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Replacing SAP Portal with SAP Fiori in Application Development

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There were two essential objectives in this thesis. The first objective was to explore the replacement of SAP portal and selected SAP applications with SAP Fiori and Fiori applications in the Travel management self-services, and the second objective was to study the Fiori software development and develop a custom Fiori application.

This study was conducted in multiple stages. The first stage was to set up a testing for the Portal and Fiori applications used in the travel management process and carefully study and compare them. The next stage was a group testing and interviews. The applications were tested on a specific test group (N=5) formed by Accenture specialists without earlier experience of the Fiori applications. The testing was arranged for one person at a time and it was followed by an interview. The application comparison, testing and a qualitative research method, semi-structured interviews, were used to gather empirical data.

The research process gave a clear picture of the reciprocal ranking of the compared applications. The Fiori applications were ranked as better in the compared functions, but at the same time it had to be noticed that the Fiori applications don't contain all the same functionalities or language translations as the Web Dynpro ABAP applications do. When considering a transition to the Fiori applications, this should be paid attention to as some custom functionalities or language translations might be required.

A significant part of the study was also the process of getting to know Fiori's application development and development tools, and developing a custom Fiori/SAPUI5 test application named SAP Office Inbox Viewer. This application can be used to view and process messages from the SAP Office inbox.

The outcomes of this thesis are an analysis of the pros and cons of the SAP Portal self-service Web Dynpro ABAP applications and the Fiori applications (Travel management), a demo incorporating Fiori launchpad with selected applications, a custom Fiori/SAPUI5 application and a description of the required development steps, and recommendations for the future.

Keywords	Application comparison, custom application development, SAP Fiori, SAP Portal, Travel management system

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List of Abbreviations

ABAP	Advanced Business Application Programming, programming language for programming SAP Application server.
API	Application Programming Interface, enables communication between applications
CE	Concurrent Employment, situation when an employee has one or more parallel employments locating in the different positions in the company's organization
ERP	Enterprise Resource Planning
ESS	Employee Self-Service
HCM	Human Capital Management
IDE	Integrated Development Environment
Mobile First	The software design principle where the mobile use is prioritized over desktop in the application or website development
MRP	Material Requirements Planning
MRP II	Manufacturing Resources Planning
MSS	Manager Self-Service
SaaS	Software as a Service, the software is purchased as a service from the multi-tenant environment hosted by a vendor instead of purchasing a license and installing the software
SAP Fiori	SAP's application design principle and technology for modern web & mobile applications
SAP ITS	SAP Internet Transaction Server
SAP Note	SAP provides instructions, corrections and solutions for the products as notes. The corrections to the programs are usually provided in the format which can be imported to the system using the transaction SNOTE
SAP NW	SAP NetWeaver
SAP NWBC	SAP NetWeaver Business Client
SAPUI5	SAP's UI Development toolkit for HTML5
WDA	Web Dynpro for ABAP. Technology for developing the Web applications in the ABAP environments published by SAP SE
WDJ	Web Dynpro for Java. Java-based technology for developing Web applications published by SAP SE in 2003

1 Introduction

Technologies in the IT Sector are constantly evolving. Transformation from the traditional big screen PC workstations to the touch screen mobile devices such as tables and smart phones requires smooth and versatile use of IT systems in the variety of different devices. This sets more requirements also for the user interface technologies.

There are numerous items of the Enterprise resource planning (ERP) software used by companies worldwide. According to Gartner SAP AG is the ERP software market leader in 2017. Behind the SAP AG there are other big players e.g. Oracle and Microsoft (1). This study concentrates on the SAP ERP system, more precisely on the SAP Enterprise Portal (later Portal) and Employee self-services and the Trips and Expenses part (Web Dynpro ABAP applications) of it as well as on the SAP Fiori and Fiori Travel management applications.

SAP AG is following evolution and the user interface technology of the SAP systems is renewed from time to time. SAP Fiori is the newest UI/UX technology of SAP AG which is designed to be used also on the mobile devices (2). Compared to SAP Portal the SAP Fiori is more scalable and smoother especially when it comes to these nowadays vital mobile features. SAP AG invests greatly in the Fiori technology and therefore it is important to gain knowledge and understanding of it for the future use and projects.

This thesis was made for Accenture which is a global company providing services in strategy, consulting, digital and technology operations across more than 40 industries. SAP technology is a significant part of Accenture's business.

Over the time SAP AG (later SAP) has developed applications for its ERP system using various technologies. These applications are used in the companies all around the world to support their business functions. Fiori is SAP's new award-winning user experience (UX). SAP's plan is to deliver Fiori across the SAP solutions. In 2013 when SAP released Fiori there were 25 Fiori applications. In December 2016 there were already 1139 Fiori applications (2).

The main objective of this study is to answer the following question: why to change the Travel management's applications from the Portal self-service Web Dynpro applications

to the Fiori applications? This is done by exploring the SAP Fiori application replacements for the Travel management's SAP standard web-based applications (Web Dynpro Java/ABAP). This and the topic scope are opened up in more detail in the next chapter. The secondary objective is to study Fiori software development by creating a simple custom application by using one of the Fiori development tools. The goal of the study is to answer to the above-mentioned question of why to do this transition from the Web Dynpro applications to the Fiori applications and in this way ponder how the lives of the user and the support person will be different after the change. No previous studies were found to be published on this specific subject.

The main contributions of this thesis are the pros and cons of SAP Portal Self-services and Fiori applications (Travel management), a demo incorporating Fiori launchpad with selected applications, a custom Fiori/SAPUI5 application and a description of the required development steps and recommendations for the future.

The main objective of this study consists of smaller goals. The first goal is to identify the Fiori replacements for the applications used in the Portal Self-services (Trips and Expenses) and explore the needed procedures to take these Fiori applications in use. The next goal is to prepare Portal and Fiori test environments where to compare the Portal Self-services and Web Dynpro ABAP (WDA) applications to the Fiori launchpad and applications. The final goal is to examine the pros and cons of both systems through the applications used in the Travel management process.

Since the SAP ERP system is massive and supports several technologies in parallel, this study concentrates on the applications used in the Trips and Expenses part of the Employee self-services (ESS) and the Fiori applications for the Travel management in the on-premise system.

Instead of a real-life project with the real customer business configurations and customizations, this study is based on the testing and comparison of two separate Accenture's sandbox/demo SAP environments which have fairly standard configuration. The systems used are one older system (SAP R/3 ERP 6.0 EHP5 & SAP NW 7.02) including SAP Enterprise Portal and one newer (SAP S/4HANA 1610 SP01 & SAP NW 7.51 SP01 & SAP NW Gateway 7.5) including SAP Fiori 2.0.

The study was conducted in several phases including knowledge build-up (Portal & Fiori), preparation of three separate test and development environments, Portal and Fiori application comparison, creation of travel request and travel expense reports using Web Dynpro and Fiori application by a test group (N=5), an interview survey for the test group, and developing a custom Fiori/SAPUI5 application.

The references of this project are web-based sources and literature. The web-based sources are mostly product documentation published by SAP or SAP user community. The literature consists mainly of different SAP configuration, programming and implementation manuals.

The methods and research process of this study are presented in more detail in the chapter 5.

2 Enterprise Resource Planning

Enterprise resource planning means a massive enterprise-wide architecture the purpose of which is to integrate core business functions and processes and the information produced in them from all the functional areas of the organization in one place. This integration enables efficient workflows as well as an access to and distribution of the information throughout the organization's business functions and departments. (3)

The evolution of the ERP systems begins from the 1960s when organizations used the Inventory control packages (IC) to automate inventory control systems. In the 1970s Material requirements planning (MRP) systems were developed for planning the component requirements to produce the product on the planned schedule. The development continued in the 1970s and lead to the introduction of the Manufacturing resources planning (MRP II) systems. The MRP II system strives to optimize manufacturing process by giving an opportunity to also plan other than material aspects, such as finance and human resources, with the actual production. In addition to the material management the MRP II system contains functions for shop floor and distribution management, project management, finance, human resources and engineering. The first Enterprise resource planning systems were released in the late 80s. These ERP systems integrated manufacturing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, and transportation functionali-

ties. From the 90s the software houses have added more functionalities to the ERP product features such as Advanced planning and scheduling (APS), Customer relationship management (CRM) and Supply chain management (SCM). (4)

ERP systems provide various types of business statistics and information for the decision making. An ideal ERP system hooks up core processes from the manufacturing, finance, human resources, supply chain management, projects and customer relationship management together in one central database repository and computing platform. (3)

The ERP systems usually include self-service capabilities which enable the user to execute routine tasks such as fetch and maintain information through internet or intranet using browser-based software 24/7. (5)

Employee's personal work-related services are called Employee self-service (ESS). Employee self-service provides services which enable the employee to view pay stubs and leave entitlements; report working hours, leaves and expenses; perform business travel management tasks; modify his/her own information such as addresses and bank account numbers, shop and manage enrollments and retirement and benefit program related tasks. Employee self-service benefits the organization by providing better data quality, decreasing the HR administrator workload, making the employees feel more connected to the organization and giving them more autonomy to manage their personal tasks and information. However, preparing and encouraging the employees to use the service can take resources and time. From the technical point of view if services are established using multiple software vendors the service the integration can be challenging due to the different data formats and login procedures and the future upgrades need tough decisions such as selection of used service platforms and software vendors. (5)

In the following subchapters 2.1 - 2.5 we will look at the SAP ERP and its submodules, and then in the chapters 3 and 4 proceed to look at the Portal and Fiori which have a central role in this study.

2.1 SAP Enterprise Resource Planning

SAP ERP is an ERP system developed by multinational enterprise software company SAP SE founded in Weinheim, Germany 1972 headquarter located in Walldorf, Germany. The first enterprise resource planning software of SAP called R / 1 was released

in 1973. SAP ERP is a comprehensive item of software and consists of various modules/components (Table 1). (6)

Human Capital Management (HCM)	Plant Maintenance (PM)
Production Planning (PP)	Financial Accounting (FI)
Materials Management (MM)	Quality Management (QM)
Project System (PS)	Controlling (CO)
Sales and Distribution (SD)	

Table 1 SAP ERP important functional modules (6)

The SAP Travel management (FI-TV) is a submodule of the Financial Accounting (FI) module. The Travel request and Travel expense reports are created for a Person who belongs e.g. to an organization. Master data of the person is managed in the Human capital management (HCM). The following chapters give a short overview of the (sub)modules which were needed when environments were set up.

2.2 SAP ERP Human Capital Management

Roach C.M.L. writes

> 'Human resource information system (HRIS) may be defined as integrated computer systems designed to execute multiple tasks in regard to the flow of information within organizations as it pertains to its human resources. HRIS have the capacity to manage such data with functionalities around acquisition: storage, analysis, manipulation, retrieval, dissemination, and control.' (7)

SAP ERP HCM module (former SAP HR) consists of Talent management, Workforce deployment, Workforce process management, Workforce planning and Analytics areas (8). The mainstream maintenance of the SAP ERP HCM will end in 2025 (9). SAP has acquired cloud provider companies Fieldglass and SuccessFactors and for the new customers SAP offers the SAP Fieldglass and SAP SuccessFactors products as default solutions for the HCM (10).

SAP's new ERP version is S/4 HANA and currently there is no S/4 HANA version of the SAP HCM. S/4 HANA includes some functions of the SAP HCM Organization management (OM) and Time sheet recording from the SAP HCM Time management (PT) and a connector to the SAP SuccessFactors. The older R/3 version of the SAP HCM can be run with the S/4 HANA as a separate system or as a compatibility pack embedded into S/4 HANA. (11)

In 9 January 2018 SAP announced that they are planning to offer a new SAP ERP HCM based integrated HCM software for S/4 HANA and the software is planned to be available in 2023 and the maintenance for this software latest in 2030 (12).

2.2.1 Organization Management

The basis for the SAP Organization management sub-module (OM) is the organization structure which is presented as an organization plan of the specific company in question. There could be multiple organization plans for the planning purposes but the plan which is set as active presents current valid organization and data, and the structure of this plan is used in the HCM processes and Business workflows. The plan is formed by linking different objects with each other using relationships. Relevant object types for the OM are:

- Organizational Unit (object type O)

  Organizational units form the framework for the structure. It can be thought to act as business area, team or factory.

- Position (object type S)

  Position incorporates the employee to the organization structure. The User (object type US) or the Person (object type P) can be the holder of the position and that assignment can be 100% or less. There can be multiple holders e.g. two with 50% percent each. The Position can be set as 'Head of own organizational unit' when it is used e.g. in the workflows when finding the superior of the employee to approve something.

- Job (object type C)

  The Job can act as a template for the positions including different kind of requirements for qualifications. It can be used for reporting to find out e.g. how many secretaries there are in the company.

- Qualification (object type Q)

  Can be e.g. different skills such as language skills like English and German. They can be used with the Jobs and Positions. When used with the Position requirements the profile for position is created and it can be used when comparing e.g. applicants to the Position.

- Work Center (object type A)

  Indicates the physical location where the work is performed. Can be general (e.g. Finland) or very specific (e.g. workstation 6b).

- Task (Object type T)

  Individual activities (such as programming) which can be used to describe a Job or Position. Tasks are created as single tasks or task groups which represent the tasks normally executed together.
  (8 pp. 35-65)

The organization plan and thus the organization structure is formed using relationships between different objects. Figure 1 below describes the different relationships between objects.

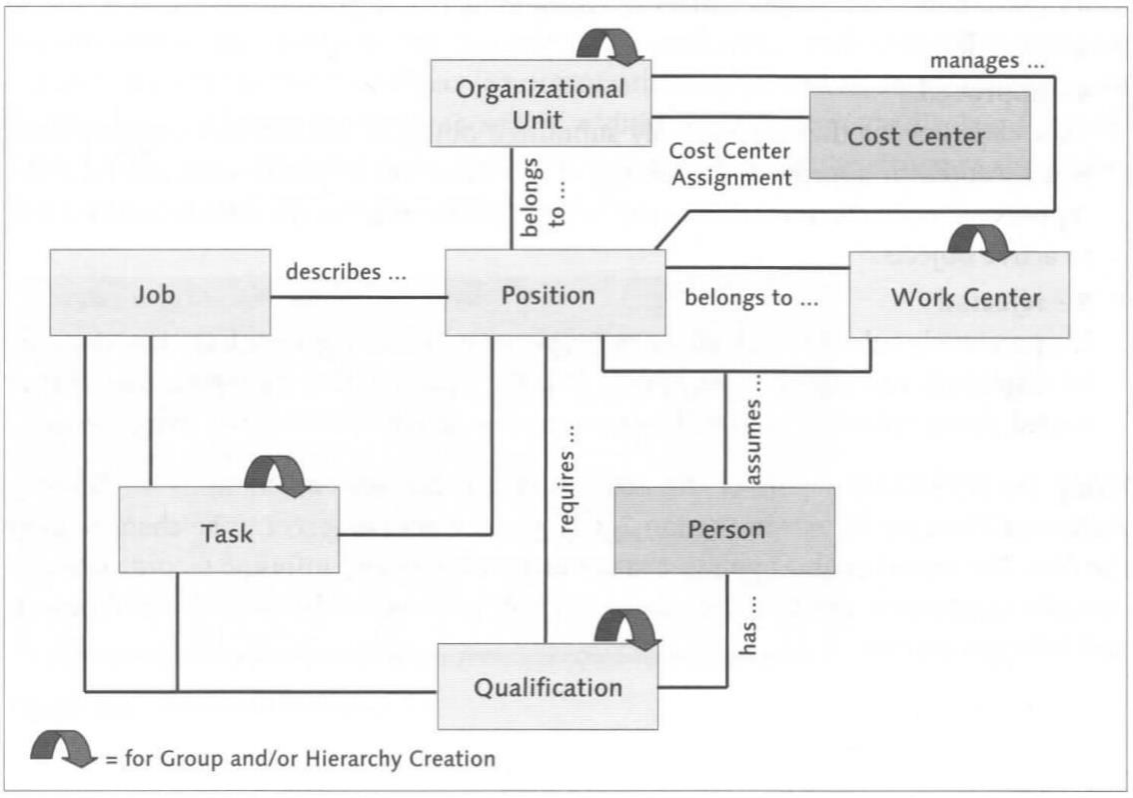


Figure 1 OM objects and relationships between them (8 p. 45)

The relationships are saved using the infotype ‘1001 Relationships’ where one record determines the relationship between two objects. Figure 2 below presents an example of how the relation between two objects are set in the master data in SAP Organization management.

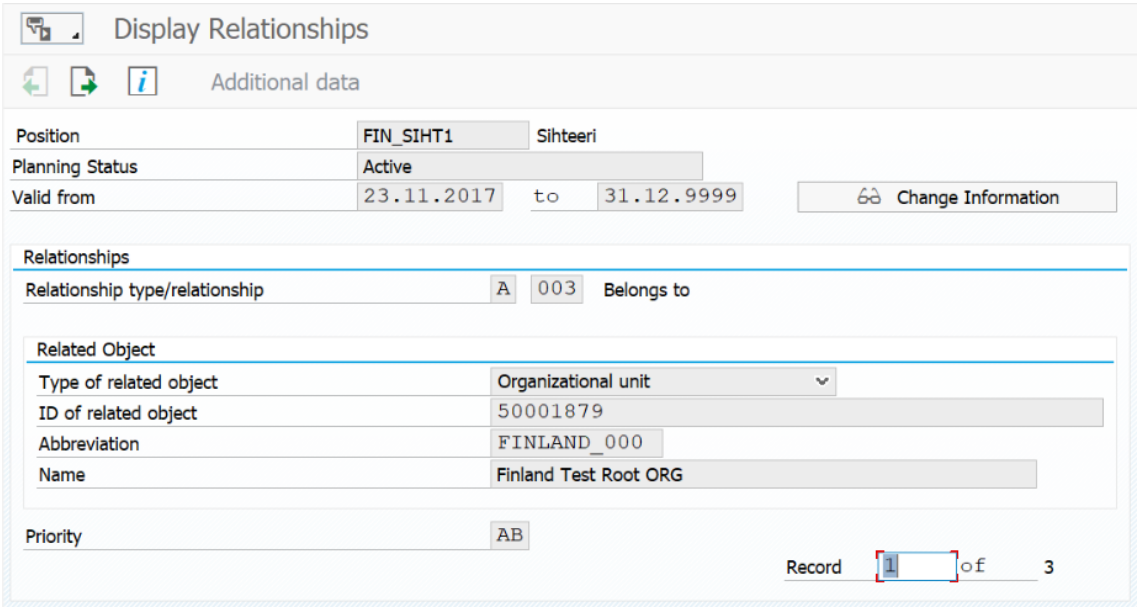


Figure 2 Transaction PP01 Display infotype 1001 Relationships, relationships between Position and Organizational unit

OM uses Evaluation Paths which can be defined as selection criteria. For example the Evaluation Path O-O-S-P displays all the relationships between the Organizational units (O), an Organizational unit and a Position (S) and a Position and a Person (P). This is used e.g. in the Organization and Staffing Display to display plan as a tree like organization structure (Figure 3). All the objects and relationships have a validity period (start and end date) which makes it possible to maintain both the history and the future.

