Implementing Budget and Grant Analysis for Public Sector Management

A Major Project Report
18ISP81

Submitted by,

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In partial fulfillment of the requirements for the degree of

Bachelor of Engineering in

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RV College of Engineering®, Bengaluru

(*Autonomous institution affiliated to VTU, Belagavi*)

Department of Information Science and Engineering

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CERTIFICATE

Certified that the minor project (18ISP81) work titled ***Implementing Budget and Grant Analysis for Public Sector Management*** is carried out by **Ayush Kumar** (**1RV18IS009**) who is bonafide student of RV College of Engineering, Bengaluru, in partial fulfillment of the requirements for the degree of **Bachelor of Engineering** in **Information Science and Engineering** of the Visvesvaraya Technological University, Belagavi during the year 2021-2022. It is certified that all corrections/suggestions indicated for the Internal Assessment have been incorporated in the minor project report deposited in the departmental library. The minor project report has been approved as it satisfies the academic requirements in respect of minor project work prescribed by the institution for the said degree.

Signature of Guide	Signature of Head of the Department	Signature of Principal
Prof. Vanishree K	Dr. B.M Sagar	Dr. K. N. Subramanya

External Viva

Name of Examiners	Signature with Date

DECLARATION

I, **Ayush Kumar** students of eighth semester B.E., Department of Information Science and Engineering, RV College of Engineering, Bengaluru, hereby declare that the minor project titled '**Implementing Budget and Grant Analysis for Public Sector Management**' has been carried out by me and submitted in partial fulfilment for the award of degree of **Bachelor of Engineering** in **Information Science and Engineering** during the year 2021-2022.

Further I declare that the content of the dissertation has not been submitted previously by anybody for the award of any degree or diploma to any other university.

I also declare that any Intellectual Property Rights generated out of this project carried out at RVCE will be the property of RV College of Engineering, Bengaluru and we will be one of the authors of the same.

Place: Bengaluru

Date:

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Letter of Engagement

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Dear Ayush,

Subsequent to the interview you had with us, I am pleased to inform you that you have been selected as **Diploma Student** / **Intern** for a period of 6 months with SAP Labs India Pvt Ltd., starting from 17 January 2022 to 08 July 2022. Congratulations!

You would receive a stipend of Rs 35,000.00 per month during the period of your training (TDS would be deducted as per Income Tax rules and regulations).

Kindly acknowledge the enclosed copy of this letter as a token of acceptance and return to us at the earliest.

You are required to provide your PAN number and Bank details within 10 days of your date of joining as they are mandatory.

We would be pleased to furnish you with any further information or clarify your queries. We congratulate you once again on your success.

Looking forward to a mutually rewarding association.

Best regards,

For **SAP Labs India Pvt. Ltd.**

Shraddhanjali Rao
Head of Human Resource, India
SAP, India

Sabish Kovath Bhaskar
HR Services Senior Consultant
HR Services Centre, SAP, India

I accept the terms & conditions of service outlined above

.....
Ayush Kumar

.....
Date

ABSTRACT

Systems Applications and Products in Data Processing (SAP) is an ERP (Enterprise Resource Planning) based software product company that supports and manages business operations and customer relations of all types of companies, big to small scale. SAP is a leading provider of cloud computing, enterprise mobility, and analytics to government and non-profit agencies worldwide.

The SAP for Public Sector innovative solution portfolio to improve government performance, services, and accountability to improve people's lives. In the public sector, citizen engagement and service delivery operations are also becoming increasingly more complicated too. Government has a timeless mission to protect, provide, and prosper. Around the world, government organizations are trying to provide their citizens with economic opportunity, health care access, a sustainable environment, and better educational systems and infrastructure.

The frontend of the web application is built using SAP UI5 and SAP Fiori principles. The database is configured on the in-memory, column-oriented SAP S/4 /acrshorthana Database, which helps in fast retrieval and efficient storage of the data. Backend server-side coding is based on SAP Core Advanced Business Application Programming (ABAP) (Advanced Business Application Programming Language), which is a 4th generation programming language. Core Data Service Views are used for efficient data modelling. Frontend and Backend services are connected via SAP OData and SAP Gateway.

