MONASH University

Information Technology

Real-Time Enterprise Systems

Lecture 3 Development of ERP and Enterprise Systems Architecture

Unit Outline

Week	W/C	Topic	Deadline:
1	25/07	Introduction to FIT3138; Introduction to Enterprise Systems	
2	01/08	Systems Integration - Role of ERP in Business Functions and Processes	Assignment 1 handed out
3	08/08	The Development of ERP Systems	
4	15/08	ERP in Sales and Marketing & CRM	
5	22/08	ERP in Production and Supply Chain Management	
6	29/08	Accounting in ERP Systems	
7	05/09	Process Modelling & Improvement	Assignment 1 due Assignment 2 handed out
8	12/09	ERP Implementation – Risk Management	
9	19/09	ERP Implementation – Data and System Integration and Configuration	
Mid-semester Break (26 Sep – 30 Sep 2022)			
10	03/10	ERP Implementation Issues: Managing Change	
11	10/10	Technologies supporting real-time enterprise	
12	17/10	Exam Review	Assignment 2 due

Objectives

After completing this lecture, you will be able to:

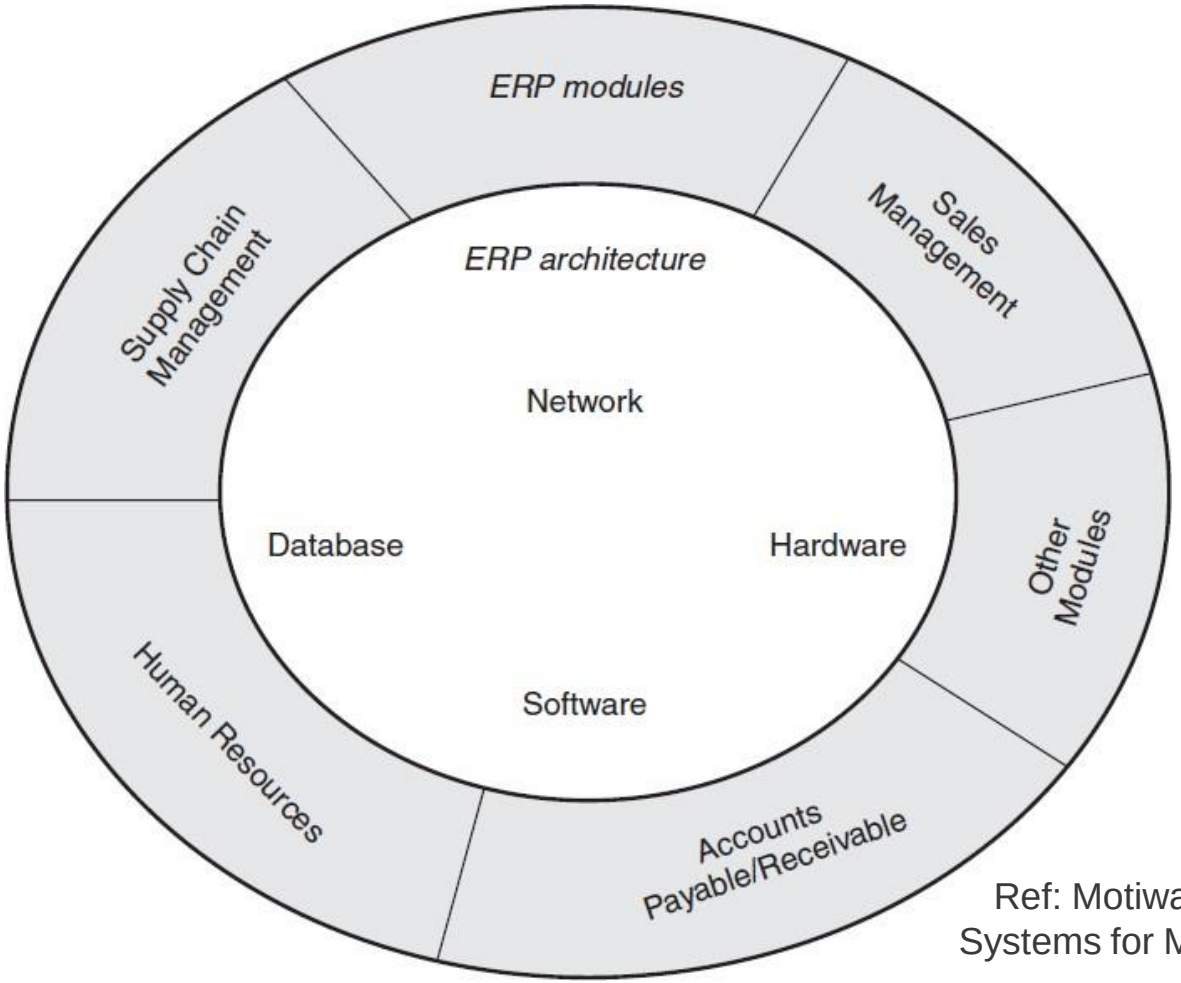
- Appreciate the development of ERP systems
- Examine in detail the enterprise systems modules and architecture.
- Understand the effects of a well-designed architecture on ERP implementation.
- Learn about cloud architecture and its impact on ERP systems.
- Answer a number of common questions about ERP systems.

Introduction

- Efficient, integrated information systems are very important for companies to be competitive
- An Enterprise Resource Planning (ERP) system can help integrate a company's operations

- However, it is crucial to understand the Enterprise System Architecture (ESA)
- The ESA is the overall IT system architecture of an organization. This architecture is the key part of managing and evolving IT systems, and therefore the business operations, of an organization. It consists of the architectures of individual systems and their relationships in the perspective of an organization.