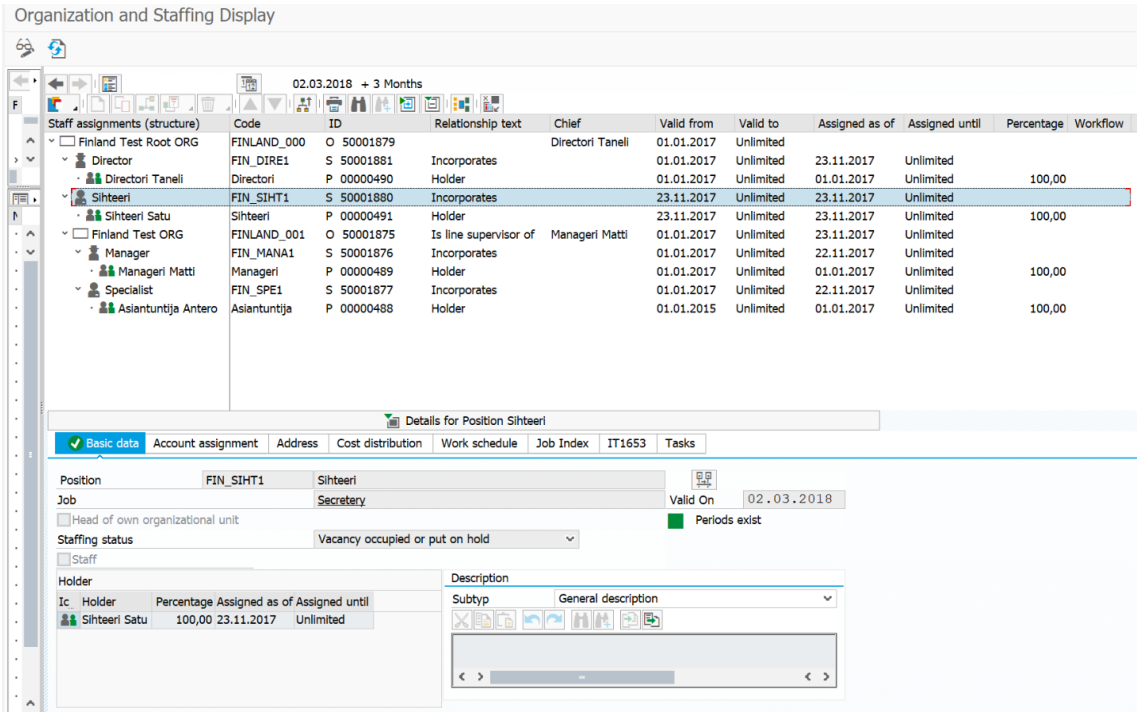


Figure 3 Transaction PPOSE Organization and Staffing Display

Other important infotypes in OM are e.g. ‘1000 Object’ containing object id’s and validity period and ‘1007 Vacancy’ containing information whether the Position is vacant or occupied and about the specific time period in question. Infotypes in the Organization management are marked with a number range 1000-1999. (8 pp. 35-65)

OM data is used in many places and in this case the workflow uses it to determine who is the supervisor of the employee whose Travel request and Travel expense report needs approval.

2.2.2 Personnel Administration

The basis for the Personnel administration (PA-PA later PA) sub-module is the actual personnel data. The personnel master data such as personal information, addresses and the organizational assignment is kept and maintained in the Personnel administration component. This master data is essential for all the HCM processes. (13 pp. 75-77)

The employee’s master data is saved using a unique key called Personnel number (object type P Person). All data records regarding to the employee are saved using employee’s Personnel number. Personnel number is maximum 8 characters long and depending on the configuration it is automatically the next vacant number from the configured number range (internal assignment) or manually entered number value (external assignment). Personnel number is used through the SAP HCM as a unique search criterion for the person. (13)

Master data in PA is saved in form of infotypes. ‘An infotype is combination of professional data that belongs together, e.g. addresses, back details, additional payment, etc.’ (13 p. 92). This means that different sets of this kind of data are collected to the data records and in SAP HCM, they are called infotypes. The infotypes have a 4-digit id and a name, e.g. ‘0006 Addresses’. Typically, every different infotype in the PA has its own table and one line corresponds to one infotype record. Infotype tables in the PA are named PAxxxx where xxxx is the number id of the infotype. Usually there are a lot of data fields to be used for the infotype and the actual fields which are displayed and saved from the infotype maintenance view depend on the configuration. The default set of the used data fields can vary e.g. between country versions. (13)

Some infotypes are divided to subtypes. Subtypes are a group of similar data and have a maximum 4-digit long id and a name: e.g. infotype ‘0006 Addresses’ has subtypes ‘1 Permanent residence’, ‘3 Home address’, ‘4 Emergency address’ etc. Every infotype record also has a start and end date which tell the validity period of the data and in this way give possibilities to keep the data history and make changes that will come into effect in the future. Infotypes in the Personnel Administration are between number range 0000-0999. (13)

SAP uses a concept called transaction code. Transaction codes are used to access programs and features of SAP GUI. Transaction code is like a short alias for an executable program. Figure 4 presents the transaction PA30 which is used for the maintenance of the single infotype records. (13)

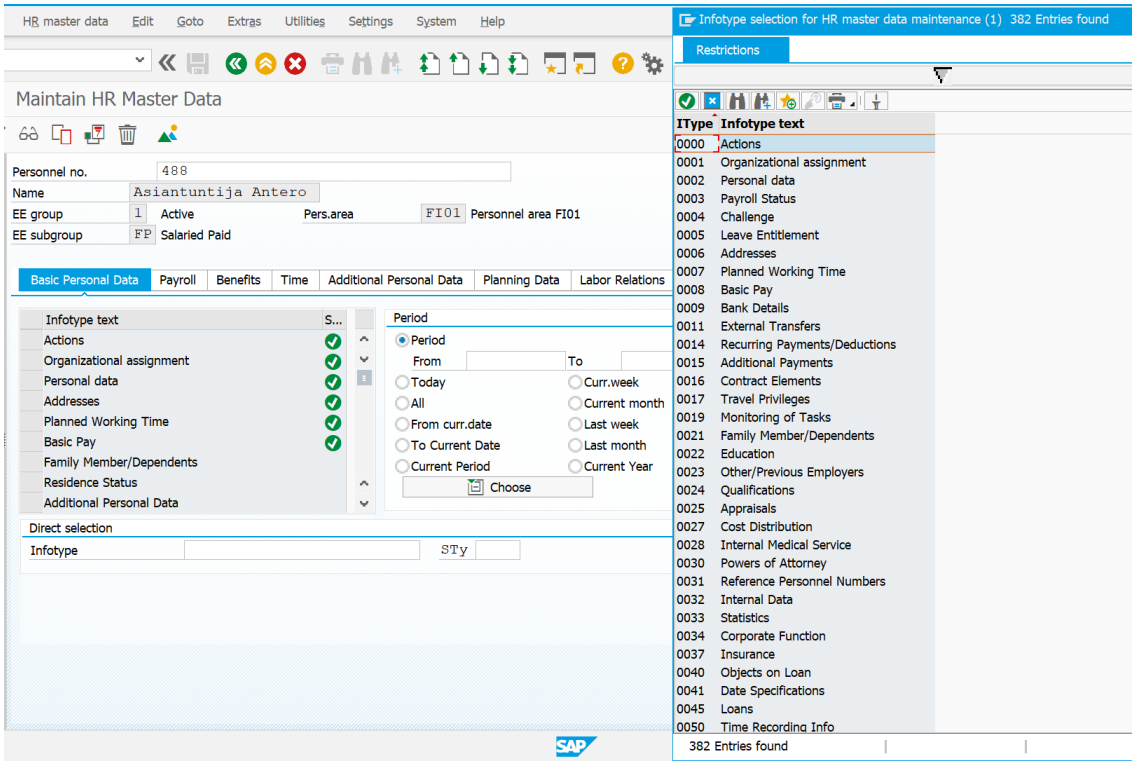


Figure 4: Transaction PA30 Maintain HR Master data, infotype selection screen open

Infotype records can be maintained as a single record at a time or as a sequence of preconfigured infotypes called Actions. There are standard Actions e.g. Hiring, Organization assignment change, Leaving and Retirement. The basic functions when working with infotypes are Create, Copy, Delete, Display, Lock/unlock, Delimit, Change, Overview and List Acquisition. Figure 5 illustrates the maintenance view of a single infotype record called Addresses. (13)

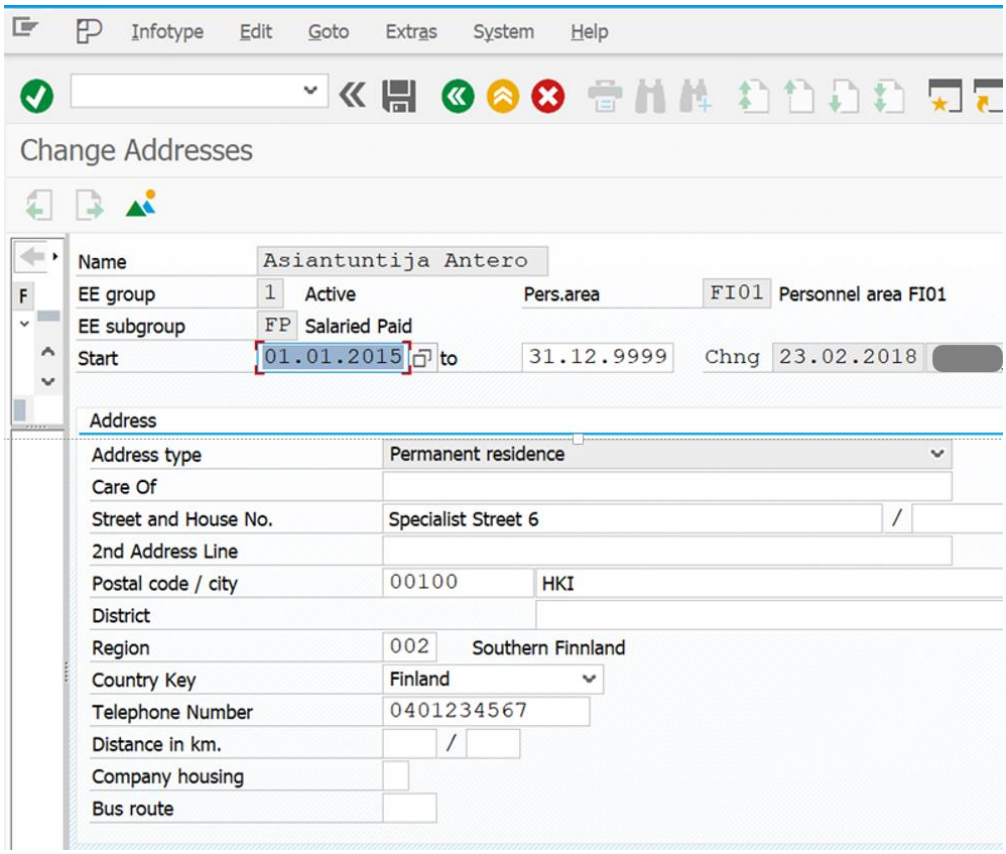
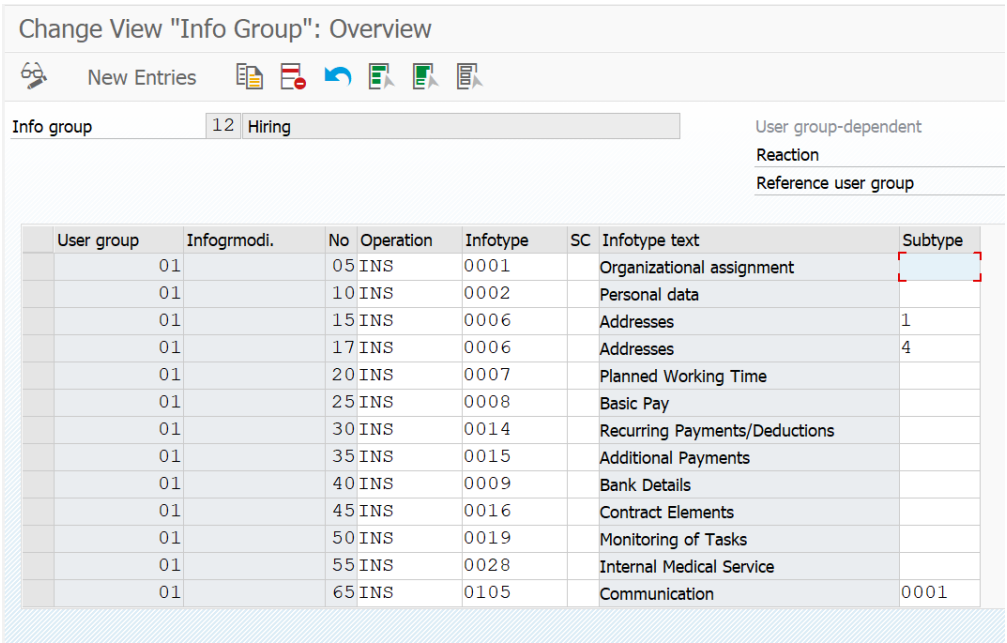


Figure 5: Transaction PA30 Maintain HR Master data, Infotype 0006 Addresses Subtype 1 Permanent residence maintenance screen

Figure 6 below demonstrates how the saved infotype records are configured as a sequence for Action Hiring. All operations are set as insert (INS) since the record of a nonexisting new person is entered into the system when the Hiring action is used.



User group	Infogrmodi.	No	Operation	Infotype	SC	Infotype text	Subtype
01		05	INS	0001		Organizational assignment	
01		10	INS	0002		Personal data	
01		15	INS	0006		Addresses	1
01		17	INS	0006		Addresses	4
01		20	INS	0007		Planned Working Time	
01		25	INS	0008		Basic Pay	
01		30	INS	0014		Recurring Payments/Deductions	
01		35	INS	0015		Additional Payments	
01		40	INS	0009		Bank Details	
01		45	INS	0016		Contract Elements	
01		50	INS	0019		Monitoring of Tasks	
01		55	INS	0028		Internal Medical Service	
01		65	INS	0105		Communication	0001

Figure 6: Example of infotypes configured to be processed during Hiring Action

Personnel Administration (PA) and Organization Management (OM) have the shared infotype 0001 Organizational assignment. If the integration between OM and PA is active when entering the infotype data and giving the position, the data entered in OM is filled to the infotype (organization unit, job, cost center etc.). Figure 7 below illustrates what kind of organizational information the infotype '0001 Organizational assignment' contains.

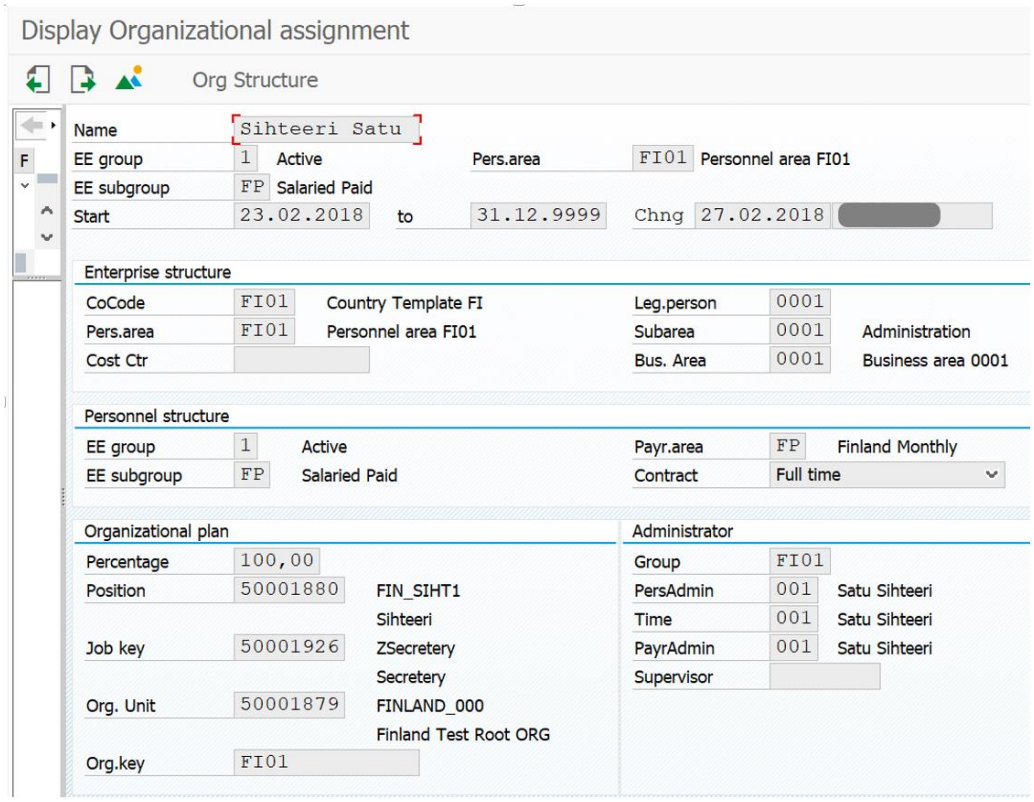


Figure 7 Transaction PA20 Display infotype 0001 Organizational Assignment

Because they contain information of employees and organization the master data of Personnel Administration and Organization Management are the basis for Employee self-services.

In the SAP ERP the user and the person are separate objects. When the user logs in to the system, the infotype '0105 Communication', subtype '0001 System user' is read to determine the person related to the user.

2.3 SAP ERP Travel Management

SAP Travel management (FI-TV) is a sub-module of the Financial Accounting (FI) module. The core function for the Travel management is to support processes related to the business trips through the SAP components Travel request, Travel planning and Travel expense report. Figure 8 below presents the different components and functions of the Travel management. The Travel expense report component can be used individually or together with the Travel request and/or Travel Planning component. (14)

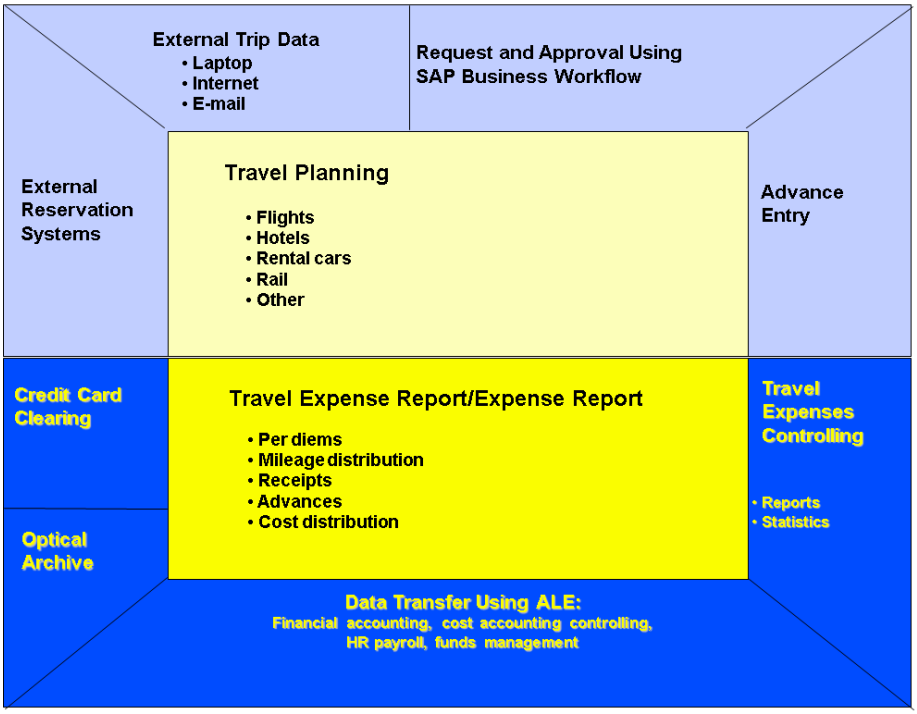


Figure 8 Travel management and integrated functions (14)

Figure 9 demonstrates the process which can be covered using SAP functions of the Travel management. SAP has also built it to cover e.g. the Finnish legal reporting requirements to taxation authority and the new National Income Register (KATRE).