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CHAPTER 1

INTRODUCTION

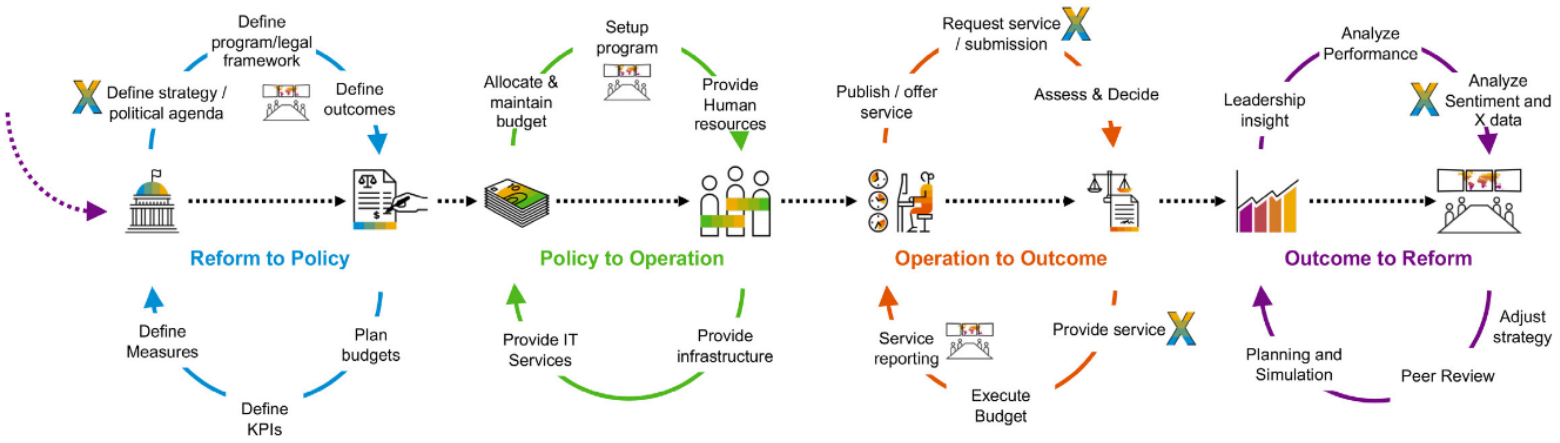
1.1 Introduction

As society grows more complex, government faces a challenge and an opportunity. The challenge is to deliver on its mission to provide, protect, and prosper in an increasingly multifaceted society where it is difficult to develop one-size-fits-all programs that meet the precise needs of citizens

To deliver improved services to citizens, governments at every level are faced with similar set of challenges. One example is how to harness the big data which has been acquired through various touch points and other sources in order to deliver impactful and relevant services along with generating meaningful insights for intelligent decision making.

As government delivers on its timeless mission to provide for its citizens, protect them, and help them prosper, it delivers services across a value chain. That begins with reform, moves through operations, delivers a service, measures outcomes, and then begins again.

By adopting an artificial intelligence and machine learning aligned data-driven strategy, government can see the benefits of digital transformation. Such a transformation can help you to design innovative new business models. across multiple channels, optimize processes, engage citizens and partners more effectively, and manage change successfully. Armed with 360-degree insight, real-time recommendations, and greater agility, you can better see the root cause of problems, look for viable solutions, and deploy them quickly. It can also help you to report critical outcomes internally and externally, reduce improper payments, and develop more meaningful and impactful public policy. In short, the transformation can help you function more efficiently while increasing public trust and support.



1.2 Purpose

The study's goal is to provide a enterprise solution with several functions of most public sector related governance and operations such as budget planning, expense tracking, and grant management all at once. The technologies are intended to effectively map real information to aid clients in going live by aiding in client creativity along with client assistance.

1.3 Motivation

The methods that government typically uses to evaluate policies and outcomes may no longer be sufficient to calibrate needed programs. As complexity rises, the world is becoming more interdisciplinary - problems can and do have multiple root causes. The inability to approach these root causes from multiple perspectives can limit the efficacy of government action to solve them.

However, most governments are not similarly managing their data as a strategic asset to solve citizen problems, meet citizen needs, and better understand the consequences of potential new policies. Government organizations still largely consider money, people, facilities, and systems (not necessarily data) as their chief assets. Very often data is perceived more as a problem than a strategic asset.