Enterprise Systems Architecture (ESA) Model



Ref: Motiwalla et al, Enterprise Systems for Management (Fig 3-1)

The Evolution of Information Systems

Silos

- Information systems configuration used until recently
- Companies had unintegrated information systems that supported only the activities of individual business functional areas

Current ERP systems evolved as a result of:

- Advancement of hardware and software technology
- Development of a vision of integrated information systems
- Reengineering of companies to shift from a functional focus to a business process focus

ERP: Integrated Information Systems

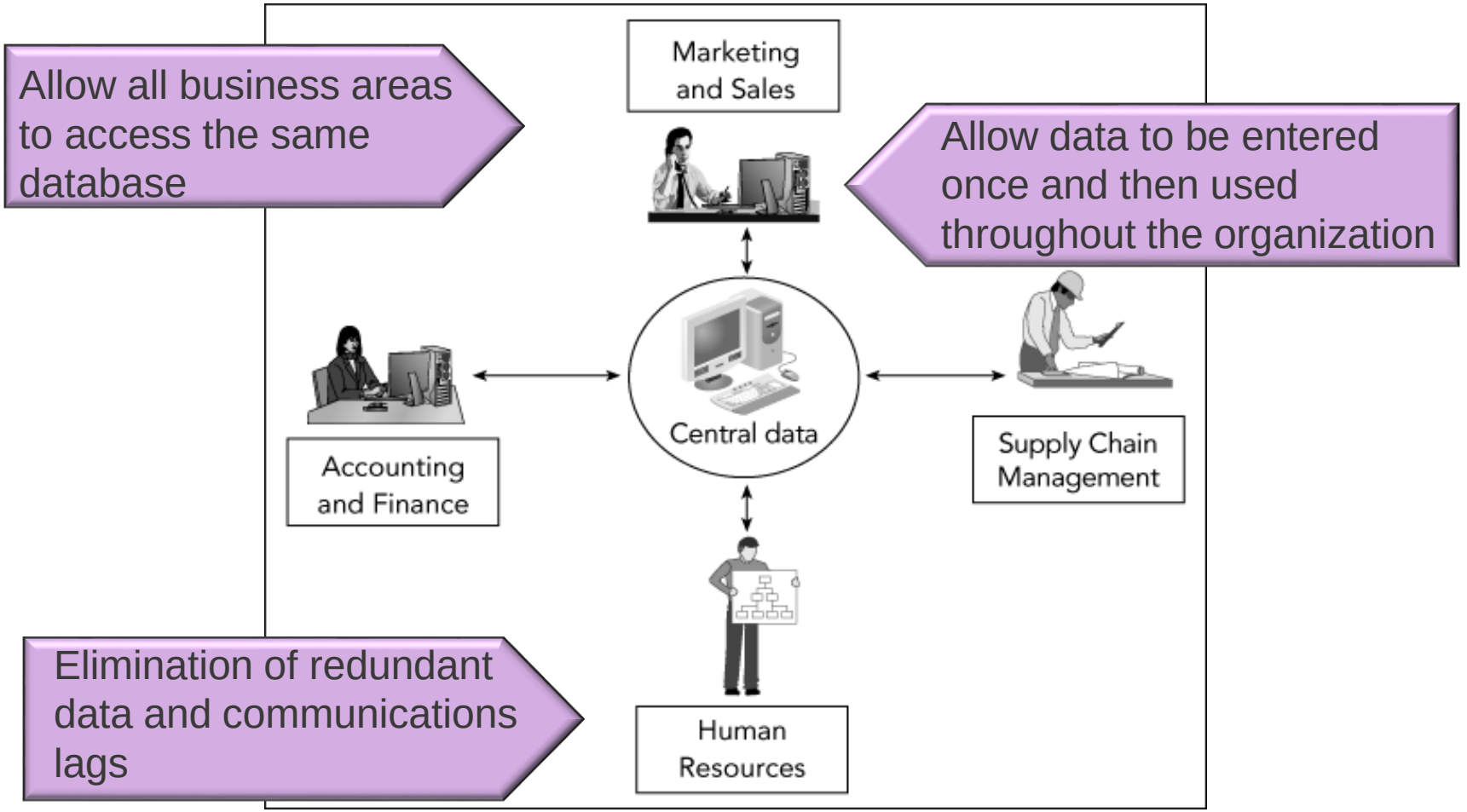


Figure 2-4 Data flow within an integrated information system

Computer Hardware and Software Development

- Computer hardware and software developed rapidly in the 1960s and 1970s
- First practical business computers were the mainframe computers of the 1960s
- Over time, computers got faster, smaller, and cheaper
- Moore's Law
  - Number of transistors that could be built into a computer chip doubled every 18 months

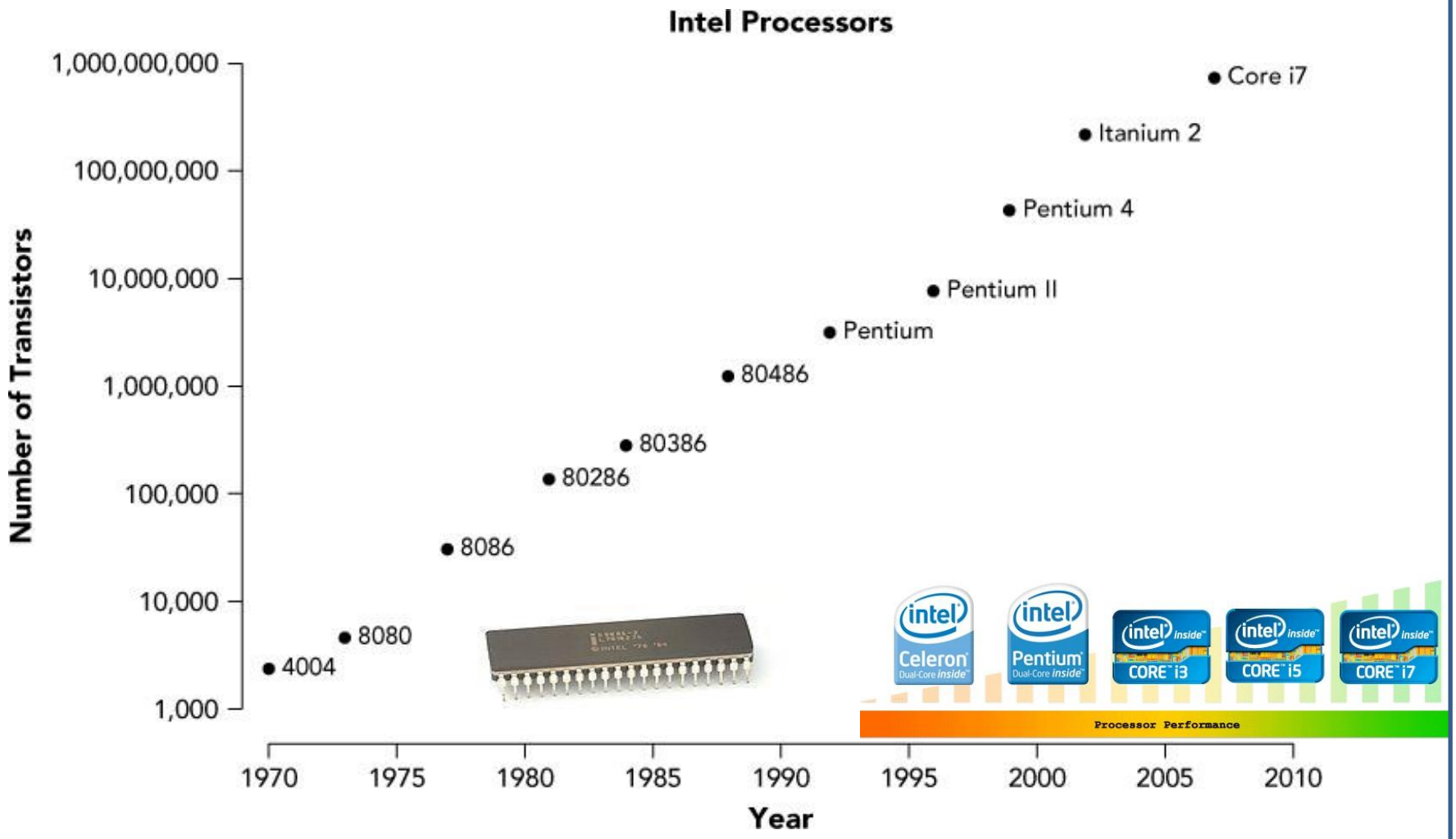
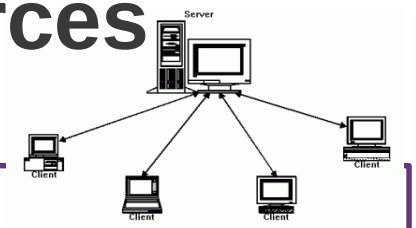