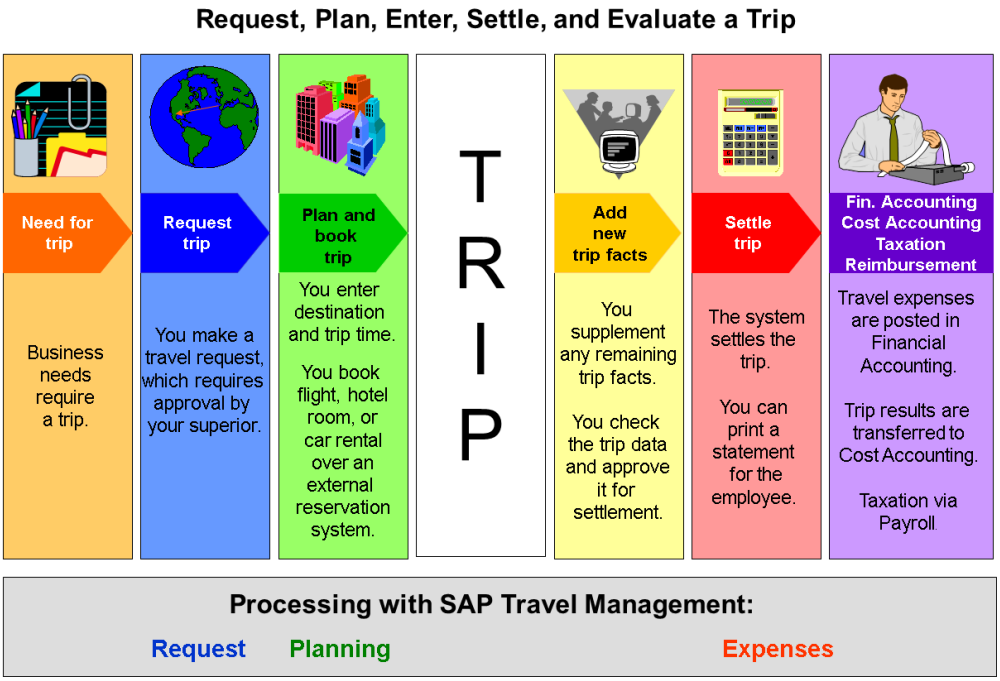


Figure 9 Travel management and processes (14)

It is not always necessary to use all the components, for example when a travel agency offers a web travel reservation system for booking flights and hotels as their service for organization. In that case the organization may just want to use the Travel request and Travel expense report components, when the possible process is that the traveling employee creates the Travel request with the trip details, approximated costs and possible travel advance. After the creation is completed the workflow starts and the approval task is created for the superior. After the superior approves the request, the traveler can book the trip on the travel agency's web reservation system using the corporate credit card and if there is a travel advance the information on it is posted to the accounting function and the advance is paid for the traveler. During the trip or after the traveler returns, he/she creates the Travel expense report which uses the information from the Travel request as a basis. Then the traveler assigns the trip the already imported credit card transactions on the flights, hotels and other possible expenses, and adds the more detailed trip information. Then the Travel expense report is saved and sent for the approval which starts the approval workflow. After the approval the Travel expense report is processed and posted to the accounting, and the expenses are paid for the traveler and for the credit card company.

Travel management has tight integrations to SAP HCM. In the Personnel Administration there is a Travel management specific infotype ‘0017 Travel Privileges’ which is presented in Figure 10. The infotype contains certain default values used for the employee in the Travel management e.g. a default vehicle type for mileages and groupings when a different custom configuration is needed for the different employee groups in the same country. (14)

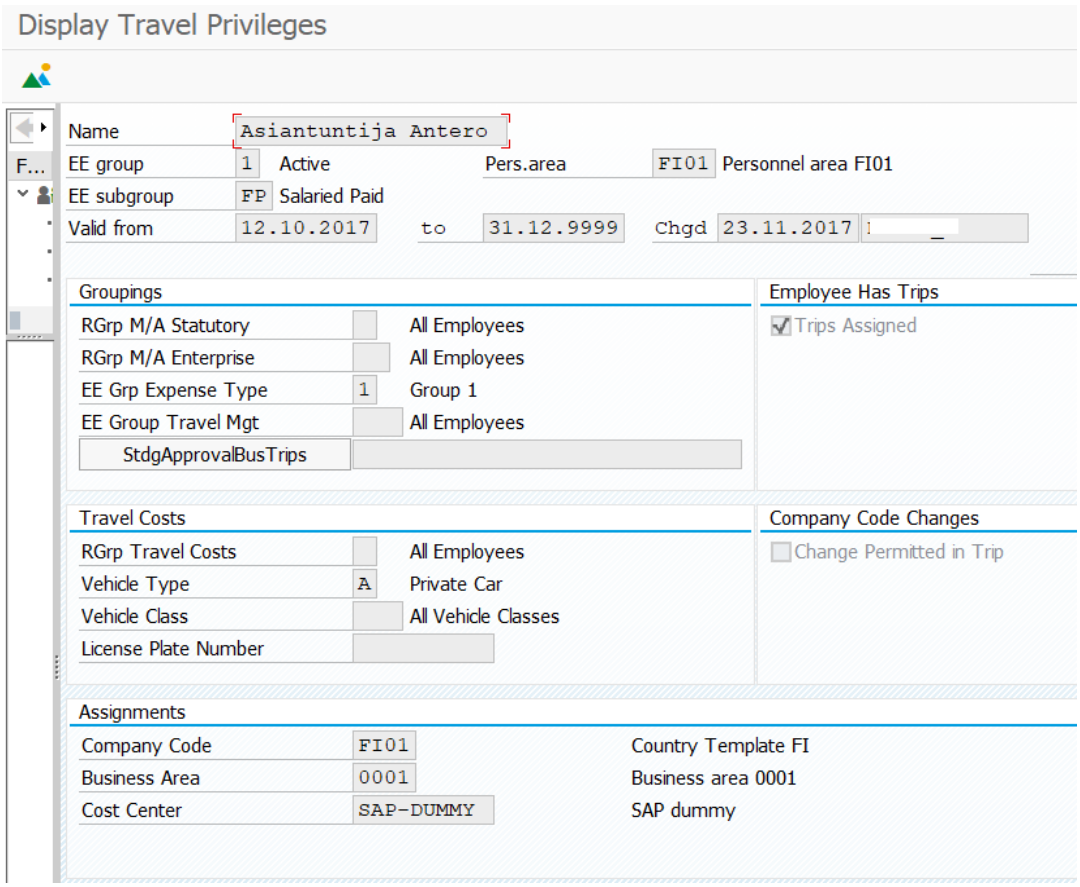


Figure 10 Transaction PA20 infotype 0017 Travel Privileges

SAP provides several different kind of applications in the Travel Management. The applications used in the Portal Self-services and Fiori for the Travel request and Travel expense report creation are the object of interest in this research.

SAP has set the SAP ERP Travel management in maintenance from March 2012 which means that there will be no new development for it except for the Fiori applications. The current SAP default travel management solution for the new customers is SAP Concur. SAP Concur is provided as SaaS (Software as a Service). (10)

2.4 SAP Business Workflow

SAP Business workflow (WF) later workflow enables automation of organizations business processes and procedures such as checking and approving travel expense reports. (15)

The workflow channels tasks and information of the process to the desired users through the organization in the right time and order. The workflow system is versatile and cross-functional over different SAP modules. To fulfill all needs it enables very complex designs. But if simplified to basics workflows are constructed using the following objects. The object (technically business object or class) contains for instance actual business information and methods for processing it. In the Standard task (Object type TS) there is a configuration which determines the method of the business object or class which is executed with the task. Standard tasks can be run in the background or the foreground. The background task can be used to execute activities such as sending emails and changing the document status. Foreground tasks are assigned to the selected agents and displayed in their inboxes. The Agents are users whose job is to execute the actual activity of the task such as approve the leave request or correct the erroneous Travel request. The selection of agents is usually done by workflow rules (object type AC). The workflow rules can use programs to fetch the desired user(s) such as the supervisor of the employee from the company's organization structure or the unit's travel manager from the configured list. Using these objects and the Controlling objects such as Forks and Conditions the workflow is built as a workflow template (object type WS). The workflows are usually started using the Event linkage. When an event such as creating/changing document is raised it creates a new instance of the workflow using linked template for the document. Objects in the workflow have data containers and using the configured data bindings between the containers the desired data is passed from the object to another when the workflow is running forward. (15)

In the standard Travel request approval process, the created Travel request is sent to the superior of the traveling person for approval. The superior can approve, reject or send the request back for correction. This process was used in the empirical part of this study when the test group was testing the Travel management process applications.

Figure 11 below presents the graphic design view of SAP's standard workflow template ('WS20000050 Approve Travel Request') for the Travel request approval. When the user

saves the Travel requests using the save and send option the event ‘Travel Request Created’ is raised and the event triggers a new instance of the Approve Travel request workflow. The workflow system determines the superior using the rule ‘AC00000168’ and creates an Approve Travel request work item (running task instance is called a work item) into superior’s workflow inbox where the superior can process it. If the Travel request is approved its status is changed to approved and the creator of the Travel request will get a message informing of the approved request and the workflow is completed. In case the Travel request is rejected its status is changed to rejected and the workflow is completed. If the Travel request is sent back for correction the Change trip work item is created into the workflow inbox of the Travel request creator. When the Travel expense report is changed the workflow is completed and a new instance is created.

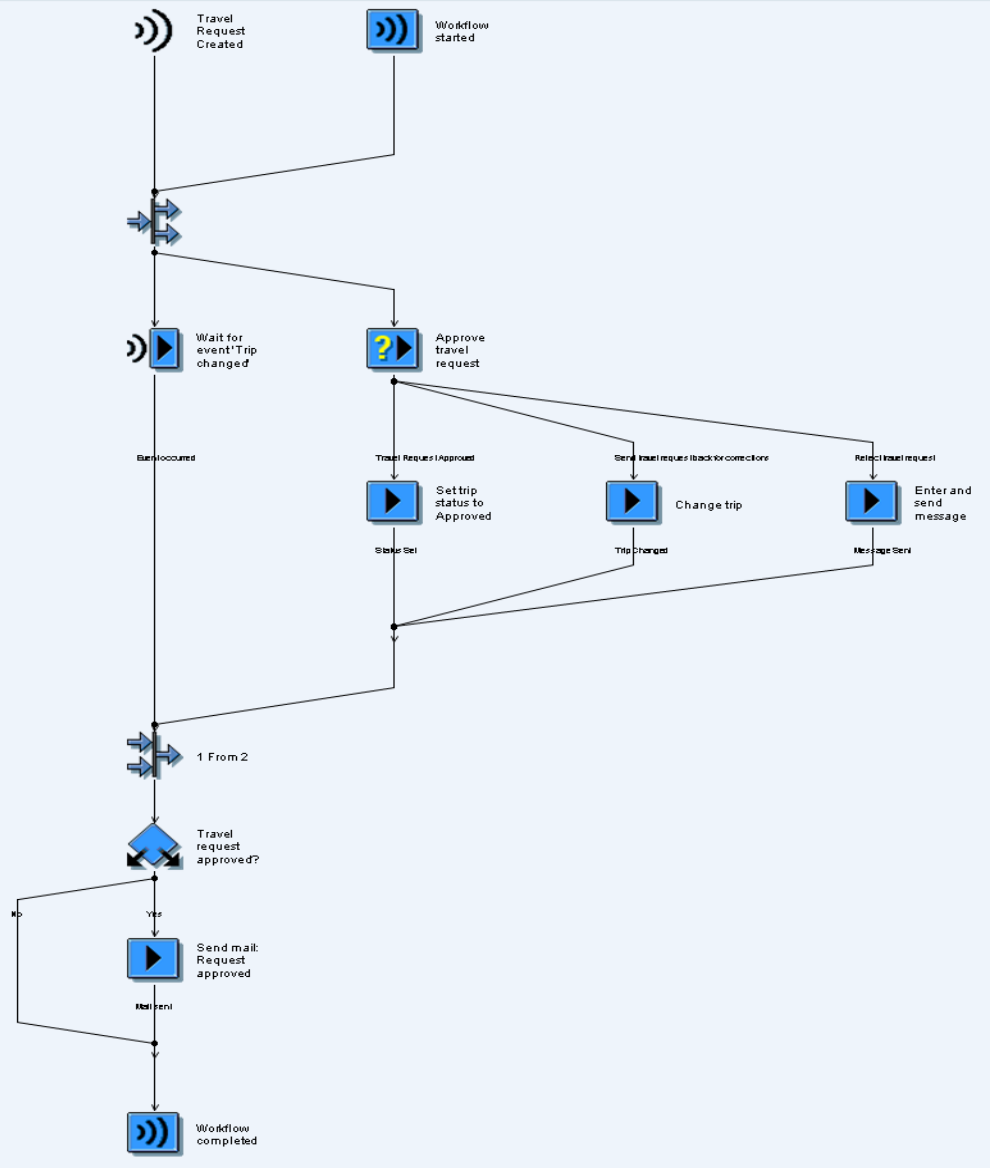


Figure 11 Graphical design view of WS20000050 Approve Travel Request workflow

The user can view and execute work items assigned to him/her from the workflow inbox. It is possible for the user to assign a substitute who can view and execute work items from the user's inbox. The user can also forward tasks from his/her inbox to another user's inbox.

Over the years SAP has released several applications for the processing of the work items from the workflow inbox. The applications are such as the SAP Business workplace for SAP GUI, Universal worklist (UWL) for the SAP Enterprise portal, Business workflow workplace for the SAP NetWeaver Business Client (NWBC), Microsoft Outlook via Duet for the Outlook integration, Lotus Notes via Alloy for the Lotus Notes integration, SAP CRM Inbox for the SAP Customer relation management, SAP SRM Inbox for the SAP Supplier relationship management and Unified Inbox. Figure 12 below represents SAP Business workplace which is a workflow inbox in the SAP GUI. (15)

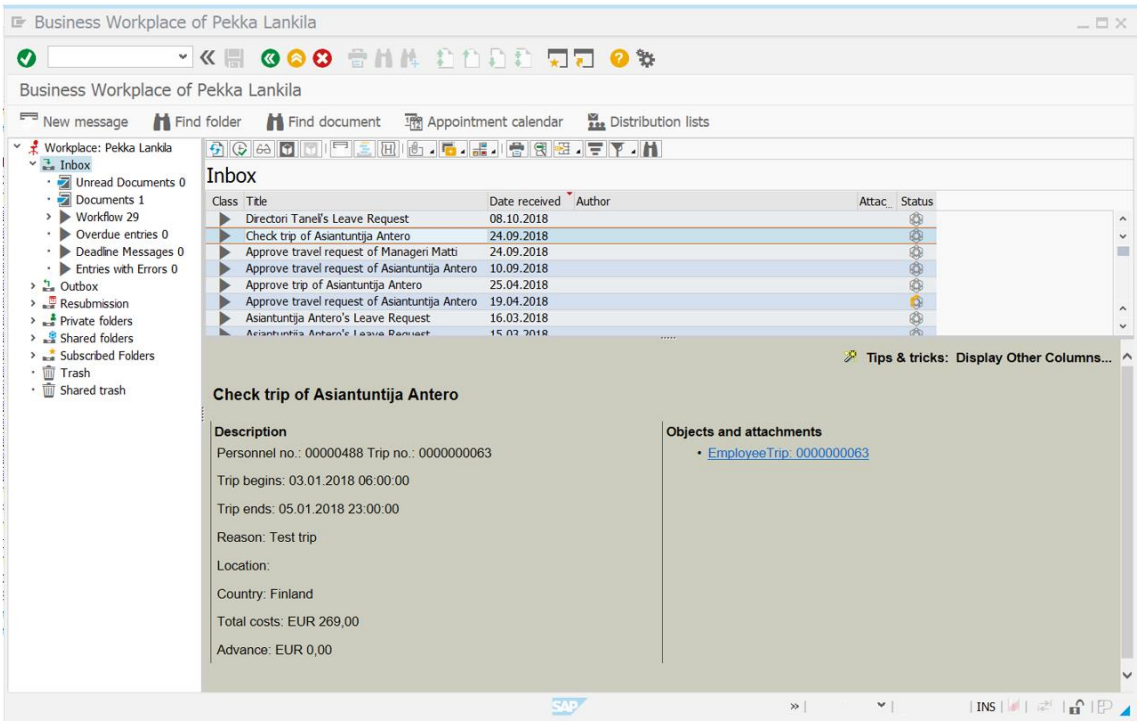


Figure 12 SAP Business workplace for SAP GUI

2.5 Cloud – Default Solutions

To increase the capability to offer better mobility and cloud solutions SAP has acquired many companies which provide cloud-based enterprise solutions. This has also meant changes for the default HR and travel administration solutions offered to the customers

by SAP. Two of these acquired companies, SuccessFactors and Concur, are presented shortly below.

SuccessFactors

SAP acquired SuccessFactors in 2011. SuccessFactors was rebranded as SAP SuccessFactors and is a cloud-based human capital management solution which is nowadays offered as a default solution for the new customer instead of the on-premise SAP ERP HCM solution.

Concur

Concur Technologies was acquired by SAP in 2014. Concur was rebranded as SAP Concur and it is a SaaS solution for the travel and expense management that replaced on-premise SAP Travel management solution as a default solution for the new customer. However, the SAP Travel management is still widely used and will need support and further development for several years.

3 SAP NetWeaver Portal

Enterprise portals in general provide a ‘single point of access’ for the user to start different functionalities integrated by a special web application. According to Chaitanya (16) and Shivakumar (17) the following features are some of the basic services provided by the enterprise portals:

Single sign-on (SSO)
User sign-in to the central system to get access to the information from several different systems without signing in again. SSO between numerous different systems is supported.

Integration
Enables the integrating of the content, data and functions from other systems.

Federation
Possibility to integrate content maintained by and provided in other portals as part of the enterprise portal’s navigation structure.

Customization

Enables the enterprise to modify the look and feel, content and features of the enterprise portal according to their needs.

