt (GR) 122
Google 30
Governance 297, 478
Graph engine modeling 312
Greenfield implementation 213, 356, 468
Guided configuration 291

H

Hadoop 243, 428, 445
HANAtization 329, 339
Hard close 480
Hardware 213
High availability (HA) 227, 270
HP Quality Center 258
Hub model 416
Human capital management 406
Hybrid adoption 272
Hybrid Application Toolkit 311
Hybrid cloud 263, 274
Hypercare 378

I

IBM Ascend 464
IBM Better Transformation framework 463, 465, 468, 476

IBM's Watson Developer Cloud 313
Idea generation 178
Identity store 246
IDoc 170
In-app extensibility 300–301, 306
Inbound delivery 133
Industry solutions 187, 210
InfoCubes 84, 440
InfoProviders 437
Infrastructure 215, 269
Infrastructure as a service (IaaS) 32, 262, 264
Initial investment 273
In-memory columnar storage 53
Insert updates 217
Inspection process 133
Instance number 231
Integration-as-a-service 407
Intercompany reconciliation 102, 478, 480
Interim modes of operation (IMO) 465, 475
Internal collaboration 172, 410
Internal Orders 66
International Federation of Robotics (IFR) 29
International Financial Reporting Standard 15 (IFRS 15) 154
Internet of Everything (IoE) 34
Internet of Things (IoT) 29, 33, 46, 50, 105, 452–453
services 312
Inventory 488
Inventory data 487
Inventory level 123
Inventory management 122, 137
Inventory Management (IM) 50
Inventory planning 121
Inventory Planning Workbench 198
Inventory posting 122
Inventory valuation 124
Inventory valuation table 76, 126
Invoice 169
Invoice automation 395
Invoice processing 394
Invoice reconciliation 395
Invoicing 390, 412

J

J2EE 399

K

Key performance indicator (KPI) 164, 227, 390, 433
Key user approach 301
KPI Modeler 431

L

Lack of visibility 161
Landscape transformation 321, 371
Learning management 404
Legacy system 378
LE-TRA 135
Licensing model 264
Line of business (LoB) 486
solutions 47, 389
Liquidity forecast 65
Liquidity Management 81
Live replication mode 231
Local ledgers 479
Logical partitioning (LPar) 267
Logistic service provider 128
Logistics 50
Logistics execution 137
Logistics Information System (LIS) 59, 350
Logistics invoice verification (LIV) 169
Log-replay 232
Long material number (LAMA) 58
LSA++ 440

M

Machine learning 315
Maintenance execution 184
Maintenance operation and execution 182
Maintenance Optimizer 334
Maintenance plan 182
Maintenance planner 334
Maintenance planning 184
Make-to-stock 116

Manage Material Coverage app 111
Manage Product Allocation Planning Data app 152
Manage Purchase Contracts app 170
Manage Sources of Supply app 171
Manage Your Solution app 291
Manual purchase orders 166
Manufacturing 105
challenges 108
key functionality 110
outlook 118
Manufacturing engineering 115
Manufacturing for complex assembly 115
Mapping concept 416
Marketing 139
Marketing and commerce
key functionality 154
outlook 159
Master data 194
Master data maintenance 157
Master filter 149
Material document 125
Material flow 108, 113
Material Ledger (ML) 59, 124, 126, 190
Material master 191
Material master data 117
Material master record 117
Material number 113
Material requirements planning (MRP) 106, 113, 191, 487–488
MRP area 117
MRP area level 109
MRP run 108, 112
Materials Management (MM) 52
Measurement documents 182
Merchandise management 194
Message management services 313
Metadata Framework (MDF) 403
Metadata management 445
Microsoft Silverlight UI 135
Migration timelines 346
Minimum viable product (MVP) 378
Mobile 32, 449, 452
Model company 375
Monitor BOP Run app 147
Month-end close 478, 483–484
MRP Cockpit 108–109, 111
MRP Dispatcher 111
MRP Live 110, 113
Multidimensional reports 431
Multinationals 477
Multiple components in one database (MCOD) 267
Multiple components on one system (MCOS) 267
Multiple Components One Database (MCOD) 239
Multiple Components One System (MCOS) 239–240
Multiple ERP systems 481
Multiple valuation 74
Multitarget application archive 258
Multitenant architecture 312
Multitenant Database Container (MDC) 239–240
My Purchase Requisitions app 167