Figure 2-1 The actual increase in transistors on a chip approximates Moore's Law

Early Attempts to Share Resources



Early-1980s

- Telecommunications developments allowed users to share data and peripherals on local networks.
- **Client-server architecture**

By the mid-1980s

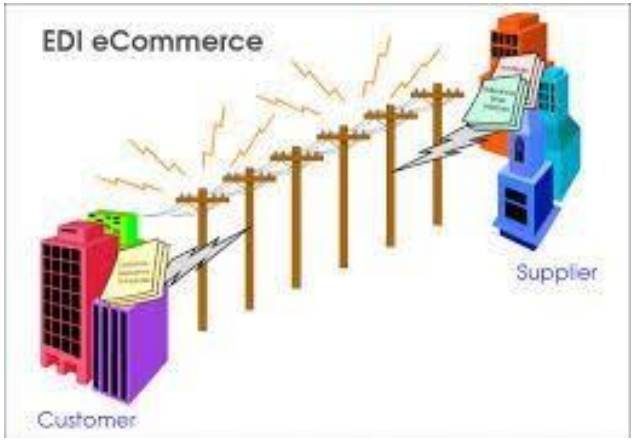
- **Database management systems** (**DBMS**) that were required to manage the development of complex ERP software existed.

By the end of the 1980s

- The hardware needed to support development of ERP systems was in place
- **Scalability** (The ability to increase capacity by adding new hardware)

The Manufacturing Roots of ERP

- Manufacturing software developed during the 1960s and 1970s
  - Evolved from simple inventory-tracking systems to **material requirements planning (MRP)** software
- **Electronic data interchange (EDI)**
  - Direct computer-to-computer exchange of standard business documents
  - Allowed companies to handle the purchasing process electronically

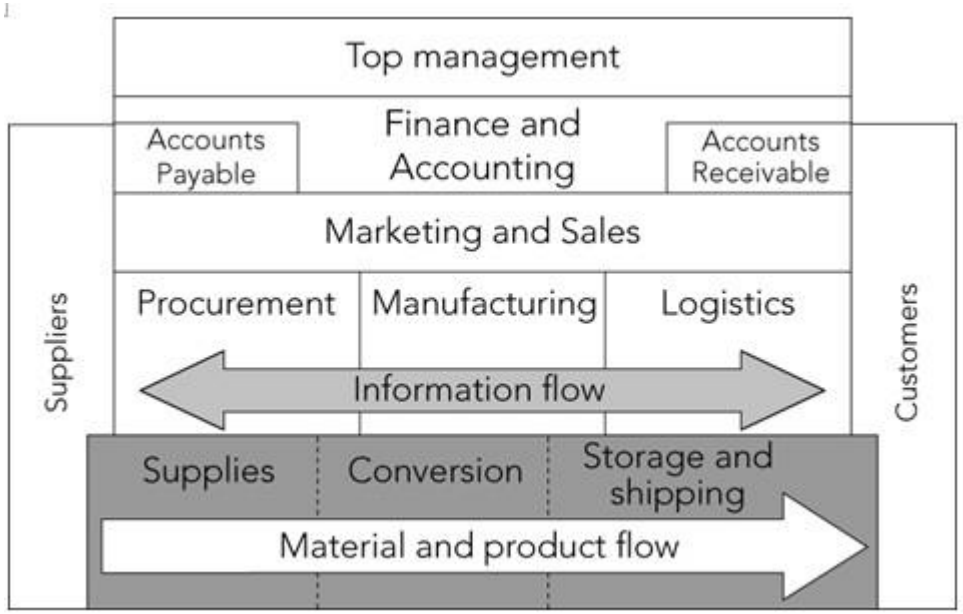


Management's Impetus to Adopt ERP

- Hard economic times of the late 1980s and early 1990s caused many companies to downsize and reorganize
  - Stimulus to ERP development
- Adopting ERP systems has come from compliance with the Sarbanes-Oxley Act of 2002
  - Requires companies to substantiate internal controls on all information
- Inefficiencies caused by the functional model of business organization
  - Silos of information limit the exchange of information between the lower operating levels

Management's Impetus to Adopt ERP (cont'd.)