Personalization

Enables the individual user to modify the look and feel, content and features of the enterprise portal according to his/her needs.

Access control

Allows the limiting of the user's access so that the users only have access to the content and services they are entitled to.

Enterprise search

Enables to search company information.

The following sections introduce the SAP NetWeaver Portal and some features of it.

3.1 Brief Overview & Architecture

SAP NetWeaver Portal is a Web front-end component for the SAP NetWeaver providing a single point of access to SAP and non-SAP systems. From the technical point of view the SAP NetWeaver Portal is a Java Enterprise Edition application running on the SAP Web application server java stack. Figure 13 SAP NetWeaver Portal Architecture Figure 13 sketches the construction of the portal architecture. (18)

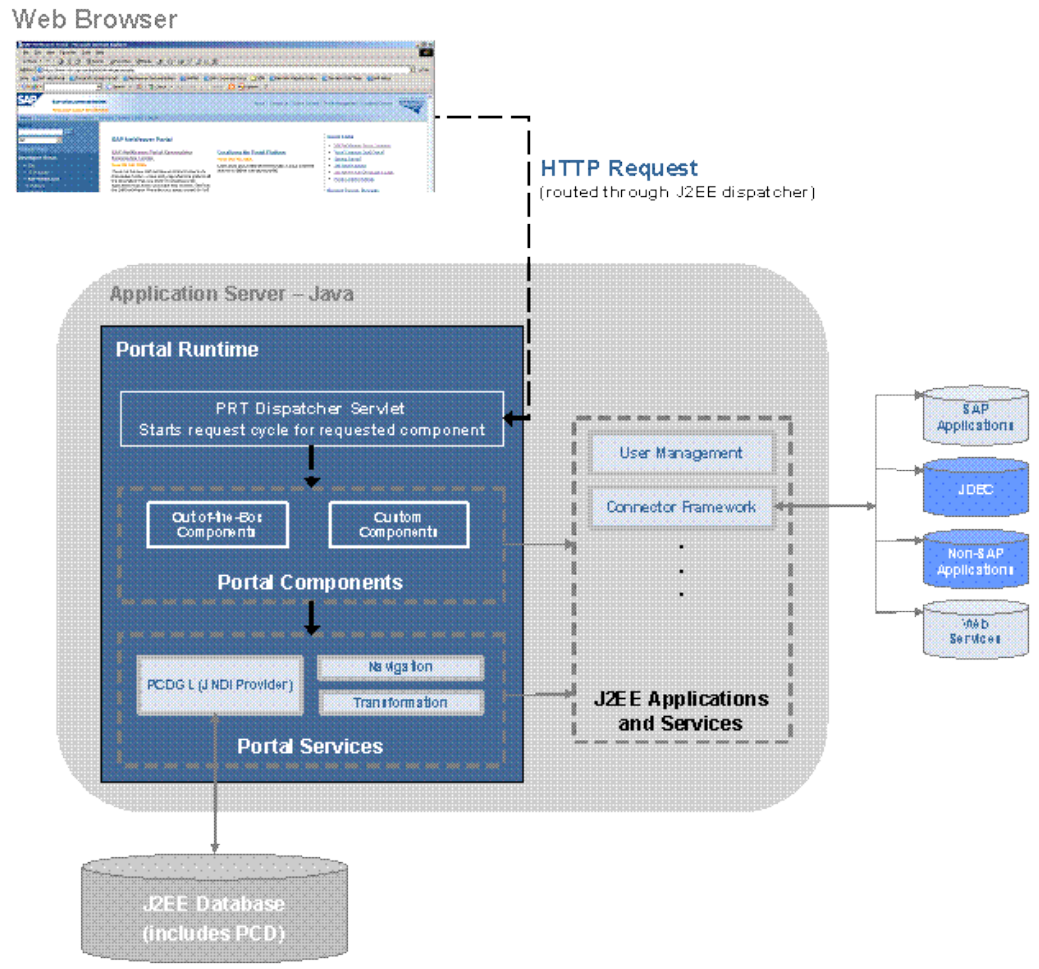


Figure 13 SAP NetWeaver Portal Architecture (18)

In the Portal platform, the Portal framework contains the SAP Web Application Server (AS Java) that runs the portal, as demonstrated in Figure 14. The Portal Runtime (PRT) runs the applications and sends back the produced HTML response to the client. Portal Content Directory (PCD) is the repository for the portal content objects such as pages, roles and iViews. The User management engine (UME) offers the user management services for the AS Java and the applications running on it. UME enables the centralization of the user management by offering a possibility to use the SAP NetWeaver AS for ABAP, the SAP NetWeaver AS for Java or the LDAP directory (e.g. Microsoft Active Directory) as a data source. The LDAP data source connection can be set as read-only when portal's user management only allows creating or modifying users and groups of the local AS Java and prevents creating or modifying the users or groups of the source system in the user management application of the portal. The Storage Recourses contains the database and User persistence store. The Database contains the application server data and portal configurations and PCD objects. The User persistence store is a storage containing the user information (notice UME). (16)

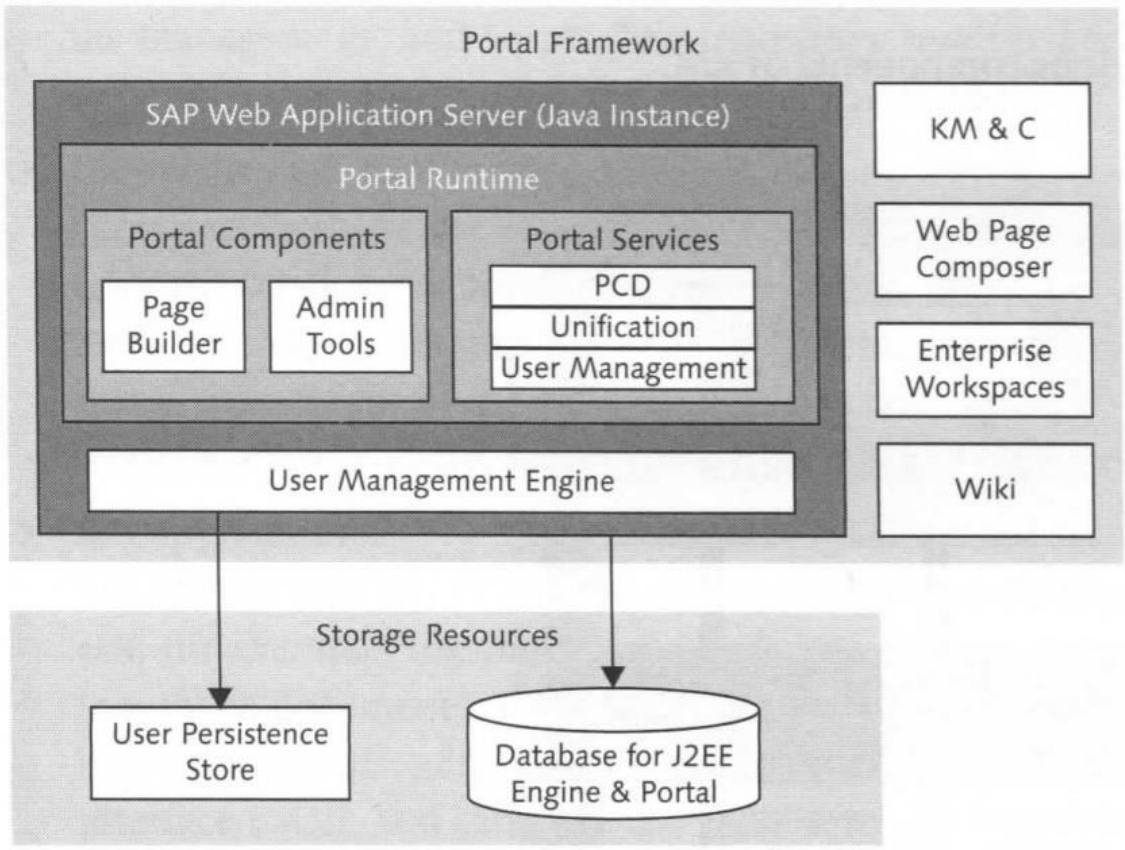


Figure 14 SAP NetWeaver Portal framework (16 p. 13)

The SAP NetWeaver Portal can be integrated with the SAP ERP by configuring connections through the connectors using SSO (logon tickets) to enable the self-services in the portal.

3.2 Employee Self-Services

The idea of the Employee self-services has been to decrease the workload of the HR administrators and increase the data quality by providing a user-friendly browser-based interface for the employee to maintain his or her own personal data. (19)

The first ESS version was released in 1998 and it based on the Internet Transaction Server (ITS) technology. The ITS technology makes it possible to present the ABAP Dynpro application as HTML in the web browser. The ITS version was used in the SAP R/3 in versions 4.6C - 4.7. (20)

The Web Dynpro Java (WDJ) version of the ESS was released with the SAP ERP (ECC) 5.0. The WDJ version bases on the Java technology and can be run only in the SAP

Enterprise Portal. Figure 15 below illustrates the services provided in the WDJ ESS and presents the starting page including the navigation constructed using the SAP HomePage Framework. (20)

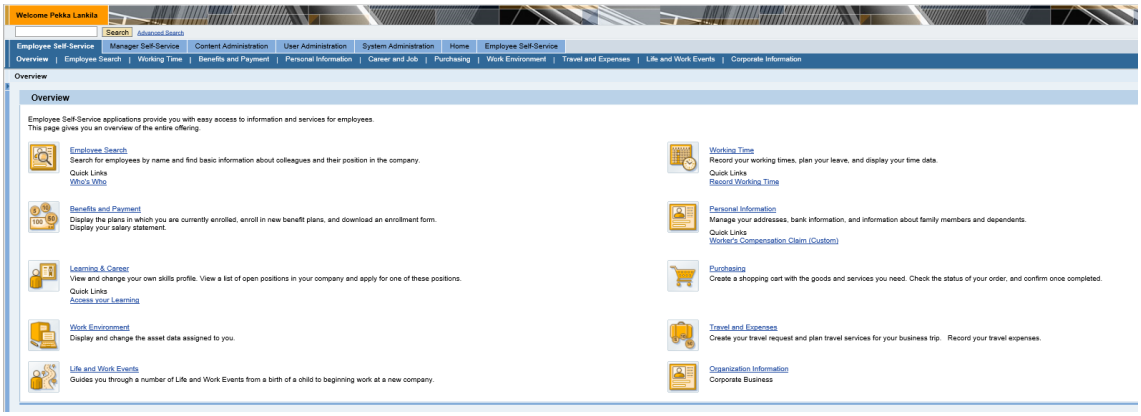


Figure 15 Web Dynpro Java based Employee self-service - Homepage Framework navigation

SAP releases the new features for the SAP ERP 6.0 as enhancement packs (EHP) (20). With the EHP 5 SAP released a Web Dynpro ABAP (WDA) version of ESS. After the EHP6 SAP started to release new features as add-ons. HR Renewal 1.0 was released for the EHP6 and HR Renewal 2.0 for the EHP7. HR Renewal introduced the UI5 applications which are based on the SAPUI5 (as also the Fiori applications do). (19)

4 SAP Fiori

SAP Fiori is SAP's newest user interface (UI) type or user experience (UX) as SAP calls it. The following sections give an overview to Fiori and the used technology.

4.1 Brief Overview & Architecture

The first version, SAP Fiori 1.0, was introduced in 2013 focusing on the 'Mobile First' approach and on providing simple mobile applications for limited tasks instead of the complex all-in-one business applications. (2)

SAP has set five core design principles to ensure that all the Fiori business applications are following SAP's design philosophy for the SAP Fiori UX. These principles are introduced below. (2)

Role-based

Instead of handling all the features for the different roles in the same complex all-in-one business application, there are different Fiori applications for the different roles which are designed to display only the most essential information on each role.

Responsive / Adaptive

Enables the same functionality of the Fiori applications regardless of the used client device or operating system. The Fiori applications work on Windows, Android, IOS and Mac running on different devices such as tables, phones and desktops.

Coherent

The user experience is similar irrespective of the business area, and the applications have a consistent look and feel.

Simple

Instead of integrating the processing of all the tasks in the complex all-in-one business application, Fiori applications have a simple design and are built for simple tasks only.

Delightful

Fiori is designed to make the use of SAP easier by using modern UI technologies to provide interactivity and assistance with high quality visualization and animation.

SAP uses 1-1-3 principle for the Fiori applications Accordingly, every application is only intended for one user/role to execute one task, and the application has maximum three views.

4.2 Technology

Figure 16 illustrates the Fiori architecture. The UI components are located in the ABAP front-end Server (FES). One of these components is the Fiori launchpad which is the entry point for the Fiori applications. The client can be a browser or a native client which is provided for the Windows, IOS and Android platforms. SAP recommends the use of the SAP Web Dispatcher as a reverse proxy and it is required when the analytical and factsheet applications are being used. The reverse proxy server is typically used to forward requests from the internet client to the back-end server located in the internal network of the company. The ABAP back-end Server contains the SAP Business suite,

business logics and the fact sheet application search models. The SAP HANA XS Engine is needed for running the Analytical applications. (2)

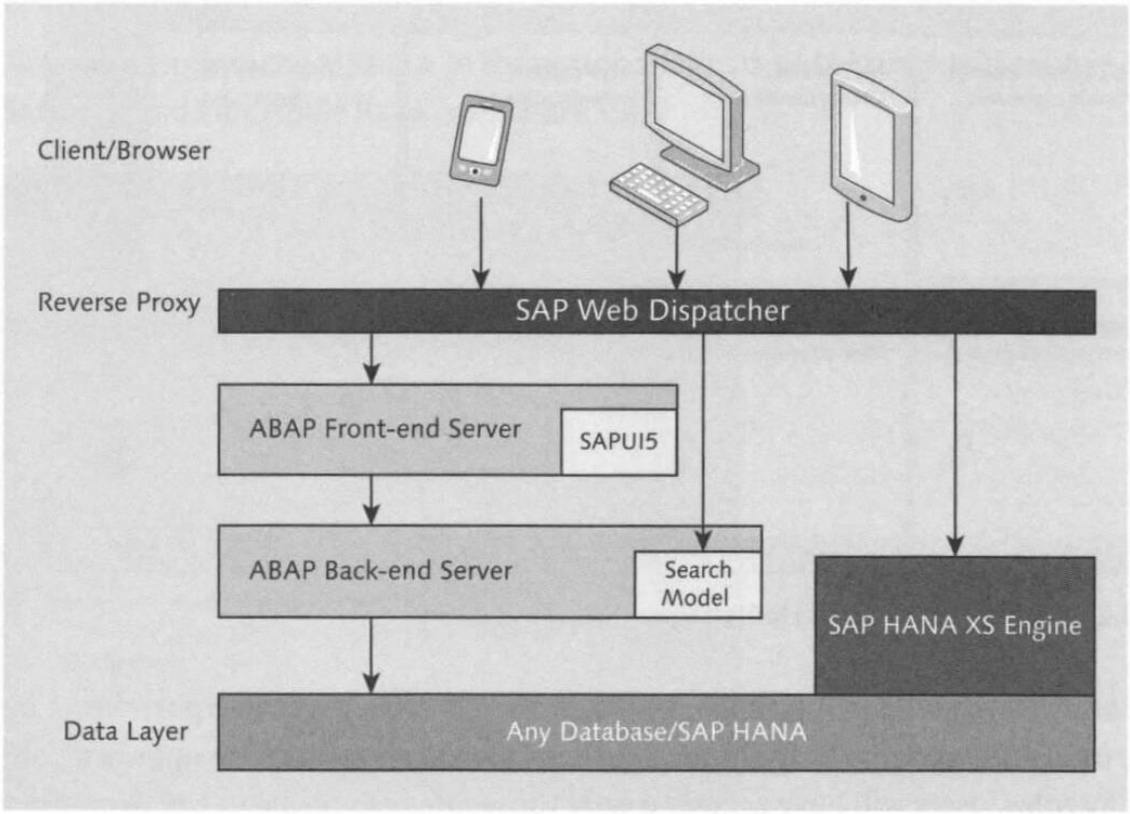


Figure 16 SAP Fiori Architecture (2)

The Fiori architecture deployment options

1. In the SAP Fiori FES Embedded deployment, the SAP Fiori UIs and SAP Gateway are deployed with ABAP back-end server.
2. In the SAP Fiori FES as a hub deployment, the SAP Fiori UIs and SAP Gateway are deployed into the ABAP front-end server and back-end business logics and data are in the ABAP back-end server.
3. In SAP Cloud platform deployment, the SAP Fiori UIs and SAP Gateway are deployed into cloud platform and back-end business logics and data are in the on-premise ABAP back-end server. The connection between the cloud and on-premise systems is done using a cloud connector. (2)

The Fiori applications use back-end business logic and data through OData services. The OData (Open Data Protocol) is a REST-based protocol initially introduced by Microsoft in 2007. It is developed to offer a standardized way to provide and consume API (Application Programming Interface) on the web. (21)

OData is standardized by the OASIS and it is built on existing widely used web technologies such as HTTP, AtomPub, JSON and XML. Among other qualities the OData provides operations for the data retrieval and manipulation which are linked to HTTP methods: GET to retrieve, POST to create, PUT / PATCH to update and DELETE to delete the data. Data can be retrieved in the XML-based Atom format or the JSON format. (22)

The Fiori applications are based on SAPUI5. SAPUI5 is a HTML5-based development toolkit, JavaScript UI control library and a collection of JavaScript libraries that enables developers to develop applications which run on the mobile clients and web browsers on different devices. SAPUI5 is designed to enable the developer to build the high-performance SAP applications which supports the SAP product standards as well as the web development standards such as CSS, OpenAjax, JavaScript and HTML5. (2)

SAPUI5 uses the popular jQuery framework as a basis and the datajs library for the data-centric applications which makes it easier to learn and consume OData services. SAPUI5 uses the Model-View-Controller concept to divide an application into three interconnected parts which isolates the business logic and the UI logic from each other and enables simultaneous development of the different parts. (21)

The Fiori releases are named as waves by SAP. In the first wave SAP released 25 Fiori applications in 29 November 2013. When wave 8 was released in December 2016 there were three different application types and altogether 1139 Fiori applications. (2) These three application types are called Transactional, Fact Sheet and Analytical applications and they are briefly introduced below. (2)

Transactional applications

Transactional applications are used to perform transactional activities. Transactional activities can be example creating, changing or approving. This type of applications can be run on any database. The applications tested in this research belong to the Transactional applications. (2)

Fact Sheet applications

Fact sheet applications are used to provide functions to search, browse or drill down the key information, contextual information and central objects in the business operations. This type of applications require the SAP HANA database. (2)

Analytical Applications

Analytical applications are used to provide insights to the large volume real-time information on the key performance indicators (KPI) and business operations. This type of applications require the SAP HANA database. (2)

SAP maintains up-to-date Fiori application-specific information and implementation instructions in their SAP Fiori apps reference library site.