1.4 Problem statement

The core mission of the public sector – to protect the community, provide services, and help the economy prosper – remains firmly in place. For public orga-

nizations, success is measured not only by financial return on investment but even more so by political and social return. Changes in technologies, citizen expectations, operational models, and standards themselves require constant adaptation. Public sector organizations must be able to respond to rapidly changing conditions and continue to deliver outcomes within budget, yet still comply with standards

Designed to help all levels of government maximize public value, SAP for Public Sector solutions enable governments to optimize limited resources in public administration while delivering responsive front-office services. Our solutions support business processes across a wide range of government functions, from accounting and procurement to case management and social services.

SAP solutions help governments leverage their finite time, money, and personnel resources to fulfill mandated program and service requirements on a timely basis. Where two or more agencies share responsibility for a common outcome, these solutions can integrate information, processes, and technology to support the active collaboration that delivers financial returns, as well as social and political results, to internal and external government stakeholders.

1.5 Objectives

This digital age is disruptive. Public sector organizations need strategic priorities that drive transformation. SAP envisions reimagined end-to-end (E2E) business scenarios to support the strategic priorities of the digital economy.

The objectives of the project are

1. Put the citizen at the center

   Continue your journey by further simplifying complicated processes for the citizen, providing personalized, self-managed, secure online engagement. Deliver the best customer experience by connecting the front office to the back office. Become anticipatory service orchestrators, information brokers, and networkers.

2. Reimagine business processes and models

   Lay a digital foundation for more efficient and agile processes, to be able

to quickly change when unforeseen disruptions occur. Proactively adapt operational models and augment everyday tasks so government workers can focus on the cases that require human engagement.

3. Leverage data as an asset

   Create a culture that is open and transparent – one that values evidence over intuition and is based on an organization-wide "single source of truth" that integrates interorganizational and external data. Prioritize protection of data and privacy. Improve services to citizens by adopting a data-driven strategy that enables action from insight.

4. Enable the workforce of the future

   Give employees every opportunity to do and be their best. Align employee skills with organization needs, reduce compliance risk, and keep remote workers engaged and productive. Track and manage employee health and assess workforce engagement and well-being. Understand potential implications for culture, productivity, and the organization overall

1.6 Scope and relevance

Organization in public sector manage fund, budget and grants from multiple sources. Allocation and consumption of funds are based on the needs of the organization. Proper tracking and analysis of funds is key to effective management of funds. Utilizing data driven approach helps in keeping track of available funds and their usage to better plan expenses and predict the requirements.

1.7 Literature Survey

1.7.1 ERP Systems in Public Sector

The vast majority of ERP system implementation in production systems has been completed and consequently the needs of that market have been satisfied. Some other potential areas of ERP systems implementation were in focus of ERP systems manufacturers. One of the emerging markets is the public sector. Implementation of ERP systems in the public sector has already began regardless

of some well-known ERP implementation problems such as enormous investment and risk of failure in implementation itself. Numerous published scientific papers deal with various aspects of ERP systems, but the number of papers regarding ERP systems implementation in the public sector is relatively small. That particular area of the public sector is becoming increasingly interesting for ERP systems manufacturers, and researchers are interested in the areas of public services where the ERP systems have already been implemented. [1]

Following are the feilds where the ERP system can be systematically incorporated in Public sector

Table 1.1: Public Sector

Code	Non economic public sector
PS1	Education
PS2	Culture
PS3	Health careful
PS4	Social Services
PS5	Law Enforcement
PS6	Military – defense
PS7	Public library

1.7.2 Available ERP Solutions

Aptean

Aptean was founded in 2012 after a merger between Consola Corporation and CDC Software and currently offers ERP solutions for several financial and manufacturing markets. The company builds and acquires solutions to support the evolving operational needs of businesses. Aptean's ERP solutions include Cimnet ERP, Encomprix ERP, Ross ERP, and more, each designed to fit individual needs. Aptean delivers solutions to global customers in the manufacturing, distribution, high tech, transportation, retail, government, real estate, financial services, health care, and not-for-profit industries. [2]

Deltek

Deltek's ERP solution, Costpoint, has assisted companies in researching and identifying new opportunities, winning new business, recruiting and developing talent, and more. Deltek offers a range of ERP products to fit the unique demands

of clients. Deltek's ERP solutions are available as cloud-based and on-premise systems, priced per employee per month. Deltek is typically used by organizations with over 21 employees and more than ten users who need the software. The solution is used in several industries, including aerospace and defense, healthcare, non-profits, and education. [3]