N

Native SAP HANA applications 435, 439
Native SQL 341
Near-Zero Downtime (NZDT) 366
Network 224
New business models 455
New implementation 321, 323, 371
Nomination Planning Workbench 198
Nonfunctional requirements 269
Nonuniform memory access (NUMA) 244
Notices 393

O

OData services 252, 305
Omnichannel service 414
Onboarding 404
Online analytical processing (OLAP) 37, 107, 162, 203, 210, 243
Online transaction processing (OLTP) 37, 107, 162, 203, 210, 243
Open Group architecture framework (TOGAF) 462
Open innovation 183

Open ODS views 441
Operational intelligence 312
Operational purchasing 164
Operational reporting 425, 429, 480, 487
Optical character recognition (OCR) 169
Order cockpit 488
Order fulfillment 144
Order routing 393
Organizational data 403
Output management 168

P

Pain points 458, 468
Parallel currencies 74, 76
Parallel processing 218
Parallel valuation 75–76
Parallelization 112
Partitioning 217–218
Payables processing 485
Payments 390
Payroll 403
Performance and goals management 404
Periodic actual cost 75, 77
Platform as a service (PaaS) 32, 262
Pool and cluster table 342
Position management 403
Post Goods Receipts app 167
Predictive analytics 427
Predictive Analytics Library 313
Predictive modeling 426
Prepackaged integrations 407
Prescriptive modeling 426
Pricing policies 412
Principle of one 37, 55, 58, 126
Private cloud 263, 273
Process KPIs 416
Process model 256
Process Receivables app 65
Processing services 243
Procurement 390
Procure-to-pay 162
Product allocation 151
Product Costing (CO-PC) 74
Product engineering 181
Product master data 113
Product valuation data 130
Production planning 105
Production Planning and Detailed Scheduling (PP/DS) 114, 489
Production variance 91
Production version 117
Profit and loss (P&L) 67, 98
Profit Center Accounting 66
Profitability Analysis (CO-PA) 66, 73, 86
Project stock 130
Promises-to-pay 65
Public cloud 263, 274
Purchase Contract app 170
Purchase order 162
Purchase order average time 165
Purchases 390, 392
Purchasing contract 117
Purchasing info record 117

Q

Quality check 236
Quality Inspection Engine 133
Quality management 138
Quality services 243
Query Browser 210, 433
Query Designer 210
Quick Sizer 326
Quota arrangement 117
Quotations 412

R

Rapid-deployment solution (RDS) 397
Readiness Dashboard 256
Real-time alert 110
Real-time analytics 164
Real-time data 100, 140, 458
Real-time processing 49
Real-time visibility 113
Rebate settlement 146
Rebates 143
Receivables 64
Recoverability 226
Recovery point objective (RPO) ... 227, 232, 270
Recovery time objective (RTO) 227, 232, 270

Recruiting management 403
Recruiting marketing 403
Redundant data 134
Regional Inventory Dashboard 198
Regulatory compliance 266, 272
Release for Delivery app 152
Remote device management 313
Replenishment 114, 191
Report R_S4_PRE_TRANSITION_
CHECKS 336, 357
Reporting 425
Representational State Transfer (REST) 252
Requests 390, 392
Requests for information (RFI) 390, 392
Requests for proposal (RFP) 390, 392
Requests for quotation (RFQ) 170, 390, 392
Requirement classification 148
Requirements Management 257
Requisitions 399
Research and development (R&D) 175
key functionality 178
outlook 183
Resource schedule 114
Response planning 421
Responsive user experience 107
Responsiveness 269
RESTful APIs 316
Retail article 190
Revenue recognition 154
RFx 391, 399
Roadmap 449
Roadmap creation 470
Role management 246
Role-based UI 250
Row storage 216
Run SAP Like a Factory 236