- Functional model led to top-heavy and overstaffed organizations incapable of reacting quickly to change.
- Process-oriented business model
  - Information flows between the operating levels without top management's involvement.
- Y2K ! https://youtu.be/TYgx6YslQ1k



History of ERP

Late 1990s

- Year 2000 (or Y2K) problem motivated many companies to move to ERP systems

By 2000

- SAP AG had 22,000 employees in 50 countries and 10 million users at 30,000 installations around the world
- SAP's competitors in the ERP market: Oracle & PeopleSoft

Late 2004

- Oracle succeeded in its bid to take over PeopleSoft
  - PeopleSoft
    - Founded by David Duffield, a former IBM employee
    - Today, PeopleSoft, under Oracle, is a popular software choice for managing human resources and financial activities at universities
  - Oracle
    - SAP's biggest competitor
    - Began in 1977 as Software Development Laboratories (SDL)
    - Founders: Larry Ellison, Bob Miner, and Ed Oates

Development of ERP

2004

- The development of SAP's internet strategy with mySAP.com
- R/3 was replaced with SAP ERP Central Component (ECC) 5.0

2006

- SAP ERP 6.0, was released
- ERP 6.0 has since then been updated through SAP enhancement packs
  - most recent SAP enhancement package 8 for SAP ERP 6.0 in 2016

Current

- Top 10 ERP Systems (refer to next slide (#18) – for list of solutions provided)
  - 1. Epicor
  - 2. Infor
  - 3. SAP
  - 4. IFS – IFS Application
  - 5. Oracle
  - 6. NetSuite
  - 7. Microsoft
  - 8. Sage – Sage 100, Sage 300, Sage X3
  - 9. Syspro – Syspro ERP
  - 10. IQMS – Enterprise IQ

Some ERP Solutions in the Market Today

Epicor

- AVP
- BVP
- Prophet 21
- BisTrack
- Epicor CMS
- Epicor ERP
- Epicor iScala
- Epicor Cloud ERP
- Epicor Eagle
- Epicor Eclipse
- Epicor Clientele
- Epicor HCM
- FFL Compliance Manager
- LaserCat3
- LumberTrack
- Prelude
- Vision
- Mattec MES

Microsoft

- Dynamics AX
- Dynamics CRM
- Dynamics GP
- Dynamics NAV
- Dynamics POS
- Dynamics RMS
- Dynamics SL
- MSD 365

Infor

- Infor CloudSuite Industrial (SyteLine)
- Infor LN
  - CloudSuite Automotive
  - CloudSuite A&D
  - CloudSuite Industrial Machinery
- Infor VISUAL
- XA
- Infor M3
  - CloudSuite F&B
  - CloudSuite Fashion
  - CloudSuite Equipment Rental
  - Distribution Enterprise
- LX
- System21
- Adage
- SX.e
  - CloudSuite Distribution
- Distribution A+
- Distribution FACTS

SAP

- SAP Business One
- SAP Business ByDesign
- SAP Business All-in-One
- SAP Hana

Some ERP Solutions in the Market Today

NetSuite

- OpenAir
- NetSuite ERP
- NetSuite OneWorld
- NetSuite CRM
- NetSuite SRP
- Omni-Channel Commerce (SuiteCommerce)

Oracle

- Oracle Fusion Applications
- Oracle E-Business Suite
- PeopleSoft Enterprise
- Siebel
- JD Edwards EnterpriseOne
- JD Edwards World
- Hyperion Financial Performance Management
- Primavera Enterprise Project Portfolio Management
- Oracle Cloud

ERP Features

- Enables a company to support and optimize its business processes
- Ties together disparate business functions (integrated business solution)
- Helps the organization run smoothly
- Real-time environment
- Scalable and flexible
- Automation of data updates
- Applicability of best practices
  - Best practices: SAP's software designers choose the best, most efficient ways in which business processes should be handled

ERP Modules

- The key role of an ERP system is to provide support for such business functions as accounting, sales, inventory control, and production for the various stakeholders of the organization.
- ERP vendors provide modules that support the major functional areas of the business. E.g. in SAP ERP:
  - Sales and Distribution (SD) – sales order processing
  - Production Planning (PP)
  - Financial and Accounting (FI-CO)
  - Materials Management(MM) – inventory and procurement
  - Human Resources (HR)
- Organizations often selectively implement the ERP modules that are both economically and technically feasible.
- Customization or changes are therefore often necessary when implementing the ERP modules.

ERP Modules

TABLE 3-1 ERP Modules from Three Vendors

Function	SAP Modules	Oracle/PeopleSoft Enterprise Modules	Microsoft Dynamics Modules
Sales	Sales and distribution, sales opportunity	Marketing and sales, supply chain management	Retail POS, field service management
Procurement	Purchasing, supplier relationship management	Procurement and supplier relationship management	Supply chain management
Production	MRP, product life cycle management	Manufacturing	Manufacturing
Accounting	Financial accounting	Financial management	Financial management
Distribution	Warehouse management	Supply chain management	Distribution management
Customer services	CRM	CRM	CRM
Corporate performance and governance	Governance, risk, and compliance management	Corporate performance management	Analytics
Human resources	Human capital management,	Human capital management	HR management
Miscellaneous	Banking	Campus solutions	e-Commerce, portals

Source: Adapted from Web sites of SAP Global, Oracle Applications, and Microsoft Dynamics. www.sapfans.com/sapfans/sapfmod.htm; www.oracle.com/applications/home.html; www.microsoft.com/en/us/default.aspx (accessed January 15, 2007).