4.3 Fiori Launchpad

Fiori launchpad is the entry point of all the Fiori applications. The applications are presented as tiles in the launchpad and there are several different tile types which can be used. The Fiori launchpad can launch the Web Dynpro ABAP, SAP GUI for HTML applications to a new browser window or a browser tab, while the SAPUI5 applications can be launched an embed to the Fiori launchpad. (2)

5 Used Methods and Process

As introduced in chapter 1, the goal of this study is to answer the question why to change the selected Web Dynpro ABAP applications to the corresponding Fiori applications. The study will also explore how this change will affect the user experience of the end user and the work of the support person.

As the SAP ERP systems are massive and very expensive, implementing and upgrading these systems are vast projects and require a wide range of different technical and functional SAP specialists. Since this study is a one-man project and only concentrates on a small piece of SAP ERP's software, instead of transforming systems with real customer business configurations and customizations it based on testing and comparison of two already existing sandbox/demo SAP environments used in Accenture. These systems,

an older and a newer one, are available for Accenture's SAP specialists and they have fairly standard configurations. The older system (SAP R/3 ERP 6.0 EHP5 & SAP NW 7.0 EHP 2 & SAP NW portal 7.02) includes the SAP Enterprise Portal and the newer (SAP S/4HANA 1610 SP01 & SAP NW 7.51 SP01 & SAP NW Gateway 7.5) includes SAP Fiori 2.0.

The custom application development was done by using a local light-weight personal development system which was SAP's Developer Edition (SAP NetWeaver Application Server ABAP 7.51 SP02) running on a virtual openSUSE Leap 42.3 Linux server which again is running VMware player software on the Windows 10 workstation.

The study was conducted in several phases. The knowledge build-up was conducted by studying the Portal and the Fiori technology implementation manuals, product documents and blogs from different internet sources, mostly from the official SAP sites. This information was compared to the existing sandbox/demo SAP systems in Accenture and to the locally installed light-weight personal development system.

The selection of the applications used in the Travel management process for creating a Travel request and Travel expense reports was made based on the experience that those applications are used in the companies on a daily basis. And because these applications create documents which need to be processed further, in this case approved by the superiors, also the workflow inbox and the related approval applications were included in the comparison.

To use the sandbox systems for testing and comparison some preparation was needed. Both of the sandbox environments are located in different countries and maintained by different maintenance teams. At first the user ids were requested from the maintenance teams and the right roles and authorizations were sorted out. Then the organizations, persons and other master data for the test persons were created.

Since the systems were not real production servers, also the missing configurations had to be added to be able to use the applications. The preparation phase took much more time than expected as the older system was moved from one environment to another and the self-services were not working because of environment specific configurations. Other users of the sandbox system had tested different functionalities and changed the

standard configurations, and due to that the creation of persons and employee self-service was not possible. The problem with the creation of the test persons was solved by using a different client in the same SAP system for testing.

The comparison of the Portal and Fiori and the selected applications from the sandbox systems (chapter 6) was conducted by using information from the literature and web sources as well as comparing the use and the feel of the Portal, Fiori and these applications with each other.

The testing (chapter 6.1) was arranged for five volunteer Accenture employees. The test persons were selected only from inside Accenture due to the SAP licensing limitations. To get a wider perspective each selected tester was a specialist from a different area. The test included the creation of a Travel request and a Travel expense report with the selected Web Dynpro and Fiori applications. Testing process included qualitative research in the form of an interview where the applications of the both technologies were compared to each other.

In the literature qualitative research is defined as a method targeting to understand the subject using soft information while answering questions 'why', 'how' and 'what kind of'. Qualitative research bases on narrow carefully assembled sample and careful analysis of it without aiming to statistical generalizations. In qualitative research the researcher should use open-ended questions and close-ended yes/no questions should be avoided. (23)

The research survey was arranged as a semi-structured interview which is one method from the field of qualitative research. The semi-structured interview is characterized by the fact that during the interview all the interviewees are asked the same or about the same questions in the same order. With this method it is also possible to check during the interview that the interviewee understands the questions (24). The semi-structured interview is suitable for the situations where there are requirements for the information on the specific issues and, consequently, there is no need to allow a lot of freedom for the interviewee in the interview situation. (25)

The qualitive research method and the semi-structured interview were chosen to collect a wide range of tester’s thoughts and user experiences on the compared applications and their features.

The research questions were sent to the testers beforehand and the actual test was arranged for one tester at a time. The test organizer and the tester went through the test case and research questions before the actual tests. During the testing the organizer observed from the side and was ready to answer any possible questions. The interview recordings were transferred from the dictaphone to the PC and processed using Audacity audio software to reduce noise. After this the recordings were carefully listened to and transcribed. The transcribed material was carefully read, compared to the interview notes, categorized and finally analyzed and summarized.

Coming back to the research goals listed in the chapter 1, the secondary goal of this study was to study Fiori software development by creating one simple custom application by using one of the Fiori development tools. Chapter 7 is dedicated for the Fiori application development. The various possibilities for application development were reviewed. Also, the separate simple instructions on adopting the tools were collected for the colleagues. The chapter explains how a simple SAP Office Inbox Viewer Fiori/SAPUI5 application and the needed OData services for reading and handling the SAP Office mails were created. The resulting application was named SAP Office Inbox Viewer. This application was selected as the development project as it was noticed that, unlike another workflow inbox applications, My Inbox Fiori application doesn't have functionality for reading and deleting SAP Office mails (SAP Note 2520673) nor marking them read or unread.

In the following chapters these processes and outcomes will be looked at and explained in a more detailed level.

6 Fiori vs SAP Portal

In this study, the Fiori and SAP Portal environments are compared to each other mainly from the perspective of the Travel management applications. The following Table 2 lists the available Fiori and Web Dynpro applications of the Travel management. There are only two Fiori applications for processing the Travel request and Travel expense reports. In the Portal Self-services many functions are separated to different applications which is more in line with the 1-1-3 principle used in the Fiori development than in Fiori's own applications. According to the 1-1-3 principle, there should be only one task and one role per one application, but still the company's travel assistant uses the same Fiori application for processing the Travel expense reports both for him/herself and for others. The

Portal Self-services has in turn its own Travel Assistant Work Center application for the travel assistant when processing the Travel expense reports for others.

Fiori strives for the simplicity of use, but not for the simplicity of development if the number of technologies to be mastered is taken into account. When the Web Dynpro ABAP application developer can manage by using built-in programming tools and with ABAP OO and Web Dynpro ABAP skillset, the Fiori application developer needs tools and ABAP to build the back-end OData services for a front-end application, and the HTML5, Java script, SAPUI5, CSS skills and a separate IDE for building the front-end Fiori application. Again, it is possible to make customizations such as change texts and alignments, hide fields, and add links and pictures to the Web Dynpro ABAP application easily by opening the application in the admin mode, and at the same time these kind of changes in the Fiori application are required as software development. But Fiori has in turn other benefits the Portal doesn't have, one very significant advantage being the opportunity to take Fiori in use without any additional license fees.

Feature	Portal Self-Services (Web Dynpro)		Fiori HCM apps
Technique	Web Dynpro Java (WDJ)	Web Dynpro ABAP (WDA)	Fiori (SAPUI5)
Navigation configured using	Home page framework	Object-Based Navigation (Web Dynpro launchpad)	Groups (Fiori launchpad)
Workflow inbox	Universal Worklist (UWL)	POWL Lean Workflow Inbox	My Inbox
Applications presented as	Services	Services	Tiles
Applications for Travel management	All My Trips and Expense (sap.com/ess~tra/AllMyTrips) Assign Credit Card Receipts (sap.com/ess~tra~tre~trs/CCBuffer) Create Travel Request (sap.com/ess~tra~tre/Request) Create Travel Plan (sap.com/ess~tra~trp/Planning) Create Travel Expense Report (sap.com/ess~tra~tre/Expenses) Travel Information from CompanyTIP (sap.com/ess~tra~trx/CompanyTIP) Route Planning (sap.com/ess~tra~trx/Routing) My Travel Profile (sap.com/ess~tra~tri/MyProfile) Personalization (sap.com/mss~per/PersonalizationDialog) Switch to Another Personnel Number (sap.com/ess~tra~tri/ChangePersNo) Unlock Personnel Number (sap.com/ess~tra~trx/UnlockPersNo)	Expense Report (FITE_EXPENSES) Delete Expense Report (FITE_EXPENSES_DELETE) Express Expense Sheet (FITE_EXPRESS_EXPENSES) Travel Request (FITE_REQUEST) Delete Travel Request (FITE_REQUEST_DELETE) Cancel Travel Plan (FITP_PLAN_CANCEL) Travel Plan (FITP_PLANNING) Travel Profile (FITP_PROFILE) Travel Assistant Work Cent (FITV_POWL_ASSISTANT) Personalization (FITV_POWL_PERSONALIZATION) Traveler Work Center (FITV_POWL_TRIPS) Travel Routing (FITV_ROUTING) Display Form (FITV_TRIP_FORM) Unlock Personnel Number (FITV_UNLOCK_PERSNO)	My Travel Requests (FIN_TR_CRE) My Travel and Expenses (TRV_TE_CRE) My Inbox - Approve Travel Requests (CA_FIORI_INBOX integrated) My Inbox - Approve Travel Expenses (CA_FIORI_INBOX integrated)
Can be used without SAP Portal	No	Yes (NWBC)	Yes
Displays information before launching actual application	No	No	Yes (Dynamic Tile)
Easy administrator's WYSIWYG application customization: e.g. changing texts and hiding objects such as fields and buttons	Yes (Portal content management: Start iview in preview mode and press Ctrl - secondary mouse button)	Yes (URL parameter sap-config-mode=X)	No, needs developer skills
Needed Skill set for application development	Java, Web Dynpro Java, ABAP	ABAP OO, Web Dynpro ABAP	HTML5, Java script, SAPUI5, OData, ABAP, CSS
Authorization roles to maintain	Portal role Back-end role	Portal role Back-end role	Front-end role Back-end role

Table 2 Application comparison

6.1 Travel Management Process

This section is devoted to comparing the Travel management process when the Portal self-services and the Fiori applications in the Fiori launchpad are in use. The comparison includes the creation of the Travel request and the Travel expense report together with the approvals. The following main functions are tested and compared:

- Presentation of functions
- General data entry
- Save draft
- Cost assignment
- Per diems for meals reimbursement
- Per diems for accommodation reimbursement
- Mileage reimbursement information
- Calculated compensation values of per diems and mileages
- Receipt expenses
- Using available credit card transactions for creating receipt expenses
- Copy Travel request/Travel expense report
- Delete Travel request/ Travel expense report
- View unassigned credit card transactions

In the Portal's Employee self-services the functions for the Travel management are presented as a list of services which are the links to the actual applications, as illustrated in Figure 17 below.

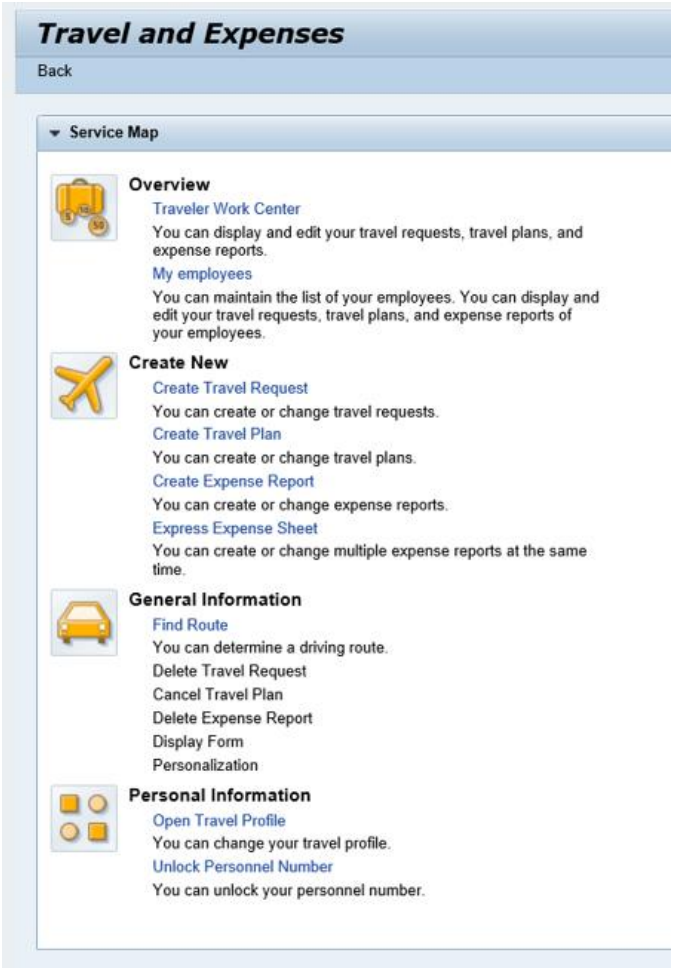


Figure 17 Travel management services - Portal self-services

Unlike Fiori the Portal Self-services provides functionalities also for the travel planning and for the company's travel assistant (later version includes an on-behalf-of functionality for the travel assistant) for creating and modifying the Travel plans, Travel requests and Travel expense reports on behalf of other employees.

Fiori offers only two applications for the employee which are for the creation of the Travel requests and Travel expense reports. Figure 18 below shows how these applications are presented as tiles on the Fiori launchpad. The tiles can display e.g. number of the open items without launching the applications.

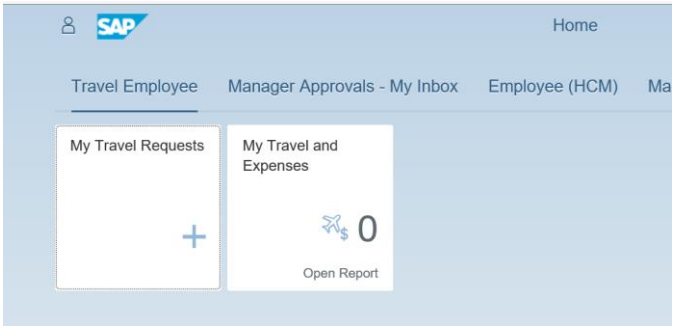


Figure 18 Applications for Travel management - Fiori

In the Portal's Web Dynpro applications the data is collected using the roadmap, steps and substeps and the calculated summary of the collected data is displayed only on the view of the last step before saving. And only the print view of the expense report gives an overview of the all expenses.

Fiori changes the logic of the data collection process when the Travel request or the Travel expense report is created.

In the Fiori applications all collected data is presented as expenses in one main view and collected using the sub and popup screens which return to the main screen. The calculated expense amounts and totals are displayed in the same main view.

6.1.1 Travel Request Functionality

Portal

To view the existing Travel requests in the Portal's Employee self-services they can be listed in the Traveler Work Center application (Figure 19).

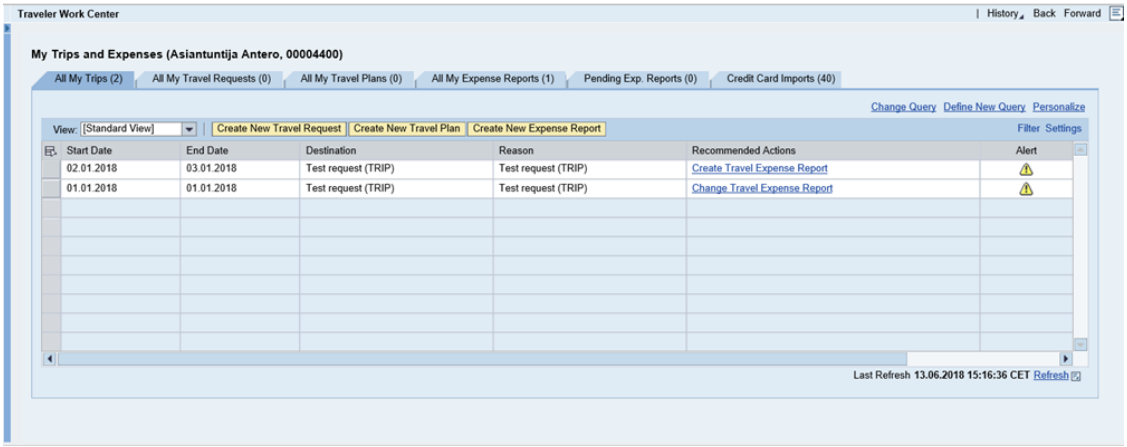


Figure 19 Traveler Work Center - Portal Self-services

This application has functionalities to open a separate application to create a new Travel request or to modify the selected existing Travel request. Figure 20 introduces the 'General Data' view of the application; entering the trip details here is the first step in the process of creating the Travel request.

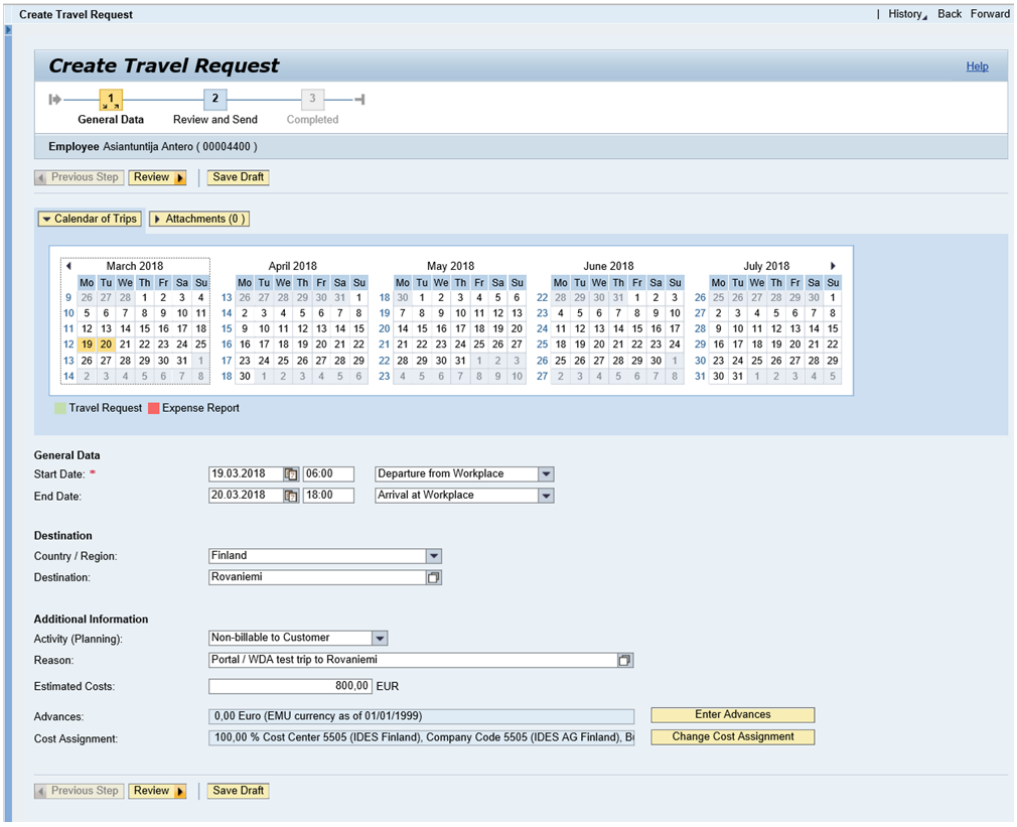


Figure 20 Create Travel Request – General Data - Portal Self-services

In addition to the ‘General Data’ view, the completion of the Travel request in the Portal self-services also requires going through the ‘Review and Send’ and ‘Completed’ views. The views are presented as steps in the roadmap in the header of the screen. The attachments can be included in the Travel request on the Attachment tab. In case there is a need to apply for an advance and/or the need to change the default cost assignment, those functions are opened into separate views displayed as sub-steps into the above-mentioned roadmaps. As Figure 20 and Figure 21 illustrate the user may have to go through five views and one tab when creating a single Travel request in the Portal self-services.