S

Safety stock 52
Sales 118, 139
challenges 140
key functionality 142
outlook 159
Sales and Distribution (SD) 249
Sales order 140
Sales order fulfillment cockpit 140, 144
SAP Activate 235, 369, 372, 464
deploy phase 378
discover phase 286
explore phase 287, 376
guided configuration 369, 384
methodology 369, 374
model companies 383
prepare phase 287, 375
realize phase 288, 377
Roadmap Viewer 284
SAP Best Practices 369, 380–381
SAP Best Practices content 382
SAP Best Practices SAP Notes 381
template 373
tools 384
SAP Administration Guide for the Implementation of SAP S/4HANA 382
SAP Analysis for Microsoft Office 98, 437
SAP Analytics Cloud 428, 442
SAP API Business Hub 316
SAP Application Interface Framework 100
SAP Ariba 39, 47, 163, 304, 370, 390, 400, 473, 488
SAP Ariba Collaborative Supply Chain 393
SAP Ariba Discount Professional 395
SAP Ariba Invoice Management 395
SAP Ariba Procurement Content 397
SAP AribaPay 395–396
SAP Asset Intelligence Network 177
SAP Asset Manager 182
SAP Assortment Planning for Retail 192
SAP Best Practices 357, 376
SAP Best Practices Explorer 285, 290
SAP Biller Direct 156
SAP Billing and Revenue Innovation Management 155–156
SAP BPC for S/4HANA Finance ... 66, 68, 83, 479
SAP Build 311
SAP Business Explorer (SAP BEx) 436
SAP Business Planning and Consolidation (SAP BPC) 436
SAP Business Suite 309, 370
SAP Business Suite on SAP HANA 204, 214, 483
SAP Business Warehouse (SAP BW) 59, 64, 204, 438, 478, 483

SAP Business Warehouse on SAP HANA 439
SAP BW on SAP HANA 215, 274
SAP BW/4HANA 428, 441, 462
SAP Cash Management powered by SAP HANA 344
SAP Cloud Appliance Library 277
SAP Cloud Connector 318
SAP Cloud Platform 46, 209, 212, 252, 258, 284, 308, 310, 403, 407, 415, 454, 457, 465
SAP Cloud Platform Integration 168, 407
SAP Cloud Platform Web IDE 311
SAP Collections Management 103
SAP Commercial Project Management 180
SAP Commodity Management 201
SAP Credit Management 103, 141, 154
SAP Crystal Reports 68
SAP Customer Activity Repository 191–193, 410
SAP Customer Relationship Management (SAP CRM) 155, 370, 413, 465
SAP DB Control Center 235
SAP Dispute Management 103
SAP EarlyWatch Alert 236, 470
SAP Enterprise Architecture Explorer 470, 473
SAP Enterprise Support 292
SAP ERP 55, 62, 332
SAP ERP Sales and Distribution (SD) 413
Credit Management 154
SAP ERP Warehouse Management (WM) 127
SAP EWM
batch master 129
business partner 129
decentralized 127
material master 129
SAP EWM embedded in SAP S/4HANA 210, 489
SAP Fashion Management 187
SAP Fieldglass 39, 46, 212, 398
SAP Financial Services Network 212, 278
SAP Financial Supply Chain Management (SAP FSCM) 79
SAP Fiori 39, 41–42, 65, 79, 110, 194, 203, 275, 327, 385, 416, 474, 480
analytical apps 433
analytics apps 123
SAP Fiori (Cont.)
fact sheet apps 123
transactional apps 122
UX 456, 458
SAP Fiori app 247, 249
reference library 42
SAP Fiori Cloud 209, 252
SAP Fiori launchpad 81, 129, 433
SAP for Retail 189, 192
SAP Forecasting and Replenishment for Retail 191
SAP Gateway 57, 209, 278
SAP General Ledger (G/L) 344, 481
SAP Global Trade Services (SAP GTS) 128, 141, 154
SAP GUI 42, 45
SAP HANA 203, 268, 456, 460
SAP HANA authorization 246
SAP HANA Cockpit 234, 258
SAP HANA database 217
SAP HANA database layer 205
SAP HANA E5 systems 224
SAP HANA Enterprise Cloud 276
SAP HANA host auto-failover 229
SAP HANA Live 68, 204, 435, 456
views 204
SAP HANA multitenant database containers (MDC) 267
SAP HANA on Power 219, 224
SAP HANA platform 216, 247
SAP HANA queries 143
SAP HANA Readiness Assessment 469–470
SAP HANA smart data integration (SDI) 278
SAP HANA storage replication 228
SAP HANA Studio 234
SAP HANA system replication 230
SAP HANA views 439
SAP HANA Web-Based Development Workbench 311
SAP HANA, spatial edition 245
SAP Hybris 37, 46, 155, 408, 414, 473
SAP Hybris Billing 141, 408, 412
SAP Hybris Cloud for Customer 39, 298, 370, 408, 414–415, 465
SAP Hybris Cloud for Sales 414
SAP Hybris Cloud for Service 414