Infor

Infor is a privately held software company founded in 2002. Infor's business applications are specialized by industry, built for the cloud, and gives you everything you need to run your day-to-day operations as well as grow your business for the long term. Whether you need to optimize vital back-office functions like HR and financials, jumpstart your customer experience, or initiate digital transformation, Infor solutions have you covered. Over 90,000 organizations worldwide rely on Infor to help overcome market disruptions and achieve business-wide digital transformation. [4]

Microsoft

Microsoft provides ERP software to businesses of all sizes through its Dynamics 365 platform, consisting of six products: Microsoft AX, GP, SL, NAV, CRM, RMS. The Microsoft Dynamics portfolio started in 2001 with the acquisition of Great Plains Software and Soloman and in 2002 with the acquisition of Navison and Axapta. Together, these four technologies make up the Microsoft Business Solutions Group (MBS), a major supplier of ERP solutions. Dynamics GP, NAV, and SL are typically intended for small and medium enterprises, while Dynamics AX is best suited for larger organizations.

[1]

Oracle NetSuite

For more than 20 years, Oracle NetSuite has helped organizations grow, scale, and adapt to change. NetSuite provides a suite of cloud-based applications, including financials / ERP, HR, professional services automation, and omnichannel commerce, used by more than 15,000 customers in 203 countries and dependent territories. ERP software from Oracle NetSuite allows consolidation in real-time

and includes automated intercompany eliminations and foreign currency translation. The solution is web-based and runs on a range of Internet browsers. The company ensures safety by using its built-in security controls and data center.

[5]

OpenGov

OpenGov provides cloud ERP solutions for public sector budgeting, community development, and financial management. Over 1,000 governments across the U.S. rely on OpenGov to help allocate resources, increase efficiency, improve public engagement, and make data and information readily available to staff and elected officials. The OpenGov ERP Cloud offers four main products: Budgeting and Planning; Financials; Reporting and Transparency; Permitting, Licensing and Code Enforcement. [6]

SAP

SAP, the German software giant, provides businesses with its SAP S/4HANA next-generation ERP software that provides strong functionality across many industries, including manufacturing, services, retail, wholesale distribution, and more. S/4HANA offers applications covering customer relationship management, financials, human capital management, and product lifecycle management. The software primarily serves small to medium-sized businesses with one hundred employees and less than 75 million USD in annual revenue.

Tyler Technologies

Tyler Technologies' solutions help governments and schools better serve their communities with technology designed to simplify complex processes. This vendor's broad solutions and product offering empower you to deliver better and faster assistance to the public — greater transparency and accessibility, sustainable office practices, secure data that's easy to manage and maintain, and faster results. Tyler Technologies offers various solutions geared toward public administration, courts and public safety, health, human services, and K-12 education.

Unanet

Unanet for Government Contractors makes managing GovCon projects easy, providing perfect clarity and total control over day-to-day operations, forecasting, and planning. Purpose-built in-house by GovCon professionals, Unanet features support DCAA requirements at each stage. This vendor also integrations PSA and PPM with Financials to help organizations reliably plan, track, and manage projects and people. Unanet also offers ERP for professional services and A/E.

ERP Modules Implemented	ERP Manufact.
Integrated Personnel and Pay System (IPPS-A),Global Combat Support System for tactical logistics (GCSS-Army), the Logistics Modernization Program (LMP), the General Funds Enterprise Business System (GFEBS).	GFEBS - SAP, GCSS-Army - SAP, LMP - SAP R/3, IPSS-A - PeopleSoft, Navy ERP - SAP R/3, GCSS-MC - Oracle, IPPS-Navy - PeopleSoft, DEAMS - Oracle, ECSS - Oracle, AF-IPPS - PeopleSoft
GFEBS, GCSS-Army, DEAMS, ECSS	GFEBS - SAP, GCSS-Army - SAP, DEAMS - Oracle, and ECSS - Oracle
human resources, controlling, logistic	SAP R/3
material management, procurement, asset management, budget planning, payment, and financial management	SAP R/3
SAP DFPS human resources, finance, operations and business processes, module for modeling units ISL - procurement, supply, logistics, equipment maintenance and ammunition.	SAP DFPS, AURA -ISL