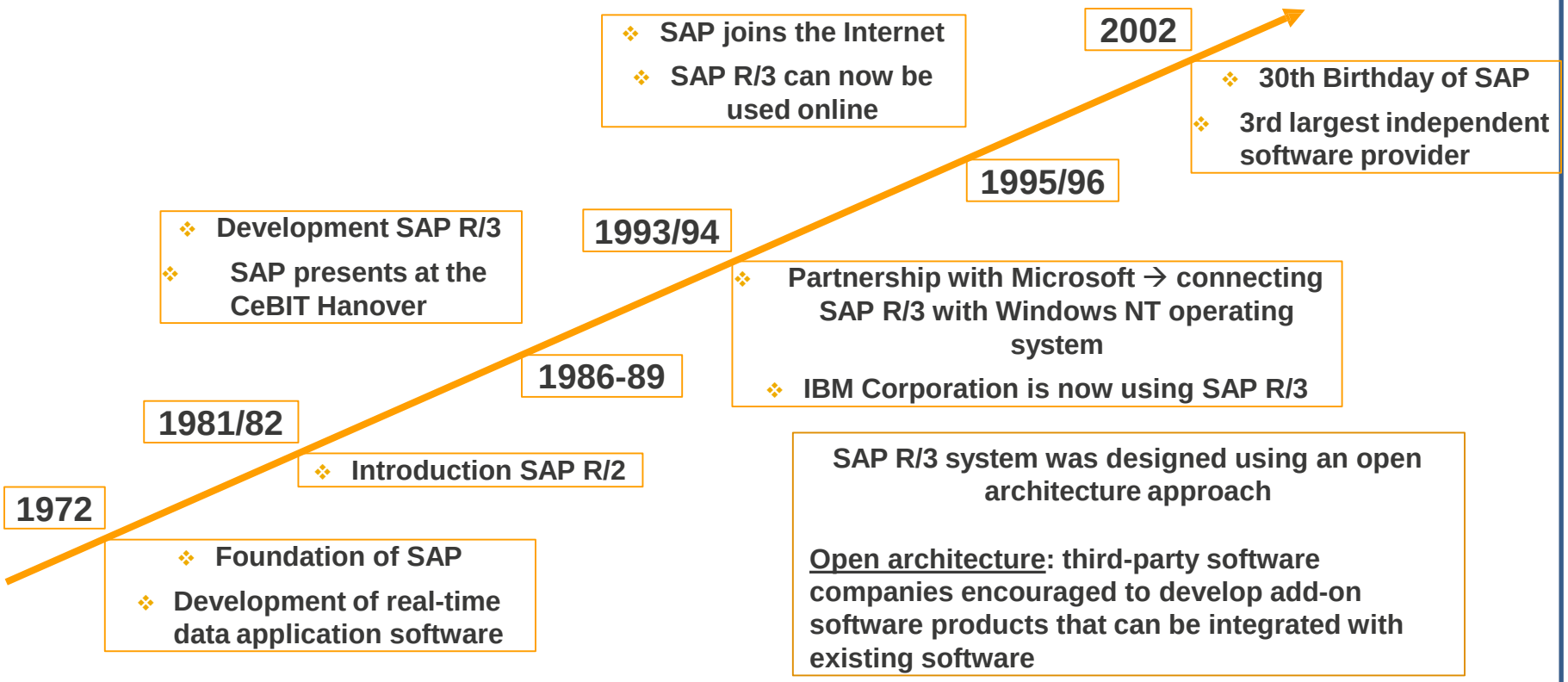
ERP Software Emerges: SAP and R/3

- 1972: five former IBM systems analysts in Mannheim, Germany formed *Systemanalyse und Programmentwicklung* (Systems Analysis and Program Development, or SAP)

Systems, Applications and Products in Data Processing.

- SAP's goals:
  - Develop a standard software product that could be configured to meet the needs of each company
  - Data available in real time
  - Users working on computer screens, rather than with voluminous printed output