SAP Hybris Commerce 193–194, 408–409, 412
SAP Hybris Commerce Cloud, data hub 194
SAP Hybris Marketing 408, 410, 412, 414
SAP Hybris Marketing Acquisition 411
SAP Hybris Marketing Data Management 410
SAP Hybris Marketing Insight 411
SAP Hybris Marketing Loyalty 411
SAP Hybris Marketing Planning 411
SAP Hybris Marketing Recommendation 411
SAP Hybris Marketing Segmentation 411
SAP Hybris Profile 411
SAP Hybris Service Cloud 184
SAP IBP for demand 419
SAP IBP for inventory 419
SAP IBP for response and supply 420
SAP IBP for sales and operations 418
SAP Information Lifecycle Management (SAP ILM) 355
SAP Innovation Management 176, 178
SAP Integrated Business Planning (SAP IBP) 109, 417, 465
SAP Integrated Business Planning for demand 201
SAP Inventory Manager 182
SAP Jam 278, 379
SAP Journey Maps 470, 473
SAP Landscape Management 238
SAP Landscape Transformation (SLT) 435
SAP Landscape Virtualization Management 238
SAP Leonardo 308, 428, 443, 454
SAP Leonardo IoT Bridge 314
SAP Leonardo IoT Edge 315
SAP Leonardo IoT Foundation 315, 318
SAP Leonardo Machine Learning Foundation 315
SAP LT Replication Server 93–94
SAP Lumira Designer 98
SAP Master Data Governance (SAP MDG) 94, 177, 193, 415, 479
SAP Material Ledger 74
SAP MDG for Retail and Fashion Management by Utopia 193
SAP Merchandise Planning for Retail 192
SAP Mobile Asset Management 177
SAP Mobile Platform 327
SAP Multiresource Scheduling 181
SAP NetWeaver 7.4 205
SAP NetWeaver 7.5 338
SAP NetWeaver AS ABAP 206, 247
SAP Portfolio and Project Management 179
SAP Predictive Analytics 68
SAP Predictive Maintenance Services 177, 185
SAP Process Orchestration (SAP PO) 168, 212, 278, 407, 415
SAP Product Lifecycle Costing 180
SAP Rapid Deployment Solutions (SAP RDS) 376
SAP Receivables Management 485
SAP Revenue Accounting and Reporting ... 141, 154
SAP S/4HANA 51
adoption 321
analytics and reporting 425
architecture 55, 203, 328
benefits 105, 121, 139, 161, 176
business scenario analysis 460
business value 40
code adaption 357
data model 125
deployment 261
extending 297
housekeeping 354
industry limitations 348
integration 277
logistics limitations 349
precheck 336
reconciliation 64
source 117
sourcing logic 117
system conversion 356, 359
SAP S/4HANA 1709 193
SAP S/4HANA Cloud 41, 59, 265, 278, 281, 323, 363, 369, 371
content schedule 293
deployment 284
deployment resources 286
extensibility 291
industry solutions 284
languages 284