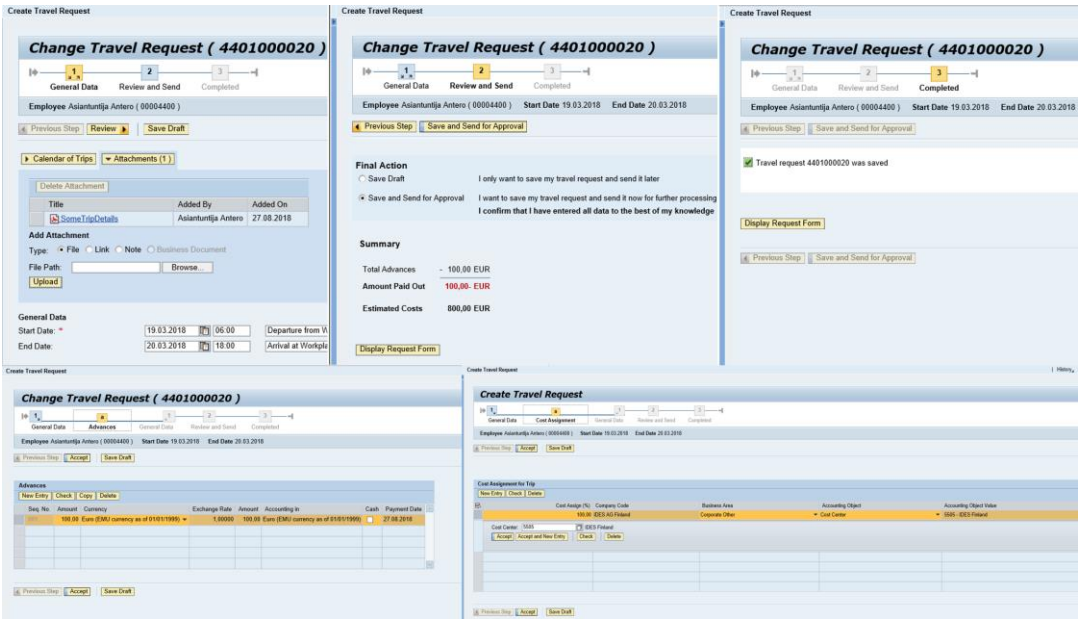


Figure 21 Create Travel Request Steps - Portal Self-services

Fiori

In Fiori creating a new Travel request or modifying and displaying an existing Travel request are done in the same My Travel Request application. The application has one view where all data is entered and displayed. When the Travel request is approved, the approver is also displayed in the same view. (Figure 22)

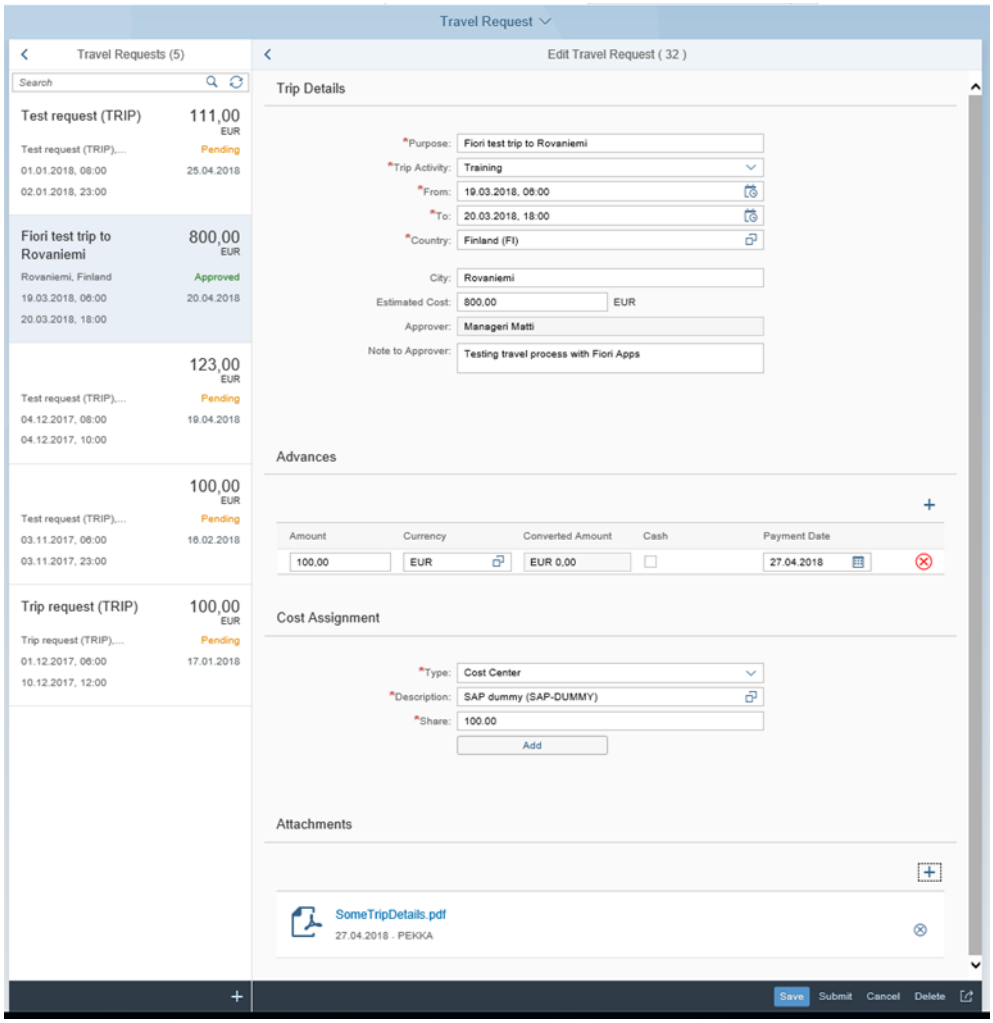


Figure 22 My Travel Requests application - Fiori

6.1.2 Travel Expense Report Functionality

Portal

In the Portal Self-services the existing Travel expense reports can be displayed and modified using the functions of the Traveler Work Center application (Figure 19). The

creation of a single Travel expense report can be started using the Create Travel Expense function from the Work Center application or starting an application from the Service Map (Figure 17). When it is not done using the recommended action in the Traveler Work Center application the creation process starts with the selection view, as illustrated in Figure 23. In this view it is selected will the Travel expense report be created using an already existing Travel request as a basis or is it needed to do from the scratch.

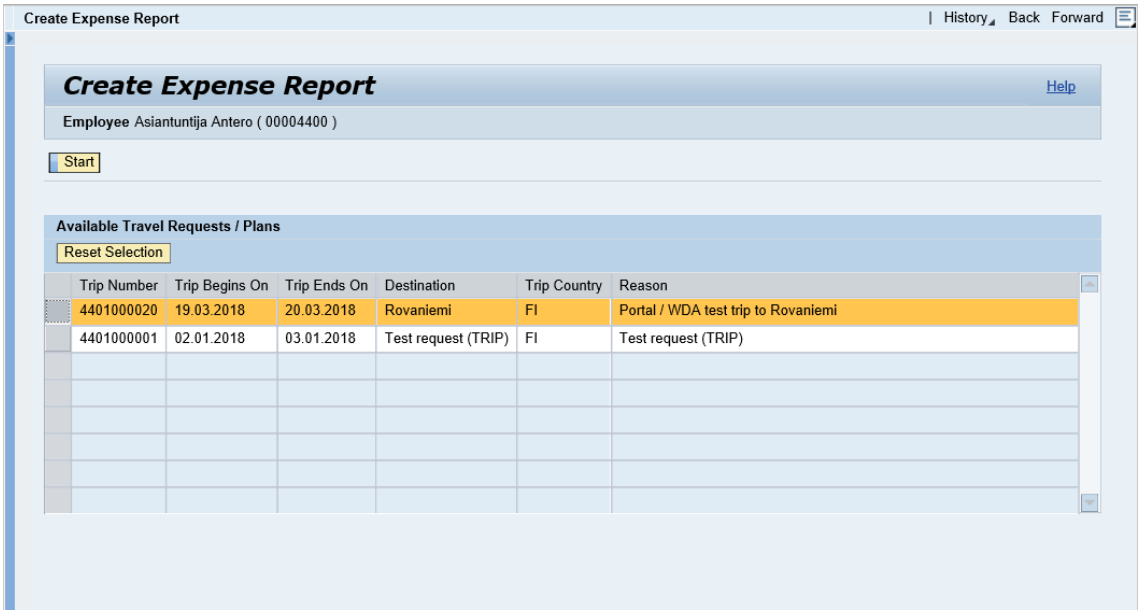


Figure 23 Create Travel Expense Report - Selection View - Portal Self-services

When using an existing Travel request as a basis, the view representing the first step of the creation process of the Travel expense report is opened and the data from the Travel request is used to prefill the trip details, as illustrated in Figure 24. The application has the same attachment functionalities as presented for the Travel request in Figure 20 and Figure 21.

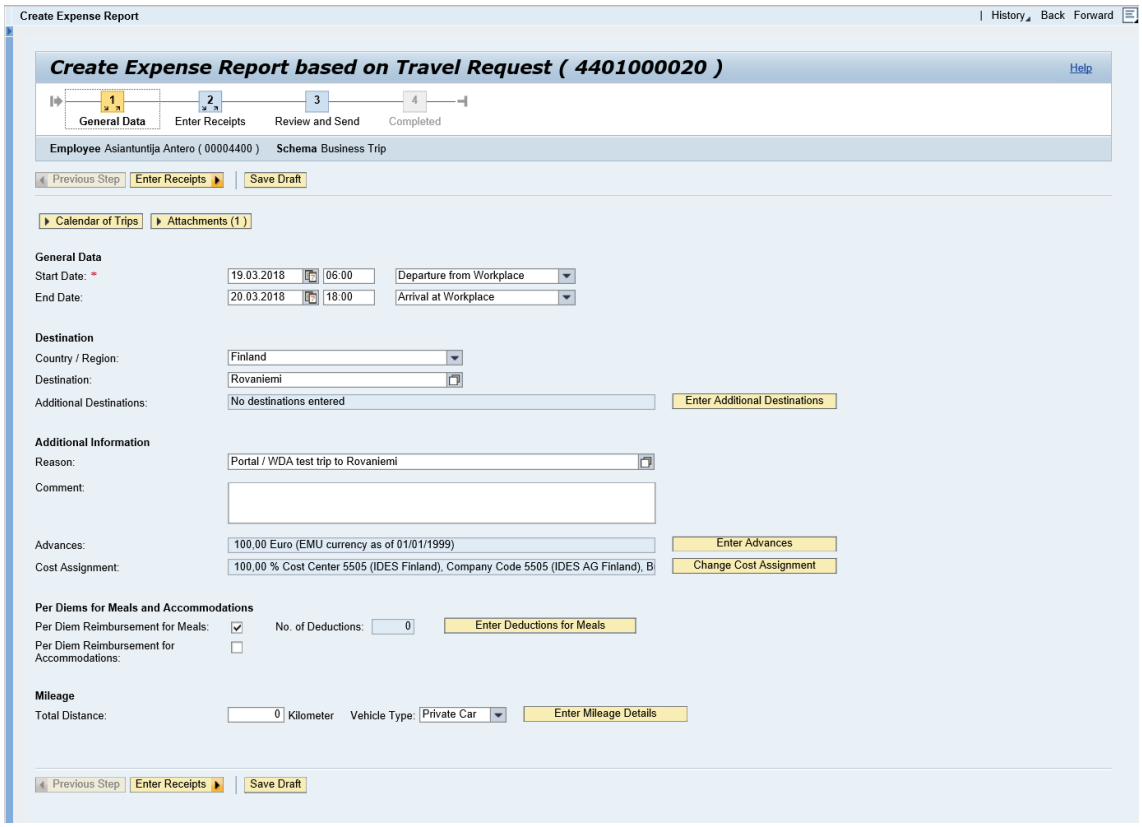


Figure 24 Create Travel Expense Report - General Data - Portal Self-services

For the trips including more than one destination the application provides the ‘Additional Destination’ view with the functions for entering information also for the other destination(s). This information is also taken account when calculation per diems. As illustrated in Figure 25 the view is displayed as a substep for ‘General Data’ step.

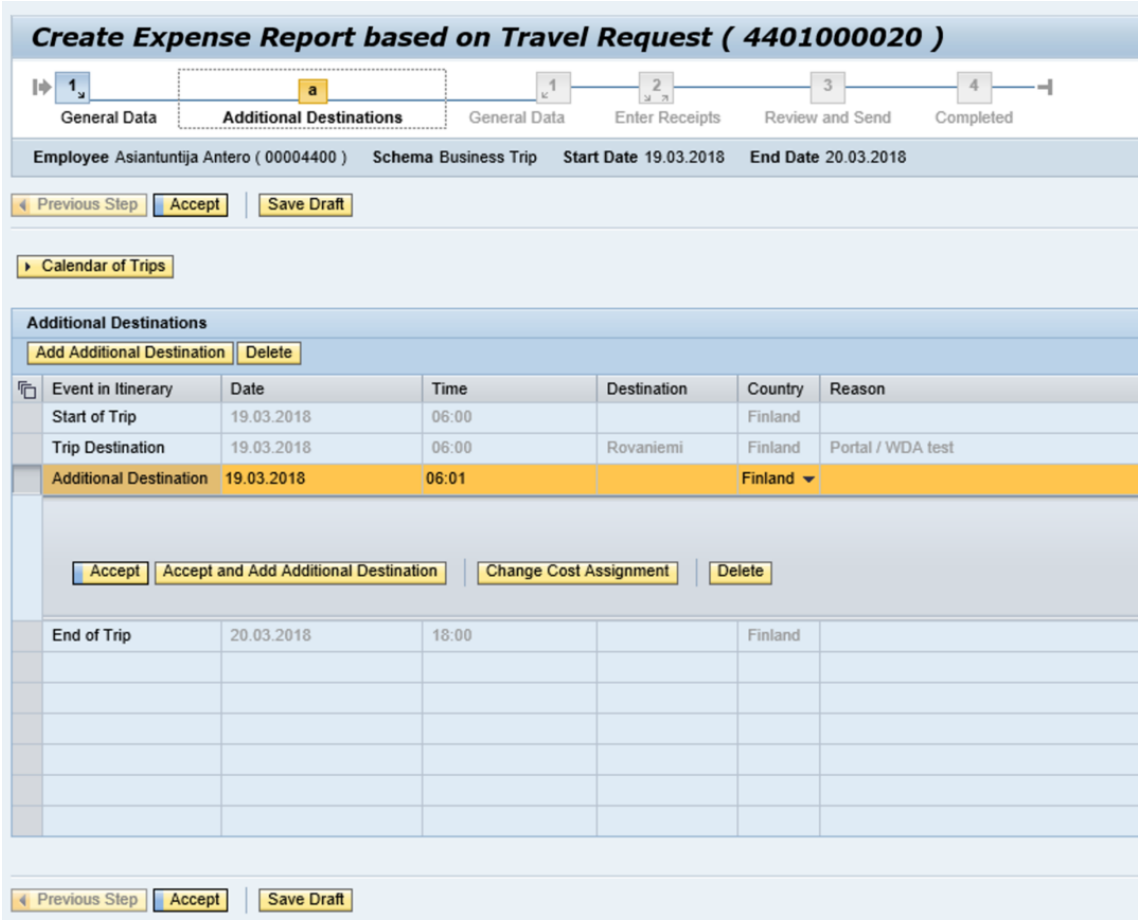


Figure 25 Create Travel Expense Report - Additional Destinations - Portal Self-services

The Cost Assignment function is available in many places. Its view is displayed as a substep of the view where it is executed, as presented in Figure 26. The function executed from the 'General Data' view affects the whole expense report's default cost assignment. The function executed from an individual expense affects only the selected expense.

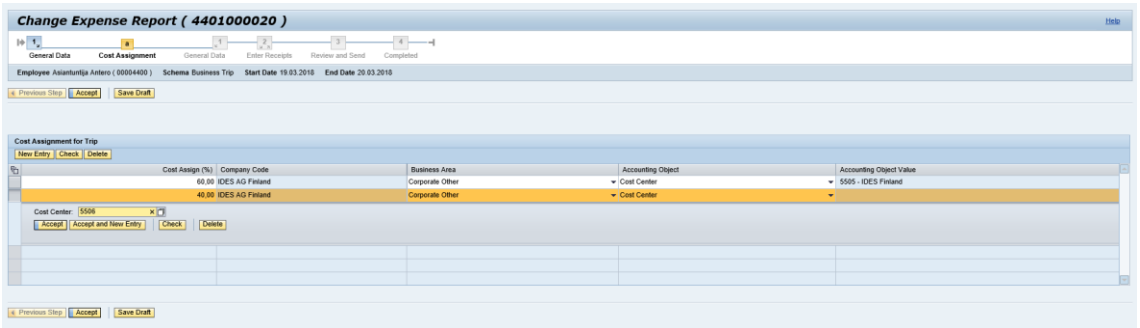


Figure 26 Create Travel Expense Report - Cost Assignment - Portal Self-services

When the per diem reimbursements are selected in the Per Diems for Meals and Accommodations section in the ‘General Data’ view the buttons for the functions for entering deductions are displayed. The deductions have their own views for both meals and accommodations, which is displayed as a substep in the roadmap illustrated in Figure 27.