SAP – A Short History



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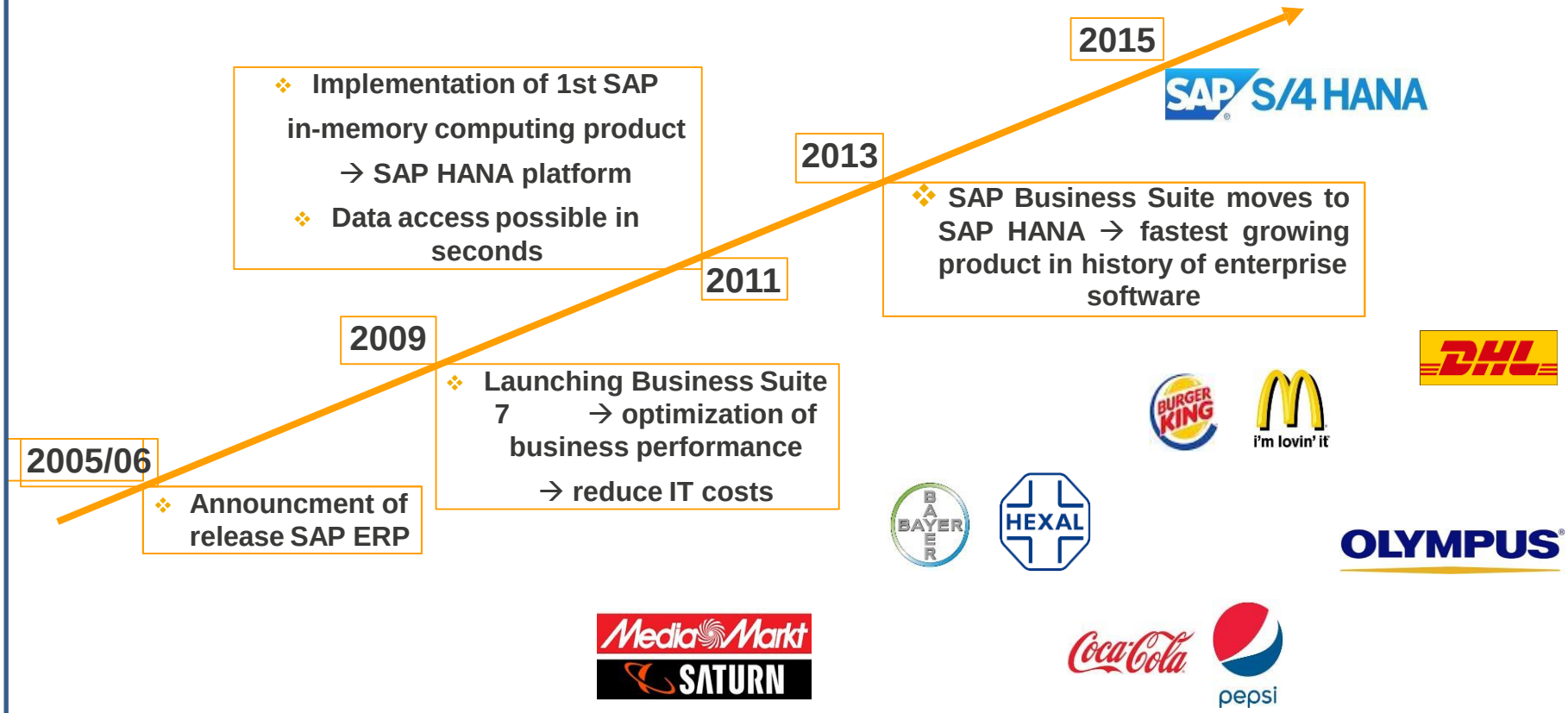
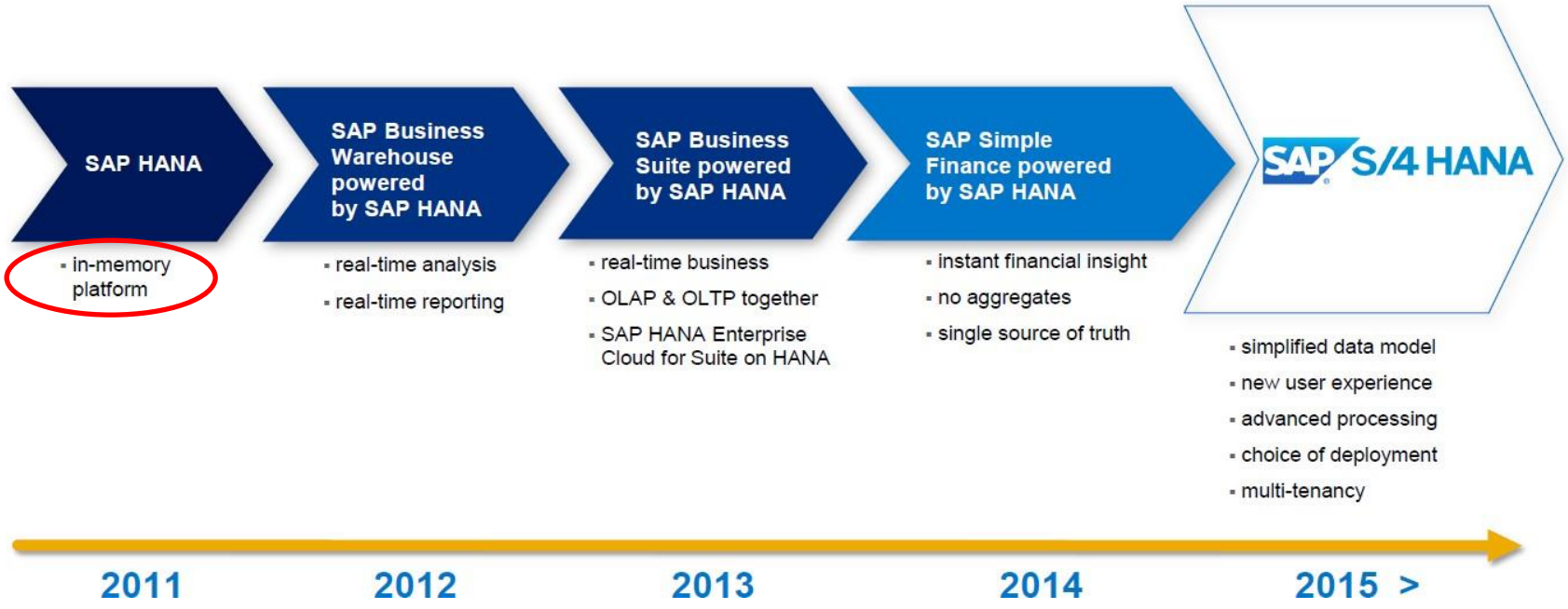


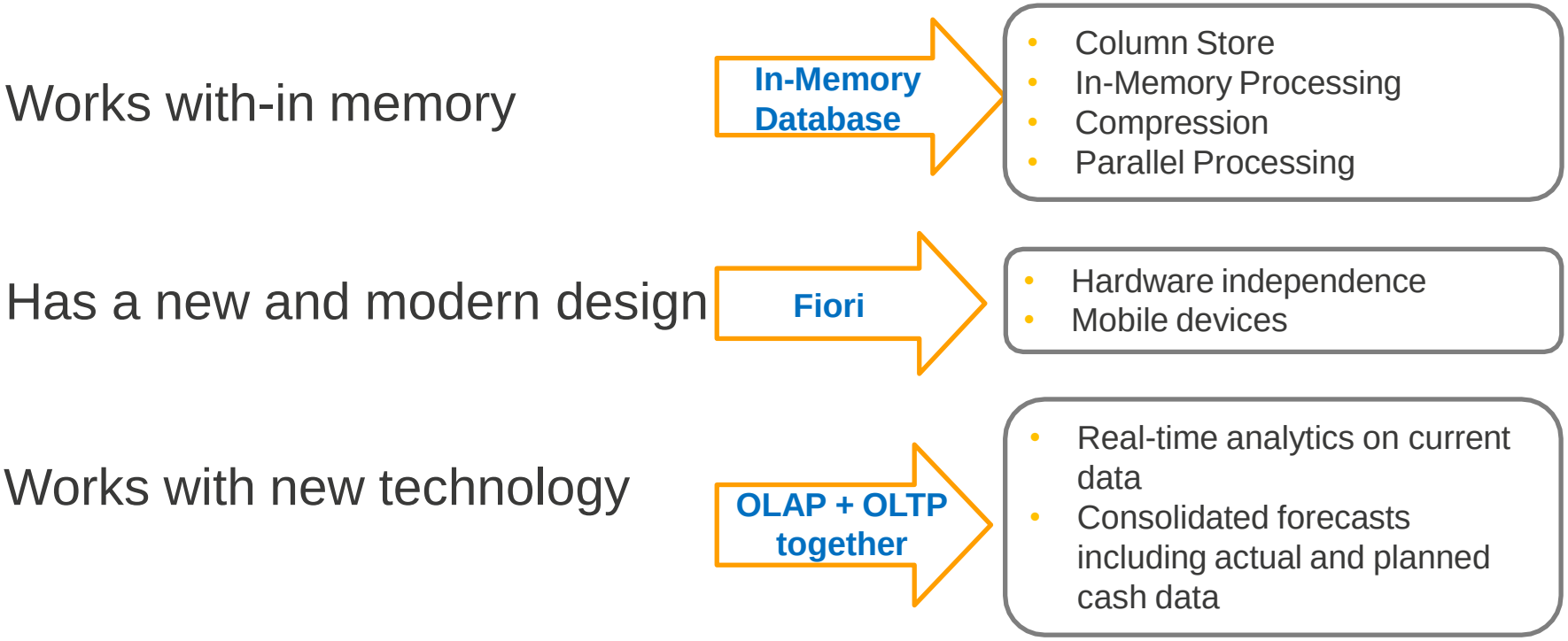
SAP S/4HANA – The New Enterprise Solution