SAP S/4HANA Cloud (Cont.)
localizations ... 284
private option ... 271
release cycle ... 291
scope ... 283
trial ... 289
upgrade schedule ... 294
value proposition ... 281
SAP S/4HANA Cloud Content Library ... 290
SAP S/4HANA core ... 172, 203
SAP S/4HANA Enterprise Management ... 347
SAP S/4HANA Finance ... 44, 61, 483
benefits ... 61
data conversion ... 344
outlook ... 102
prechecks ... 367
talent development ... 68
SAP S/4HANA for fashion and vertical business ... 187, 194
SAP S/4HANA Migration Cockpit ... 360
standard objects ... 362
SAP S/4HANA Migration Object Modeler ... 361
SAP S/4HANA Oil & Gas ... 195
new table structure ... 195
technical simplifications ... 195
upstream/downstream ... 196
SAP S/4HANA Oil & Gas for hydrocarbon management ... 195
SAP S/4HANA Oil & Gas for retail fuel network operations ... 198
SAP S/4HANA Oil & Gas for upstream contracts management ... 197
SAP S/4HANA Oil & Gas for upstream operations management ... 197
SAP S/4HANA Oil & Gas for upstream revenue management ... 197
SAP S/4HANA Retail ... 188
integration ... 193
technical simplifications ... 188
SAP S/4HANA Retail for merchandise management ... 187
SAP S/4HANA security ... 245
SAP S/4HANA Supply Chain for secondary distribution ... 200
SAP Screen Personas ... 474
SAP Smart Business apps ... 431
SAP Smart Business Cockpit ... 210
SAP Solution Builder profile ... 386
SAP Solution Builder tool ... 383–384, 386
SAP Solution Manager ... 235, 257, 377, 384, 387
SAP SuccessFactors ... 39, 46, 298, 370, 400, 402, 473
SAP SuccessFactors Employee Central ... 403
SAP Supplier Lifecycle Management ... 162, 172
SAP Supplier Relationship Management (SAP SRM) ... 397
SAP Supply Chain Control Tower ... 422
SAP Supply Chain Management ... 370
SAP Transportation Management (SAP TM) ... 135
benefits ... 136
business partner ... 136
SAP Treasury and Risk Management (TRM) ... 104
SAP Upstream Operations Management ... 197
SAP UX Explorer ... 470, 473
SAP Vora ... 428, 447
SAP Web IDE ... 311
SAP Work Manager ... 182
SAPphone ... 200
SAPUI5 ... 135, 249, 304
Savepoint ... 226
Scalability ... 224
Scale-out ... 225
Scale-up ... 222, 225
Schedule BOP Run app ... 147
Scheduler Workplace ... 181
Season Workbench ... 192
Segment definition ... 149
Self-service configuration ... 384–385
Self-Service Configuration User Interface (SSCUI) ... 289
Self-service procurement ... 166
Self-service requisitioning ... 165
Series data processing ... 312
Service agreement ... 158
Service agreement management ... 158
Service maintenance plan ... 157
Service management ... 139, 158
key functionality ... 157
outlook ... 159

Service parts ... 158
Service parts warehousing ... 158
Service task lists ... 157
Service-orientated architecture (SOA) ... 170
Services procurement ... 398, 400
Settlement Management ... 141
Shared enterprise storage ... 224
Side-by-side extensibility ... 303, 306
benefits ... 307
Sidecar ... 481
Simplification ... 36, 480
Simplification database ... 337
Simplification list ... 335
Simulation ... 49
Single data source ... 37
Single Sign-On ... 246
Single source of truth ... 62, 97
Single system ... 128
Site maintenance ... 189
Sizing guidelines ... 222
Sizing requirements ... 326
SmartOps ... 419
Social media ... 452
Soft close ... 64, 78, 100, 480
Software as a service (SaaS) ... 32, 214, 263, 271, 309
Software Logistics Toolset (SL Toolset) ... 347
Software Provisioning Manager (SWPM) ... 347
Software Update Manager (SUM) ... 335
Software-as-a-service (SaaS) ... 390, 392, 403
Solution finder ... 414
Solution stability ... 215
Solution validation workshop ... 377
Source list ... 117
Source list entry ... 117
Sourcing ... 390
Sourcing and procurement ... 109, 161, 170
challenges ... 162
key functionality ... 164
outlook ... 173
Special purpose ledger table ... 70
Spend analysis ... 391
Spot buy ... 393
Stack XML ... 334
Standard SAP code ... 339
Standby host ... 230
Stock ... 108, 123
Stock levels ... 116, 487
Storage location MRP ... 116
Strategic sourcing ... 392
Structure history ... 157
Subcontracting ... 109
Subcontracting demand ... 116
Subcontracting stock ... 116
Succession planning ... 405
Supplier activity management ... 172
Supplier discovery ... 391
Supplier evaluation ... 172
Supplier portfolio management ... 171
Supply alternatives ... 108
Supply chain ... 121
challenges ... 123
key functionality ... 125
outlook ... 137
routing ... 135
Supply chain execution ... 393
Supply planning ... 421
Synchronous ... 231
Synchronous in-memory ... 232
System conversion ... 321, 329, 371
tool ... 333
System identifier (SID) ... 231
System Landscape Optimization (SLO) ... 277, 367
System of record ... 50
System usage ... 43