Figure 1.1: ERP system used in millitary sector

ERP Modules Implemented	ERP Manufact.
Finacial accounting, HT mgt, Material Mgt, Project Mgt, Record Mgt, Faze II: Payroll, Asset Mgt, Procurement Mgt	SAP
Financial, Human Capital, Pension, Logistics and Technical	SAP
full ERP	Datatel® Colleague®
finance, procurement, human resources, campus solution - student modules	PeopleSoft
full ERP	MADAR
human capital management, financial management and payroll processing	Munis
full ERP	Oracle
different ERP componenets or full ERP implemented in different institutions	multiple manufacturers
full ERP	proprietary developed ERP "Is_UVN"
financial system, business processes of budget execution, financial accounting	SAP
finance, human resources (HR) and student information system software	not specified

Figure 1.2: ERP system used in education sector

ERP Modules Implemented	ERP Manufact.
financial management, procurement, supplier order management, contract management and requsitions, human resources, payroll and employee/manager self service	New York-based Infor
SB (Basic System): Document and work flow management; SCI (Integrated Accounting System): Accounting and controlling ; HR (Human Resources)	SAP
HR	SAP
Accounting, Budgeting, Payroll, Human Resources, and Procurement	SAP R/3
Full ERP, The ERP system integrates all of the city's business functions, including procurement, payroll, finance, inventory and human resources	Oracle
financial, procurement, personnel, budget, inventory control, grants and project management wifh fully integrated document management and workflow	SAP
finance, sales	BAAN
financials, controlling, human resources, logistics. The software is to assist companies by providing support for sales, customer relationships, inventory, operations, financials and human resources.	Microsoft Dynamics Ax
budgeting solution	CGI - AMS Advantage ERP Suite

Figure 1.3: ERP system used in financial sector

ERP Modules Implemented	ERP Manufact.
multiple ERP systems	multiple manufact
patient management (appointments, registration, admission, discharge andtransfer);financial management (accounts payable, accounts receivable, general ledger andfixed assets); materials management (inventory and purchase); human resource (scheduling, training and payroll);•ancillary services (dietary, laboratory and pharmacy); and management information (reporting on and providing statistics on various issues).	SAP
planned: patient management (appointments, registration, admission, discharge and transfer); ancillary services (dietary, laboratory and pharmacy); Radiolgy IS, operations, intensive care; materials management (inventory and purchase); financial management (accounts payable, accounts receivable, general ledger and fixed assets); management information (reporting on and providing) implemented: patient management	Hospital informatio n system "Ericsson Nikola Tesla alliance"

Figure 1.4: ERP system used in healthcare sector

1.8 Methodology and Architechtural Roadmap

1.8.1 Methodology

The steps adopted during the implementation of the Budget Planning Application can be shown as a three stage pipeline as discussed below :

- Use of SAP UI5 and SAP Fiori for the deployment of the front-end system. A glimpse of the Fiori LaunchPad is shown in the diagram below. It shows the catalogue containing a suite of applications customized according to user preferences and packages.