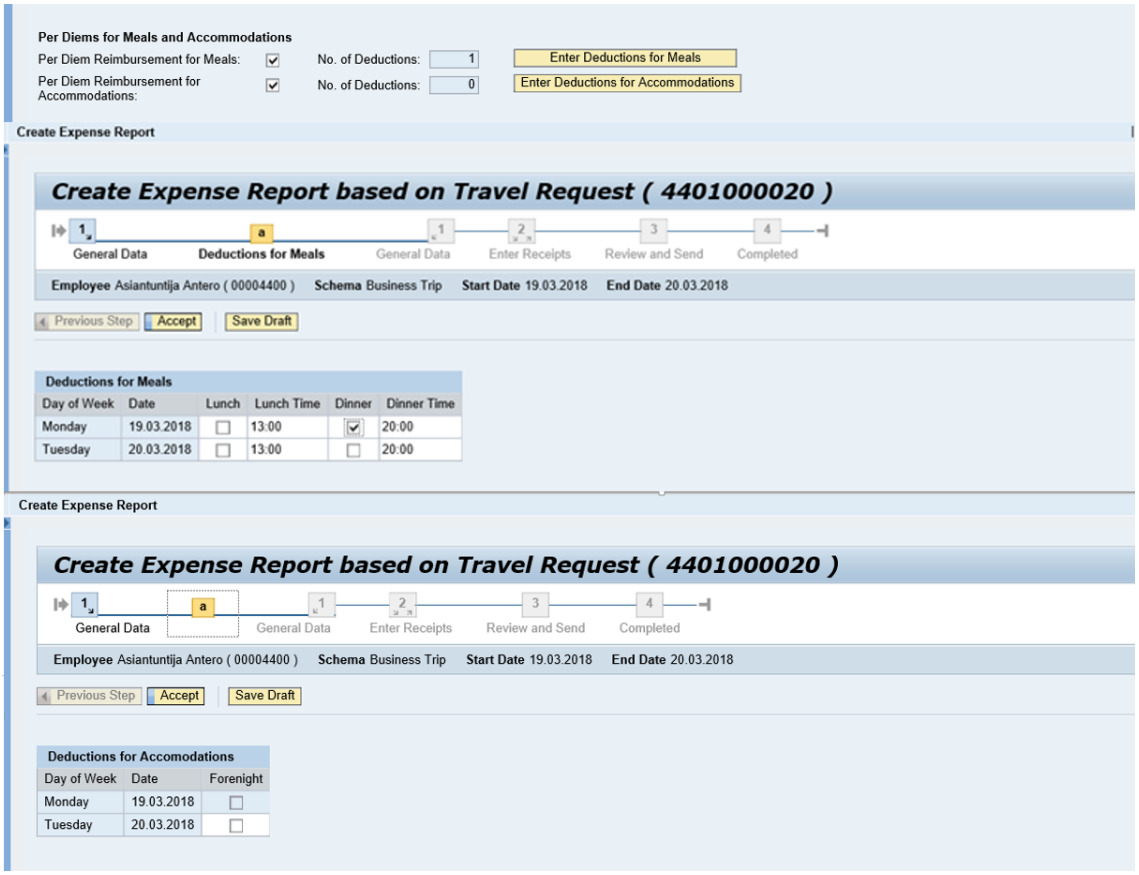


Figure 27 Create Travel Expense Report - Deductions - Portal Self-services

Figure 28 demonstrates the ‘Mileage Details’ view that opens when an Enter Mileage Details function is selected from the ‘General Data’ view. The view opens as a substep and it is used for entering the mileage information.

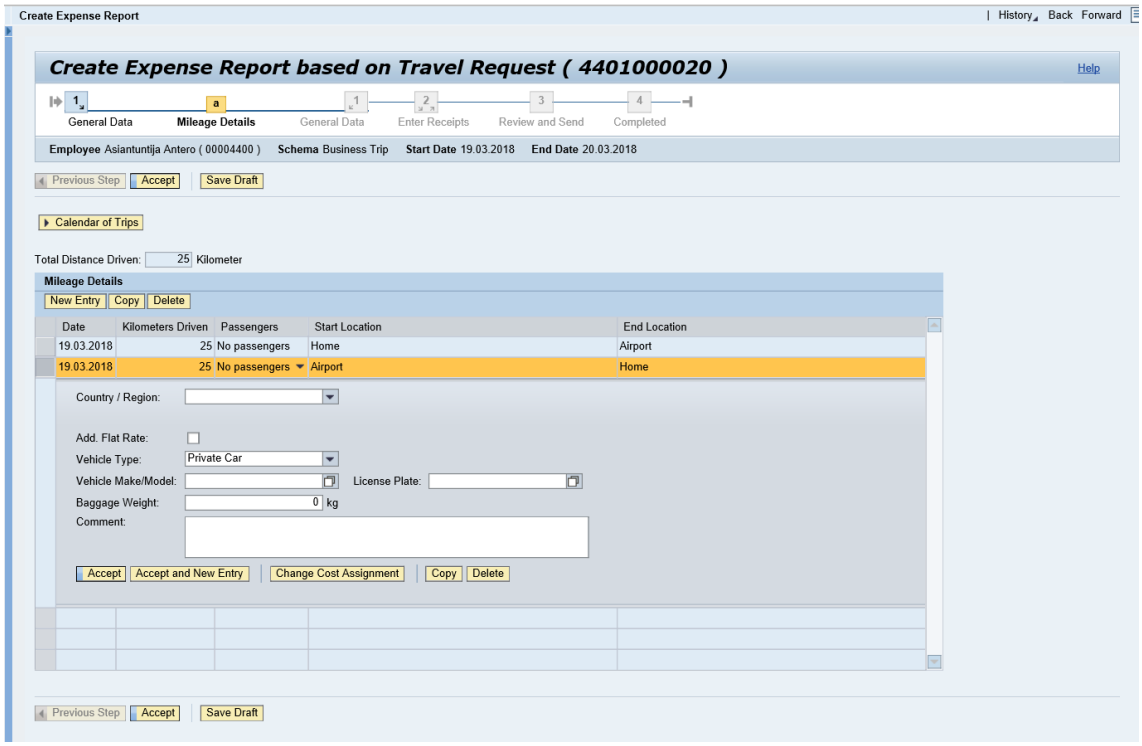


Figure 28 Create Travel Expense Report - Mileages - Portal Self-services

Figure 29 presents the second step in the creation process of the Travel expense report named as Enter Receipts. In this view the Available Credit Card Receipts table contains a section called Receipts which deals with imported business credit card transactions from the credit card company. This section displays only those transactions which are not already included in the expense reports. When a transaction is included in the expense report it is transformed into an expense and displayed as a Receipt in the Expense Report table. When the transaction is a purchase paid using a business credit card which has personal liability (the credit card bill is sent to the employee not to the company) the user can delete unnecessary transactions and the function helps in creating the expenses and the user doesn't need to enter all of the data manually. If the transaction is a purchase paid using a business credit card which has company liability the user cannot delete it.

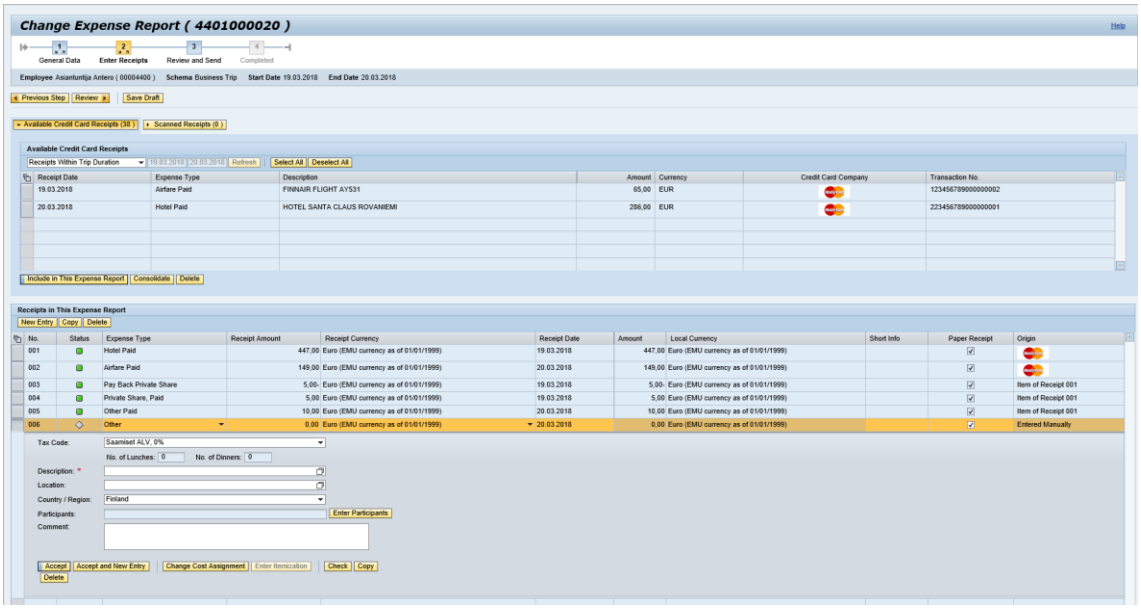


Figure 29 Create Travel Expense Report - Enter Receipts - Portal Self-services

When the same credit card transaction includes different expenses it needs to be split into multiple expenses using the Enter Itemization function. The itemization function has its own view which is also displayed as a substep and opens a pop-up dialog for new expenses. Figure 30 presents a situation where a 10€ breakfast fee and a 5€ pay-TV fee are separated from the Hotel expense. The result of this example situation is displayed in Figure 29.

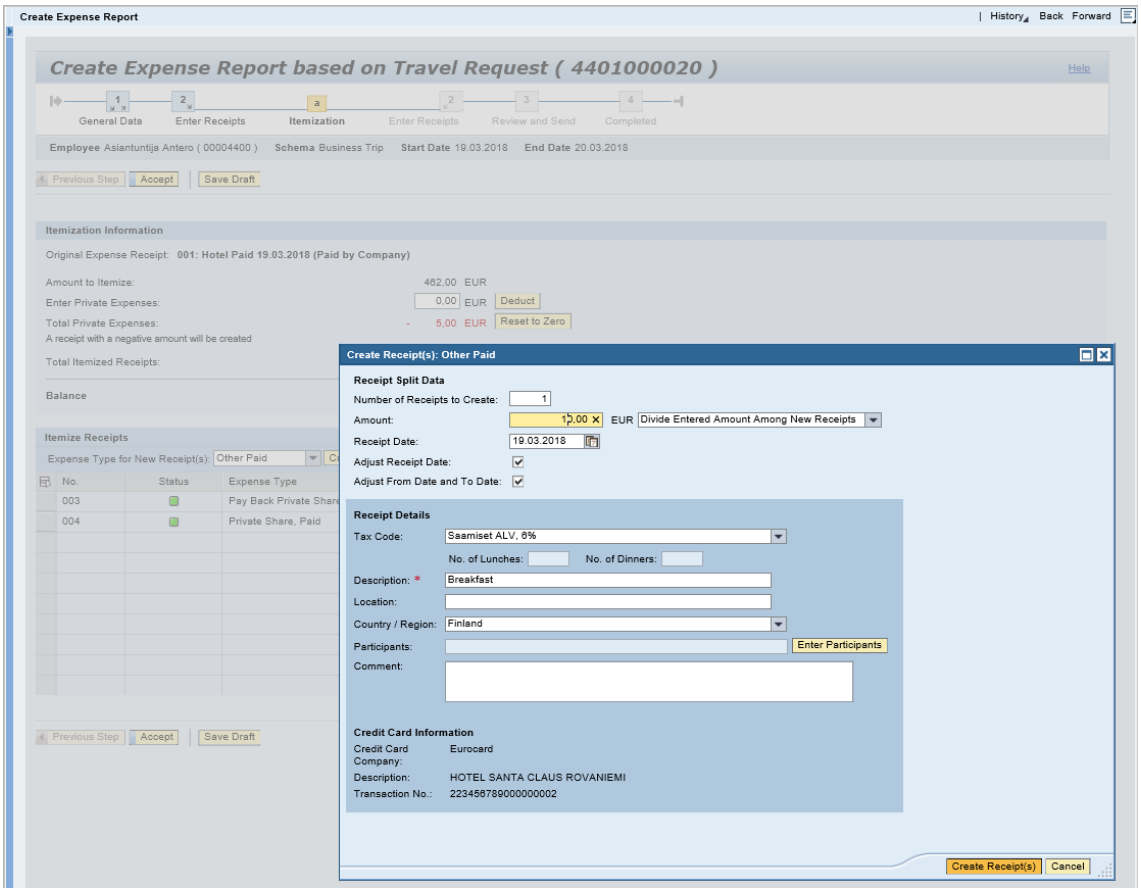


Figure 30 Create Travel Expense Report - Itemization - Portal Self-services

After entering the receipt expenses, the third step in the creation process of the Travel expense report is called ‘Review and Send’ and illustrated in Figure 31. This view contains a summary of the expenses as well as Display Expense Form function. Display Expense Form function displays the expense report data in a printable format which can be used to see the details of the automatically calculated sums. In this view the user can decide whether the expense report is complete and send it for the approval process or save it as a draft and continue to change it later.

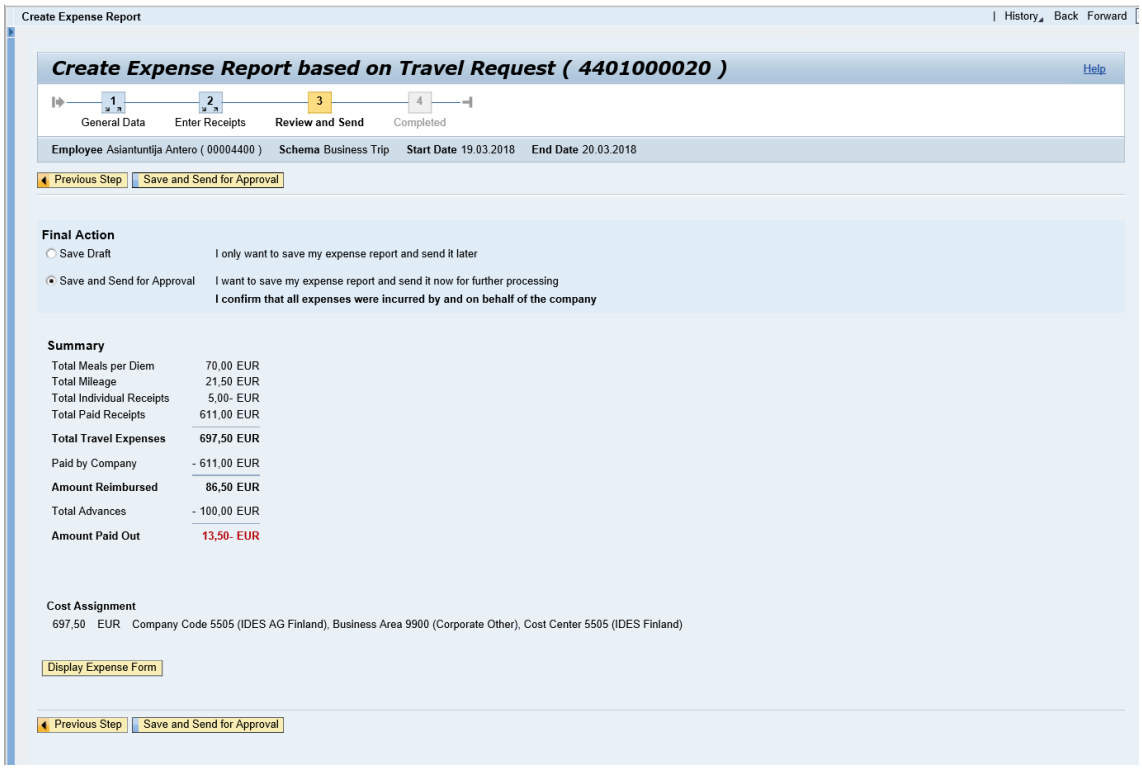


Figure 31 Create Travel Expense Report - Review and Send - Portal Self-services

The last step in the creation process of the Travel expense report is the ‘Completed’ view which only displays the verification messages, as illustrated in Figure 32.

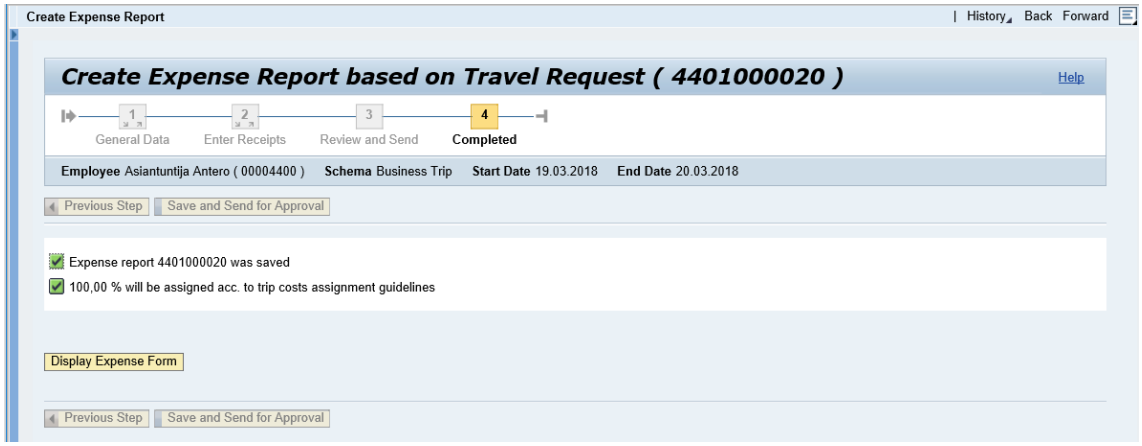


Figure 32 Create Travel Expense Report - Completed - Portal Self-services

Fiori

In Fiori creating a new Travel expense report or modifying and displaying an already existing report are done in the same My Travel and Expenses application. The creation process starts by clicking the plus sign and selecting whether the Travel expense report

should be created using an existing Travel request as a basis or from scratch, as with the Portal. Figure 33 illustrates how the existing Travel expense reports are displayed on the left side of the My Travel and Expenses application and how the existing Travel requests are displayed as a list in the pop-up dialog.

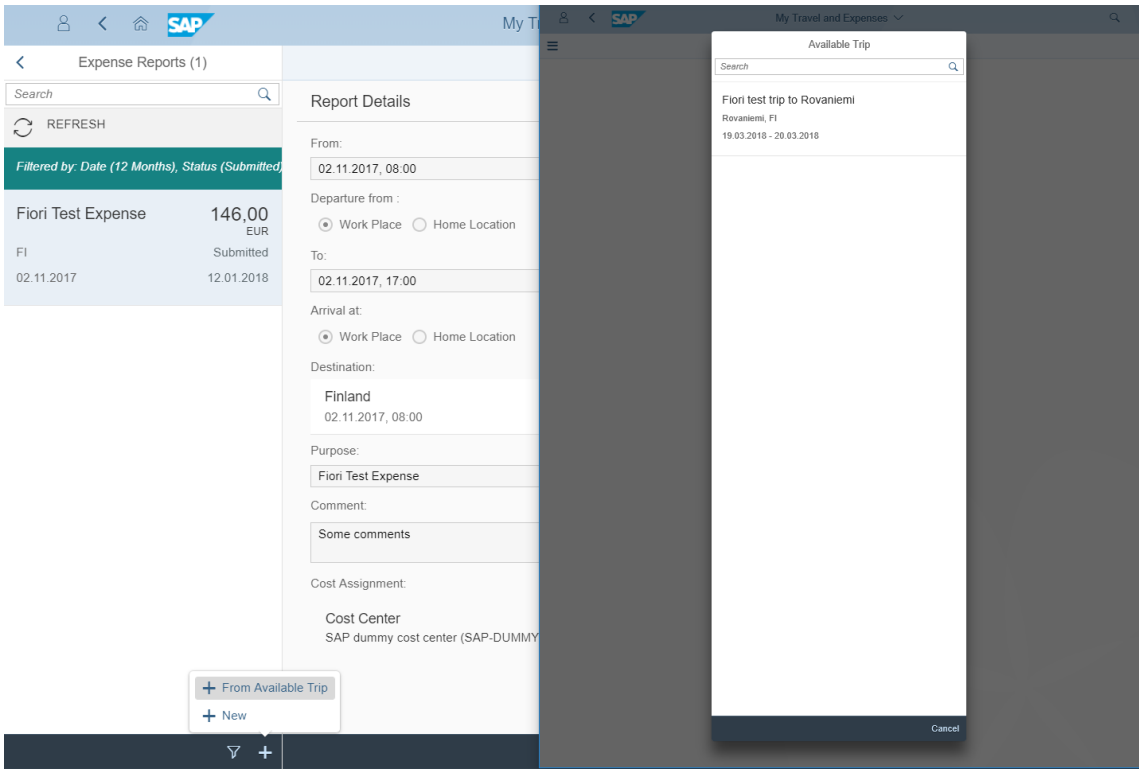


Figure 33 Create Travel Expense Report – Selection Dialog - Fiori

After the selection the information from the selected Travel request is refilled for the Travel expense report. The Meal per diems expense is automatically created. This starting situation is illustrated in Figure 34. By using the Calculate Amount function the sums of mileages and per diems with deductions are calculated and displayed on the same view as visualized in Figure 35.