T

Table
/SCWM/THUTYPE ... 131
ACDOCA ... 62, 70, 88, 100, 127, 209, 249, 491
ANLC ... 207
BKPF ... 249
BSAD ... 207
BSAK ... 207
BSEG ... 249
COSP ... 207
COSS ... 207
FAGLBSIS ... 207
FAGLSBSAS ... 207
GLT0 ... 208
GLT3 ... 208
MATDOC ... 54, 125, 249

Table (Cont.)
MKPF ... 125
MLCD ... 208
MSEG ... 125
THUTYPE ... 131
Tailored data center integration (TDI) ... 223
Talent management ... 403, 407
Technical assessment ... 470
Technical limitation ... 352
Technology drivers ... 213
Text analysis ... 312
Text analytics ... 313
Third-party vendors in landscape ... 477
Time-off management ... 403
Top-down distribution ... 90
Total cost of ownership (TCO) ... 128, 213, 472, 479, 483, 488
Trade Promotion Management (TPM) ... 145
Trader's and Scheduler's Workbench ... 195, 198
Transaction
AJRW, AJAB ... 368
AS91 ... 368
BP ... 189
FSH_SWB ... 192
KE28 ... 90
SM_Workcenter ... 236
SOLAR_PROJECT_ADMIN ... 387
SPAU ... 339
SPDD ... 339
WRP1 ... 191
WRP1R ... 191
Transaction usage ... 43
Transactional app ... 250
Transformation Navigator ... 460
Transport scheduling ... 136
Transportation and distribution ... 199
Transportation management ... 137
Travel expense ... 396
Two-tier ERP landscape ... 275
Two-tier model ... 282

U

Unicode ... 354
Unicode conversion ... 332
Universal Journal ... 62, 68, 70, 73, 92, 209, 480
Unstructured data ... 34
UOM group ... 197
User experience (UX) ... 36, 321, 401, 453, 474, 480
design ... 37
User interface (UI) ... 452
User management ... 246
User provisioning ... 247

V

Valuation ... 90
Valuation methods ... 124
Vendor approvals ... 399
Vendor collaboration ... 109
Vendor Invoice Management (VIM) ... 169
Vendor management system (VMS) ... 398
Vertex ... 212, 278
Virtual data marts ... 441
Virtual data model (VDM) ... 204, 210, 433
Virtual machine (VM) ... 220, 267
Virtualization ... 220
Virtualization options ... 220
Visibility ... 108
Visualization ... 431
Volatility ... 108
VPRS condition ... 88

W

Waterfall implementation method ... 372
Web services ... 407
Whitelisted APIs ... 303
Workflows, reports, interfaces, conversions, enhancements, and forms (WRICEF) ... 288
Workforce analytics ... 405
Workforce planning ... 406
Workshop ... 327, 470
Write performance ... 217

Service Pages

The following sections contain notes on how you can contact us.

Praise and Criticism

We hope that you enjoyed reading this book. If it met your expectations, please do recommend it. If you think there is room for improvement, please get in touch with the editor of the book: meaganw@rheinwerk-publishing.com. We welcome every suggestion for improvement but, of course, also any praise!