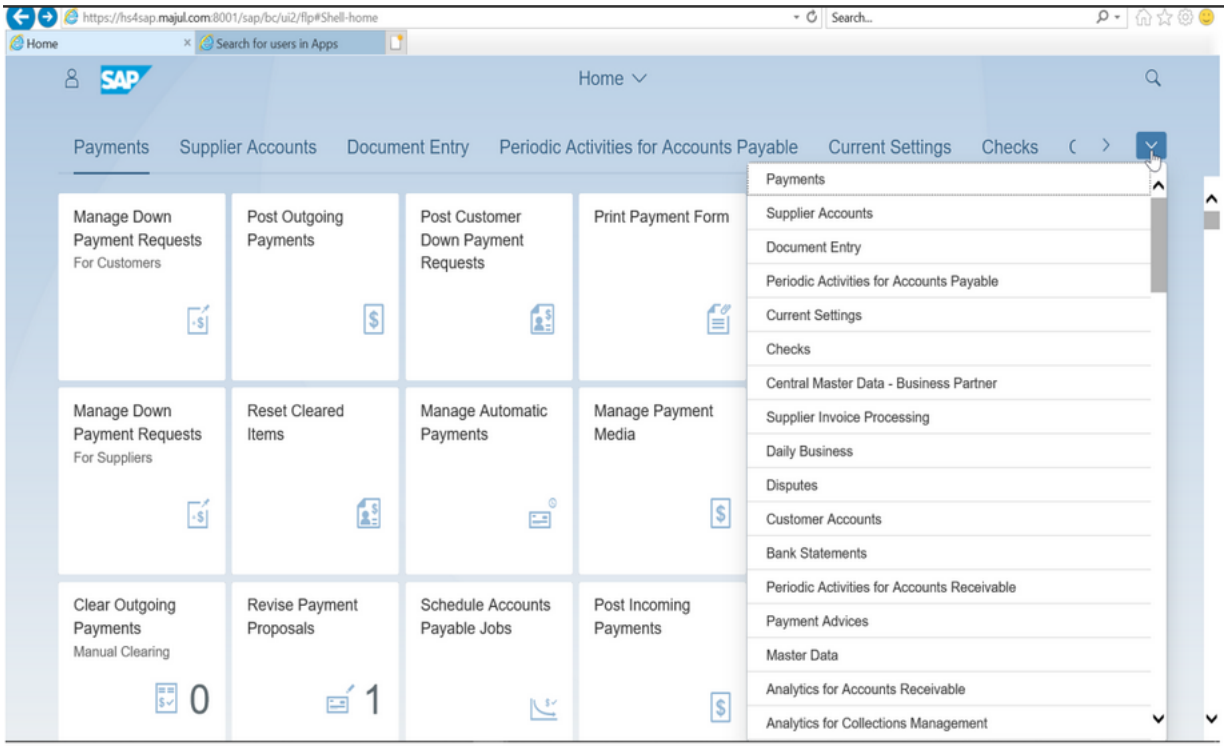


Figure 1.5: Fiori LaunchPad

- Setting up SAP S/4 HANA databases for collecting and capturing info received through the programs. The database can analyze significant volume actual statistics in a brief period.
- Server-side code on the backend built upon SAP ABAP.
- To get an expedient solution for data representation, Core Data Services Views are supported by the current relational databases and views.
- SAP NetWeaver Gateway Client and Open data Protocol are used toh link backend with frontend resources.

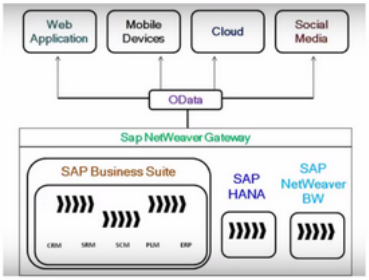


Figure 1.6: SAP Odata Protocol

The figure above shows a high level framework of the different tiers and the connection amongst all components. The Odata and Netweaver Gateway are mainly used for the interlinking of front-end and backend services.

The features to be provided include-

- Budget requests, reviews and adoption- Manage budgets in a single application
- Operating, capital and grants budgeting - A single application for all budget types
- User configuration - Tailor budget forms, process controls, reports and analytics to your unique budgeting requirements and adapt them to changing requirements
- Personnel cost forecasting - Examine and plan personnel expenditures at a highly granular level to support budgeting, spending plans and collective bargaining
- Modeling and analytics - Powerful modeling tools combined with the strength of SAP Business Objects for reporting, dashboards and ad hoc analysis