Market Background

SAP HANA – the great simplifier of enterprise software

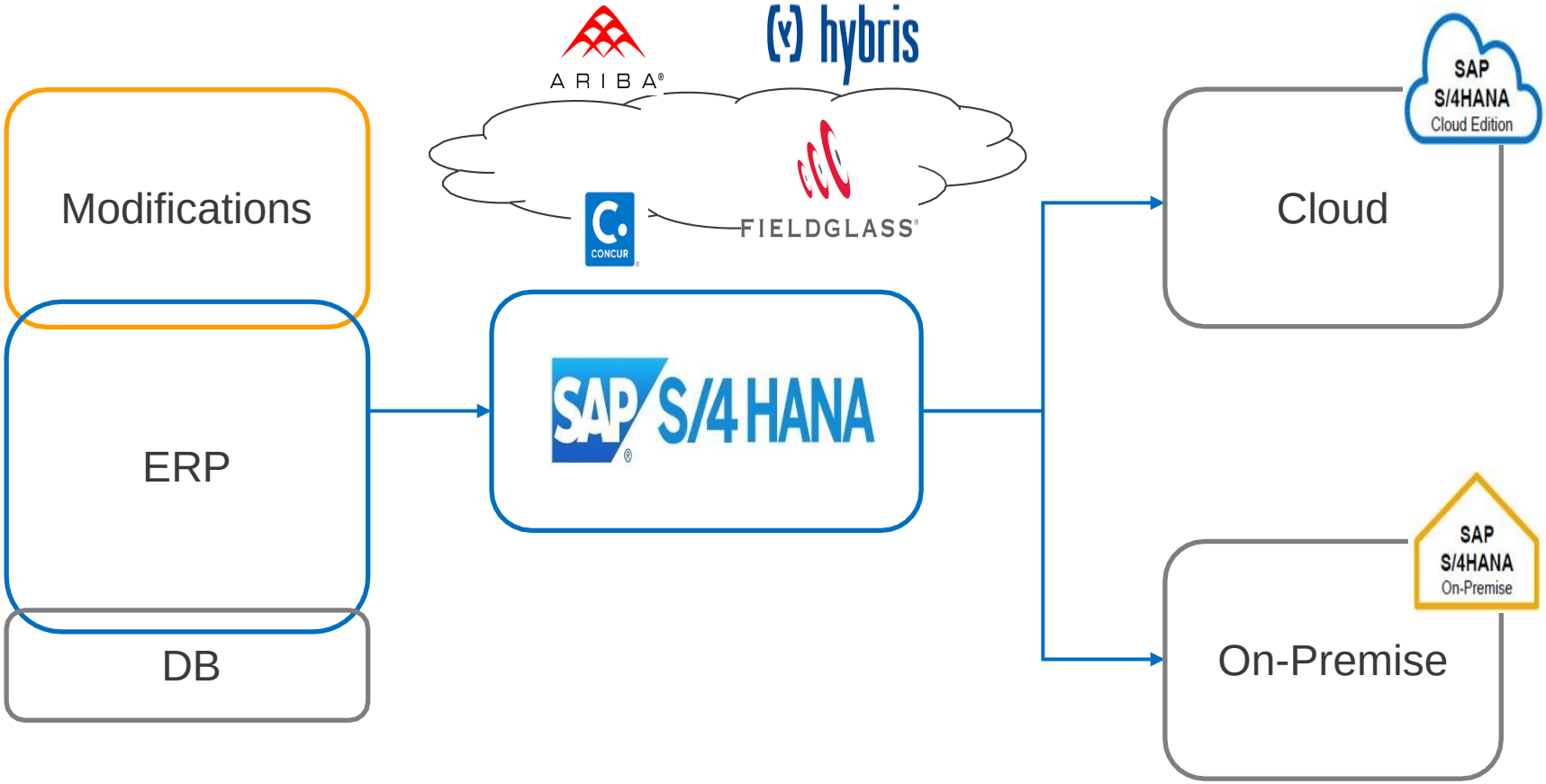


What‘s New in SAP S/4HANA?



SAP HANA is an In-Memory Database that allows you to process data very fast

SAP S/4HANA



SAP S/4HANA – On-Premise Vs Cloud

- SAP S/4HANA …

… Chooses between Cloud and On-Premise

- No extra hardware investments needed
- Cloud and On-Premise can be used hybrid without loosing the company´s integration
- Protection of investment
- Possible migration of SAP Business Suite customers

SAP Fiori
SAP S/4HANA Core
SAP HANA

SAP S/4HANA – On-Premise Vs Cloud

Subscription Licensing

→ Deployment in the private cloud, maintained by SAP

- SAP provides system and controls maintenance
- Automatic participation in quarterly innovation upgrades
- In-App extensibility with limited ABAP
- Current release cycles
- SAP ERP embedded

Traditional licensing

→ Traditional licensing with customer control of deployment and maintenance

- Private control of deployment and maintenance
- Hardware at companies location
- Privately controlled data
- Fewer release cycles
- Individual requirements possible
- Traditional ABAP extensibility up to core modification

The Significance and Benefits of ERP Software and Systems

- More efficient business processes that cost less than those in unintegrated systems
- Easier global integration
- Integrates people and data while eliminating the need to update and repair many separate computer systems
- Allows management to manage operations, not just monitor them
- Can dramatically reduce costs and improve operational efficiency

Questions About ERP

- How much does an ERP system cost?
- Should every business buy an ERP package?
- Is ERP software inflexible?
- What return can a company expect from its ERP investment?
- How long does it take to see a return on an ERP investment?
- Why do some companies have more success with ERP than others?

Choosing Consultants and Vendors

- One person cannot fully understand a single ERP system
- Before choosing a software vendor, most companies:
  - Study their needs
  - Hire an external team of software consultants to help choose the right software vendor(s) and the best approach to implementing ERP

How Much Does an ERP System Cost?