You can also share your reading experience via Twitter, Facebook, or email.

Supplements

If there are supplements available (sample code, exercise materials, lists, and so on), they will be provided in your online library and on the web catalog page for this book. You can directly navigate to this page using the following link: www.sap-press.com/4499. Should we learn about typos that alter the meaning or content errors, we will provide a list with corrections there, too.

Technical Issues

If you experience technical issues with your e-book or e-book account at SAP PRESS, please feel free to contact our reader service: support@rheinwerk-publishing.com.

About Us and Our Program

The website http://www.sap-press.com provides detailed and first-hand information on our current publishing program. Here, you can also easily order all of our books and e-books. Information on Rheinwerk Publishing Inc. and additional contact options can also be found at http://www.sap-press.com.

Legal Notes

This section contains the detailed and legally binding usage conditions for this e-book.

Copyright Note

This publication is protected by copyright in its entirety. All usage and exploitation rights are reserved by the author and Rheinwerk Publishing; in particular the right of reproduction and the right of distribution, be it in printed or electronic form.

© 2018 by Rheinwerk Publishing, Inc., Boston (MA)

Your Rights as a User

You are entitled to use this e-book for personal purposes only. In particular, you may print the e-book for personal use or copy it as long as you store this copy on a device that is solely and personally used by yourself. You are not entitled to any other usage or exploitation.

In particular, it is not permitted to forward electronic or printed copies to third parties. Furthermore, it is not permitted to distribute the e-book on the Internet, in intranets, or in any other way or make it available to third parties. Any public exhibition, other publication, or any reproduction of the e-book beyond personal use are expressly prohibited. The aforementioned does not only apply to the e-book in its entirety but also to parts thereof (e.g., charts, pictures, tables, sections of text).

Copyright notes, brands, and other legal reservations as well as the digital watermark may not be removed from the e-book.

Digital Watermark

This e-book copy contains a **digital watermark**, a signature that indicates which person may use this copy. If you, dear reader, are not this person, you are violating the copyright. So please refrain from using this e-book and inform us about this violation. A brief email to info@rheinwerk-publishing.com is sufficient. Thank you!

Trademarks

The common names, trade names, descriptions of goods, and so on used in this publication may be trademarks without special identification and subject to legal regulations as such.

All of the screenshots and graphics reproduced in this book are subject to copyright © SAP SE, Dietmar-Hopp-Allee 16, 69190 Walldorf, Germany. SAP, the SAP logo, ABAP, Ariba, ASAP, Concur, Concur ExpenseIt, Concur TripIt, Duet, SAP Adaptive Server Enterprise, SAP Advantage Database Server, SAP Afaria, SAP ArchiveLink, SAP Ariba, SAP Business ByDesign, SAP Business Explorer, SAP BusinessObjects, SAP BusinessObjects Explorer, SAP BusinessObjects Lumira, SAP BusinessObjects Roambi, SAP BusinessObjects Web Intelligence, SAP Business One, SAP Business Workflow, SAP Crystal Reports, SAP EarlyWatch, SAP Exchange Media (SAP XM), SAP Fieldglass, SAP Fiori, SAP Global Trade Services (SAP GTS), SAP GoingLive, SAP HANA, SAP HANA Vora, SAP Hybris, SAP Jam, SAP MaxAttention, SAP MaxDB, SAP NetWeaver, SAP PartnerEdge, SAPPHIRE NOW, SAP PowerBuilder, SAP PowerDesigner, SAP R/2, SAP R/3, SAP Replication Server, SAP S/4HANA, SAP SQL Anywhere, SAP Strategic Enterprise Management (SAP SEM), SAP SuccessFactors, The Best-Run Businesses Run SAP, TwoGo are registered or unregistered trademarks of SAP SE, Walldorf, Germany.

Limitation of Liability

Regardless of the care that has been taken in creating texts, figures, and programs, neither the publisher nor the author, editor, or translator assume any legal responsibility or any liability for possible errors and their consequences.