1.8.2 Architectural Roadmap

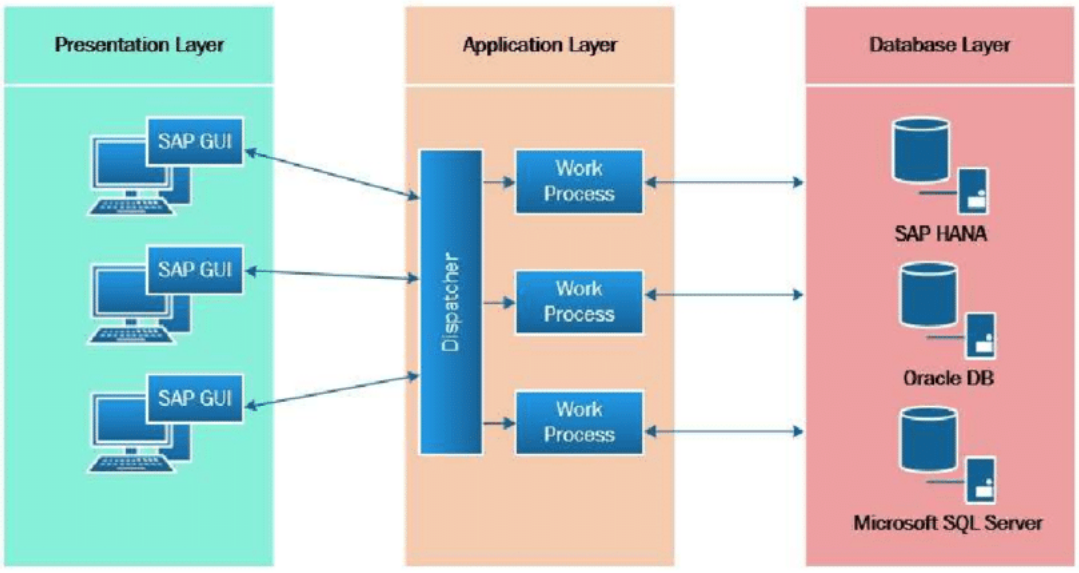


Figure 1.7: Architectural Roadmap

The SAP System Architecture follows a three tier architecture containing Presentation, Application and a database layer. Each of these layer has it's own software component. With this setup, the overall system can be distributed among a range of computers or it can also be in one system like MiniSAP which has all these components in one computer. A common configuration includes where in the database and the application server run concurrently in a single large computer. All the other application servers run on their computers. Let's explain all these three components further so that you can develop a better understanding of the SAP system architecture.

Presentation Layer

This is the view you see when you login into SAP from your computer. This is presentation layer that has been generated. The SAP GUI Software components ensure that the SAP system user interface is shown and that the user's actions are passed to the application server for further processing.

Application Layer

The application layer is the one where the entire work is carried out for your. All your actions are processed at this place. This software component can have one or more than one based on the requirements and the processing needs of each and every organization.

The application server provides a range of services for the operation of the SAP system. The application servers processes are carried out through work processes. This is defined at the start of the SAP system. The work processes are components that are able to execute an application. One thing to note here is that each work process is registered as a user in the database system for the entire runtime of the SAP system.

Database Layer

Each SAP System Architecture will have a central database in which the entire data is stored. Everything, like the customer records, programs, just about anything which needs to be stored is maintained at this level.

In a nutshell, any actions you do on the presentation layer is passed to the

application layer for processing which would retrieve any relevant data from the database layer and the application layer processes the data and presents it to you via the presentation layer. This similar SAP System Architecture is followed by any ERP system.

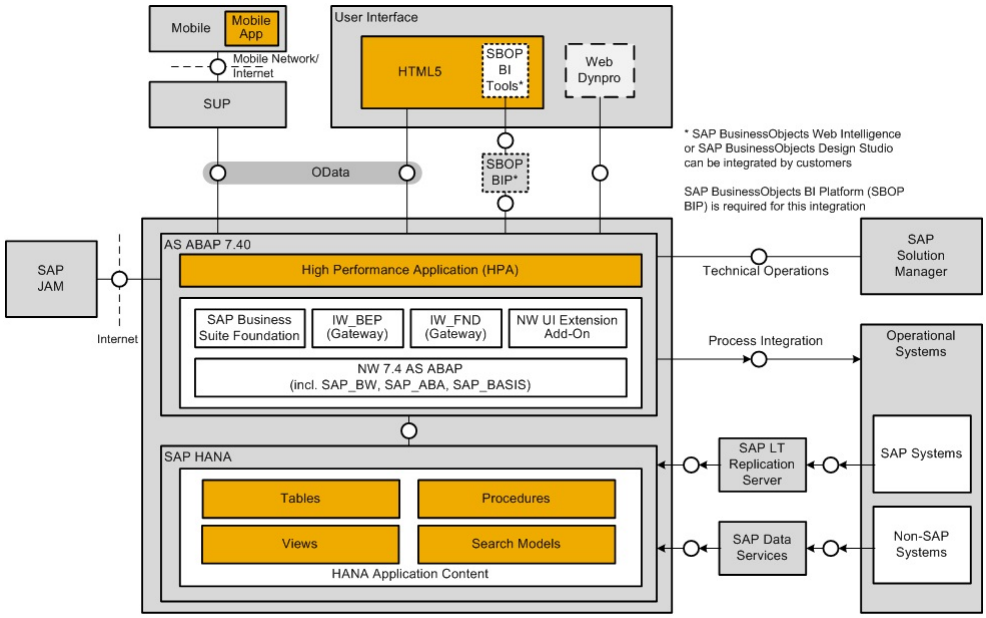


Figure 1.8: Detailed Architectural Roadmap

1.9 Organization of Report

The report is organised into seven chapters which are as follows:

Chapter 1 This section elaborates how the Budget Planning platform features distinctive functions that may greatly assist public sector finance departments with thousands/even millions of bank connections including maintaining transaction signatory info.

Chapter 2 : This section reviews the prerequisites of the aim of the project. The functional and non-functional specifications for the implementation of the Budget Planner are discussed along with the software and hardware requirements.

Chapter 3 : High level diagrams including the UML Class diagram, sequence diagram, architecture diagram, data flow diagram, etc are discussed in chapter 3 to comprehend the flow of information.

Chapter 4 : Its operational specifics, including the norms utilised for code review, are detailed in this section. Furthermore, basic needs as well as solutions would be explained.

Chapter 5 : The validation and verification of the various functionalities of the MBA app are detailed here. Unit testing, Regression testing and Integration testing are elaborated upon.

Chapter 6 and 7 : Chapter six and seven mainly demonstrate the results and elaborate on the analysis obtained hence forth. An ultimate conclusion, along with limitations and future enhancement of the product are also presented.

1.10 Summary

Ultimately, this section illustrates the importance in streamlining financial client relations throughout the worldwide community. The Budget Planner enables consumers to oversee the procedure of creating / consuming funds by providing one-stop management of the lifespan for public sector. This software assists clients in becoming more self-sufficient by lowering overall need on every type of assistance.

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Chapter 2

Requirement specification

CHAPTER 2

REQUIREMENT SPECIFICATION

2.1 Specific Requirements

The feasibility study involves the sequence of actions carried out throughout the criteria analysis stage for creating a detailed report containing the Requirement Specification (SRS). Accuracy of experiments conducted at the current stage remains critical in planning. In a prototype relevant for specified demands, the criteria ought to be flexible and readily transferable. The Specification Document indeed comprehensive description of the program's intended capabilities. It lays the groundwork of future business evaluations. These following sections detail each program's unique needs.

2.1.1 Functional Requirement

A statement that provides insights about what a programme is expected to deliver is called functionalrequirement. The following are the functional requirements of this project

- Budget data from the previous year of the plan year can be used as reference data.
- Copy reference data to the individual FM account assignment.
- Use the commitment and actual data from two years before the plan year.
- Commitment/Actual and Budget in Funds Management.
- Reporting of the transaction data for the budget and the assigned funds.
- Process control can be mapped using the status and tracking system .

2.1.2 Non Functional Requirement

The needs that the software should fulfil but aren't really included over its major contribution are referred to as Non functional Requirements. Certain needs ought to be quantifiable to evaluate performance or progress during any point ofh execution. The Non Functional Requirements are listed below:

- **Agreement** to certain SAP protocols and quality.
- Threshold **performance** achievement.
- Each individual unit must be developed in such a way so as to allow efficient integration amongst one another and ensure **scalability**
- **Maintainable** and **Accessible**.
- **Fault tolerant**.
- **Compliance** to GDPR.

2.1.3 Hardware Requirements

Table 2.1: Hardware Requirements

Processor	Intel Haswell CPU or IBM POWER8 CPU
Hard Disk Partitions (System and Data)	5 GigaBytes, 15 GigaBytes
Drive	Digital Versatile Disk- Read Only Memory
Screen Display	800 x 600 with 16-bit colors or higher
Random Access Memory	128G

2.1.4 Software Requirements

Software requirements that are necessary include-

- Operating System - Windows 7/greater or MacOS 10.12/greater.
- DB : SAP HANA S/4
- Programming Languages : SAP ABAP
- Application Programming Interfaces : SAP NetWeaver Gateway Client and Open data protocol services.
- ABAP Benchmarking Tool : SAP Benchmarking Tool
- SAP HANA Cloud : SAP HANA Cloud
- SAC : SAP Analytics Cloud

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