According to one 2020 study, the average cost of ERP implementation is around US$ 7,200. Again, this is just the average price, and the actual ERP implementation costs may vary significantly depending on:

- Unique business needs.
- The size and complexity of the business.
- Number of users.
- Customization required.
- Need for new hardware or hardware upgrade.
- Consultants and Analysts fees
- Time for implementation
- Training required

How Much Does an ERP System Cost?

Some examples (Approx, in US$, 2022):

Microsoft Dynamics 365	$65 - $95 per user, per month
ERPNext (OpenSource)	$50 per user, per month
NetSuite	$1000 per month + $100 pu/pm
SAP BusinessOne	$1600 - $3200 per user
Oodoo (OpenSource)	$28 pu/pm
Oracle	From $175 pu/pm

Should Every Business Buy an ERP Package?

- Some of a business's operations, and some segments of its operations, might not be a good match with the constraints of ERP
- Sometimes, a company is not ready for ERP
- ERP implementation difficulties result when management does not fully understand its current business processes and cannot make implementation decisions in a timely manner

Is ERP Software Inflexible?

- Many people claim that ERP systems, especially the SAP ERP system, are rigid
- Options for customization offered by SAP ERP
  - Numerous configuration options that help businesses customize the software to fit their needs
  - Programmers can write specific routines using **Advanced Business Application Programming (ABAP)**
- Once an ERP system is in place, trying to reconfigure it while retaining data integrity is expensive and time-consuming

What Return Can a Company Expect from Its ERP Investment?

- ERP eliminates redundant efforts and duplicated data; can generate savings in operations expense
- ERP system can help produce goods and services more quickly
- Company that doesn't implement an ERP system might be forced out of business by competitors that have an ERP system
- Smoothly running ERP system can save a company's personnel, suppliers, distributors, and customers much frustration

What Return Can a Company Expect from Its ERP Investment? (cont'd.)

- Cost savings and increased revenues occur over many years
  - Difficult to put an exact dollar figure to the amount accrued from the original ERP investment
- ERP implementations take time
  - Other business factors may be affecting the company's costs and profitability
  - Difficult to isolate the impact of the ERP system alone
- ERP systems provide real-time data
  - Improve external customer communications

How Long Does It Take to See a Return on an ERP Investment?

- **Return on investment (ROI)**: assessment of an investment project's value
  - Calculated by dividing the value of the project's benefits by the project's cost
- ERP system's ROI can be difficult to calculate
- Peerstone Research study
  - 63 percent of companies that performed the calculation reported a positive ROI for ERP
  - Most companies felt that nonfinancial goals were the reason behind their ERP installations

Why Do Some Companies Have More Success with ERP Than Others?

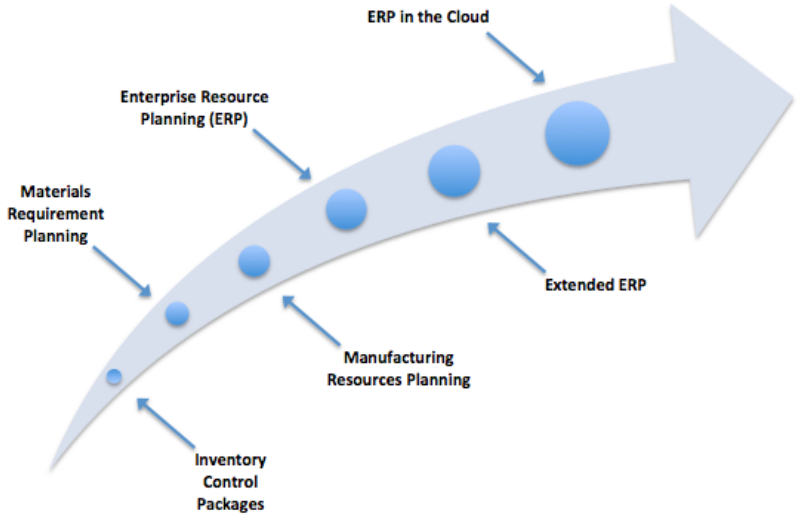
- Usually, a bumpy rollout and low ROI are caused by *people* problems and misguided expectations, not computer malfunctions
  - Executives blindly hoping that new software will cure fundamental business problems that are not curable by any software
  - Executives and IT managers not taking enough time for a proper analysis during planning and implementation phase
  - Executives and IT managers skimping on employee education and training
  - Companies not placing ownership or accountability for the implementation project on the personnel who will operate the system

Why Do Some Companies Have More Success with ERP Than Others? (cont'd.)

- Usually, a bumpy rollout and low ROI are caused by *people* problems and misguided expectations, not computer malfunctions (cont'd.)
  - Unless a large project such as an ERP installation is promoted from the top down, it is doomed to fail
  - ERP implementation brings a tremendous amount of change for users
- For many users, it takes years before they can take advantage of many of an ERP system's capabilities
- Most ERP installations do generate returns

The Continuing Evolution of ERP

- Understanding the social and business implications of new technologies is not easy
- ERP systems have been in common use only since the mid-1990s
- ERP vendors are working to solve adaptability problems that plague customers



Summary

- Speed and power of computing hardware increased exponentially, while cost and size decreased
- Early client-server architecture provided the conceptual framework for multiple users sharing common data
- Increasingly sophisticated software facilitated integration, especially in two areas: A/F and manufacturing resource planning
- Growth of business size, complexity, and competition made business managers demand more efficient and competitive information systems
- SAP AG produced a complex, modular ERP program called R/3
  - Could integrate a company's entire business by using a common database that linked all operations

Summary (cont'd.)

- SAP R/3, now called SAP ERP, is modular software offering modules for Sales and Distribution, Materials Management, Production Planning, Quality Management, and other areas
- ERP software is expensive to purchase and time-consuming to implement, and it requires significant employee training—but the payoffs can be spectacular
  - For some companies, ROI may not be immediate or even calculable
- Experts anticipate that ERP's future focus will be on managing customer relationships, improving planning and decision making, and linking operations to the Internet and other applications through service-oriented architecture

End of Lecture 3

References:

- Ellen Monk, Bret Wagner. (2013). Concepts in Enterprise Resource Planning. (4e) Course Technology, Cengage Learning. Chapter 2