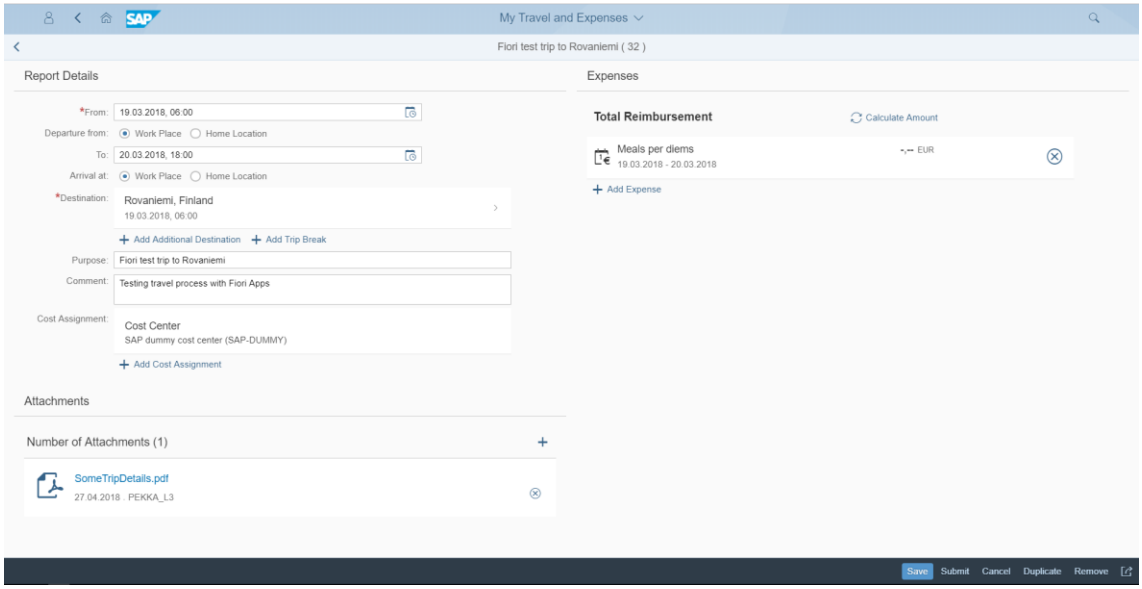


Figure 34 Create Travel Expense Report – Pre-filled - Fiori

Unlike in the Portal self-service application, in the Fiori My Travel and Expenses application there is no need to go to the 'Review and Send' or the 'Print' view to check the calculated sums. They are all displayed as expenses in the main view as demonstrated in Figure 35. The expenses can be created in any order using the Add Expense function. The application has two modes for displaying the Travel expense report. These modes are presented in Figure 34 and Figure 35. The 'Details' view displays the already created trips on the left side and in the Full Screen mode the whole screen is used for the selected Travel expense report.

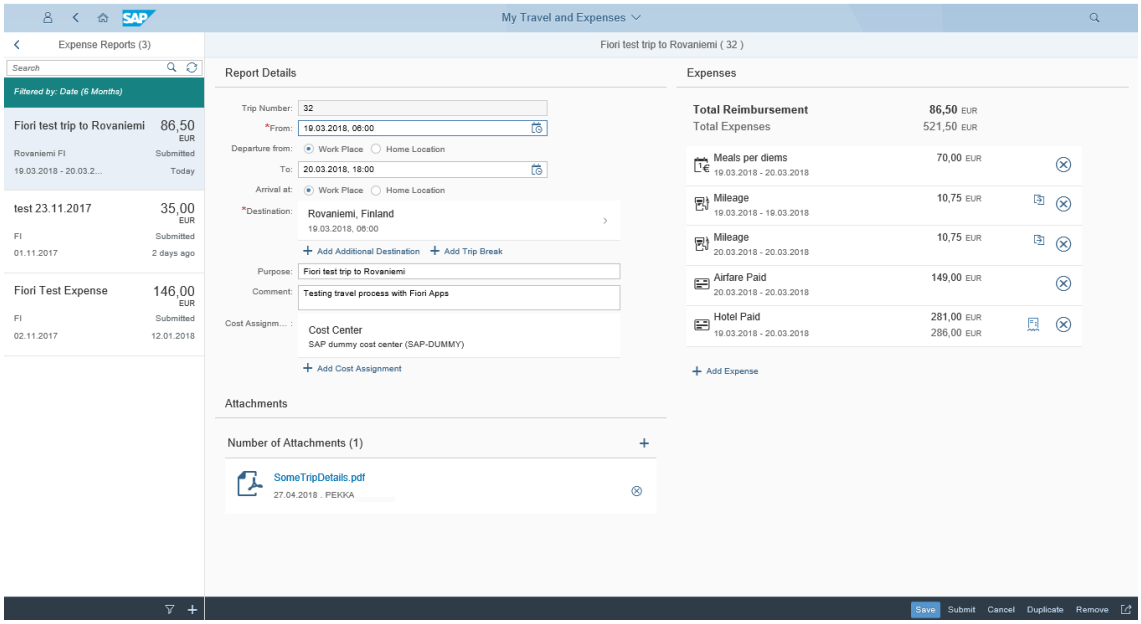


Figure 35 Create Travel Expense Report – Completed - Fiori

When the trip includes multiple destinations, in the Fiori application these destinations are entered using the Add Additional Destination function. This function opens a pop-up dialog for the selection of the country and after it is selected, a view for entering the details is displayed. Figure 36 presents the country selection pop-up dialog and the view opens after the country selection.

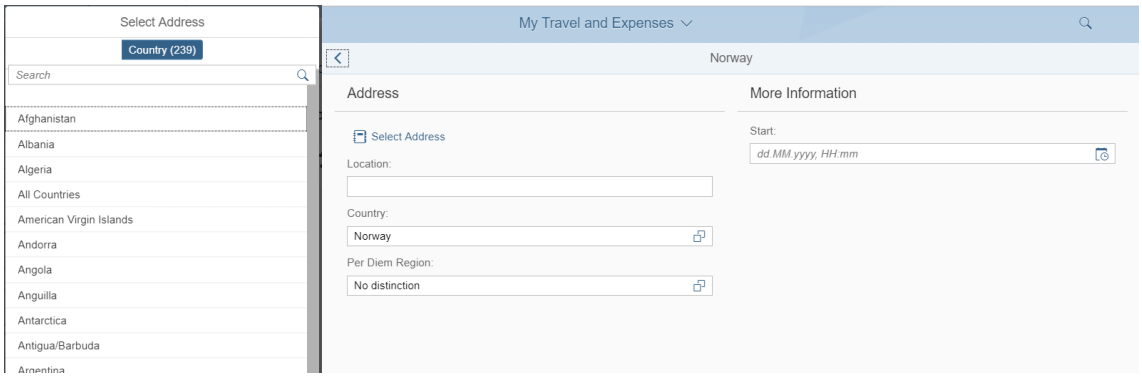


Figure 36 Create Travel Expense Report - Additional Destinations - Fiori

For the cost assignment functionality, the Fiori application has the Add Cost Assignment function. On the expense subview, the Manage Cost Assignment function needs to be selected first to see the Add Cost Assignment function. This function opens the dialog window for the cost element selection. After the additional cost element is selected it is added to the view and the sharing function will be displayed. Compared to the Portal self-service application the function is not opened to a new view and the cost sharing can be done using absolute values or percentages. Figure 37 demonstrates the pop-up dialog for the cost element selection, the percentage cost assignment in the main view and the absolute cost assignment in the single expense view.

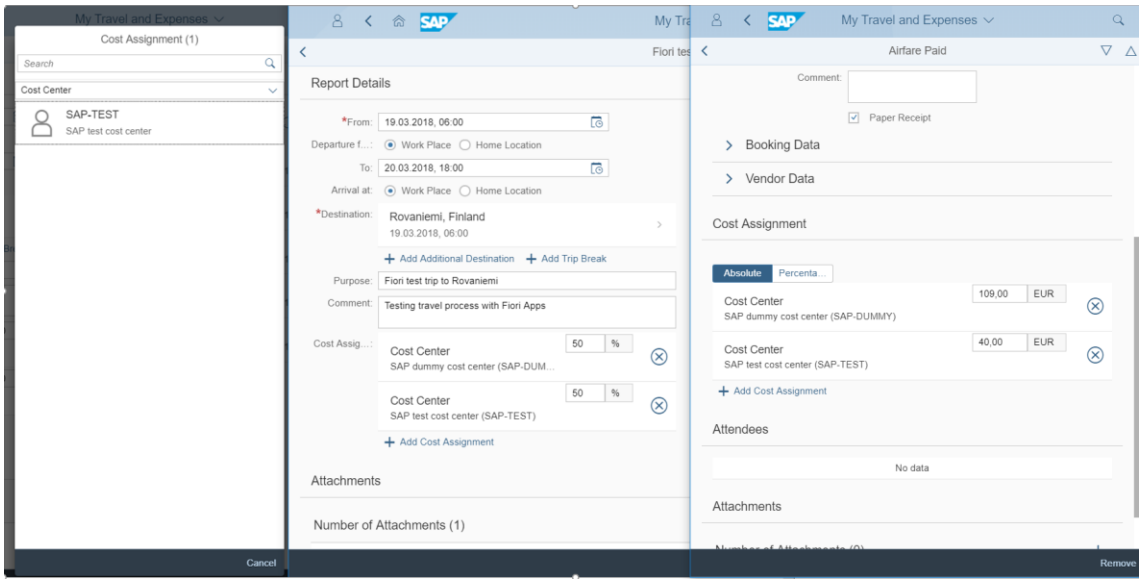


Figure 37 Create Travel Expense Report - Cost Assignment - Fiori

In Fiori the mileage information is entered as an expense into the Travel expense report. Figure 38 represents the Add Expense dialog and the Mileage 'Expense Details' view which opens when the Mileage Expense is selected from the list. Unlike in the Portal Self-services application the calculated compensation value can be viewed on the screen immediately.

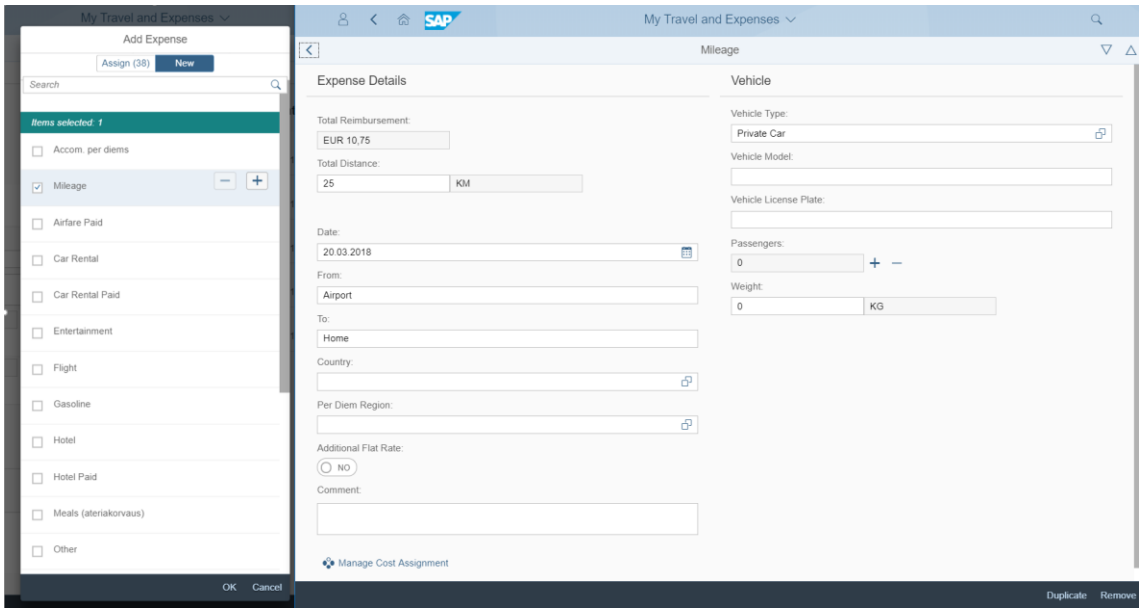


Figure 38 Create Travel Expense Report - Mileages - Fiori

In the Fiori application the Meals per diems and the Accommodation per diems are presented as expenses in the main view. The meals per diems expense is generated auto-

matically and the Accommodation per diem expense can be selected from the Add Expense list. Whenever one of the expenses is selected, the view where the deductions of the both types on per diems can be done is opened. Figure 39 demonstrates the Add Expense selection list, the ‘Deductions’ view and how the Accommodation per diem expense is displayed in the main view.

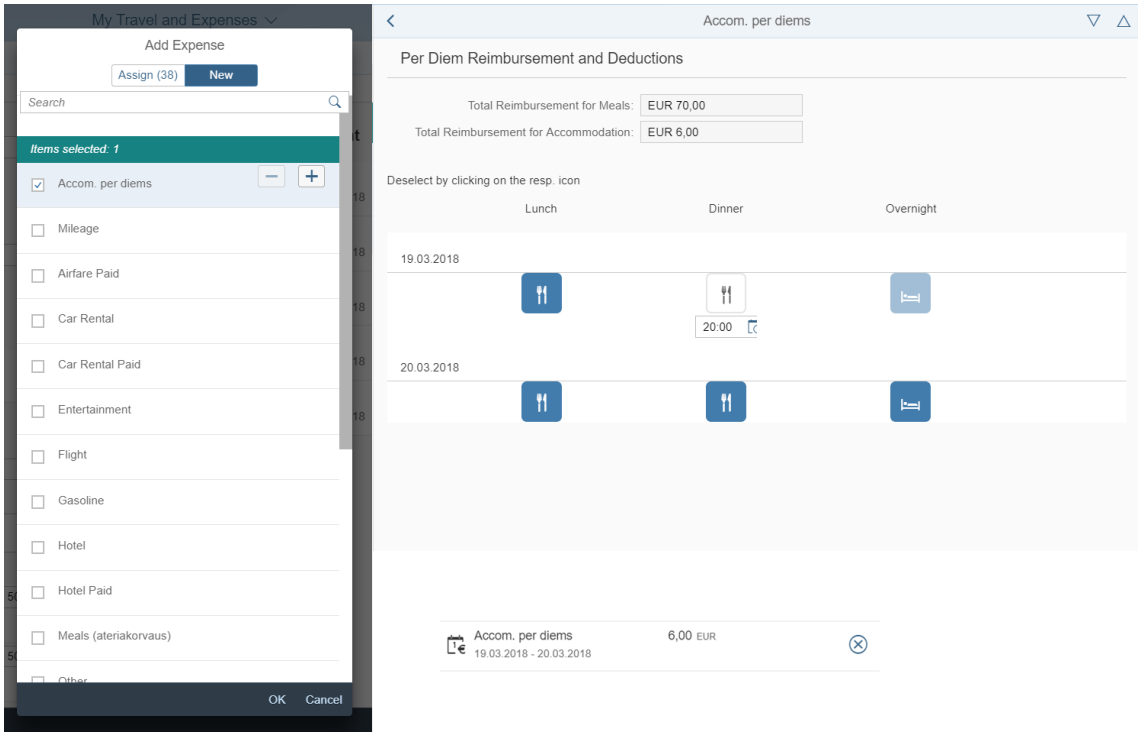


Figure 39 Create Travel Expense Report - Deductions - Fiori

In the Fiori application the imported credit card transactions which are not yet included into any travel expense report are presented in the Add Expense pop-up dialog from where transactions can be selected into the expense report as a new expense. Figure 40 illustrates the Add Expense pop-up dialog selection list and the credit card transaction which is included into the expense report as Hotel expense where the 10€ breakfast and the 5€ pay-TV fees are separated.

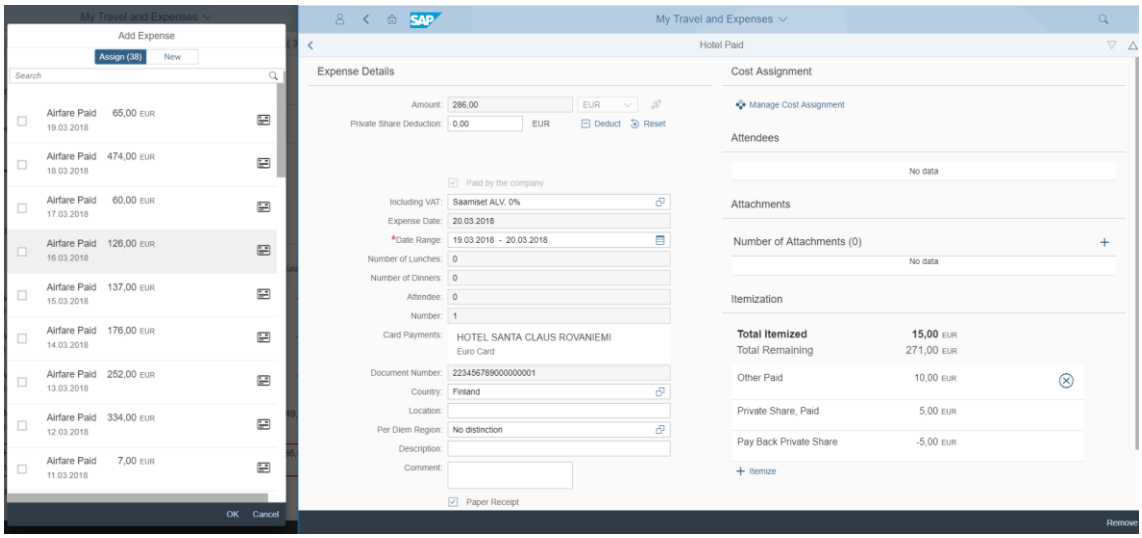


Figure 40 Create Travel Expense Report - Add Expense – Fiori

A private share can be deducted from the expense in the ‘Expense Details’ view without using the Itemize function. The Itemize function is used when the expense created from the credit card includes different expenses that need to be separated. Figure 41 presents the ‘Itemization’ view and the expense selection pop-up dialog which is used to select a new expense type for the separated amount.

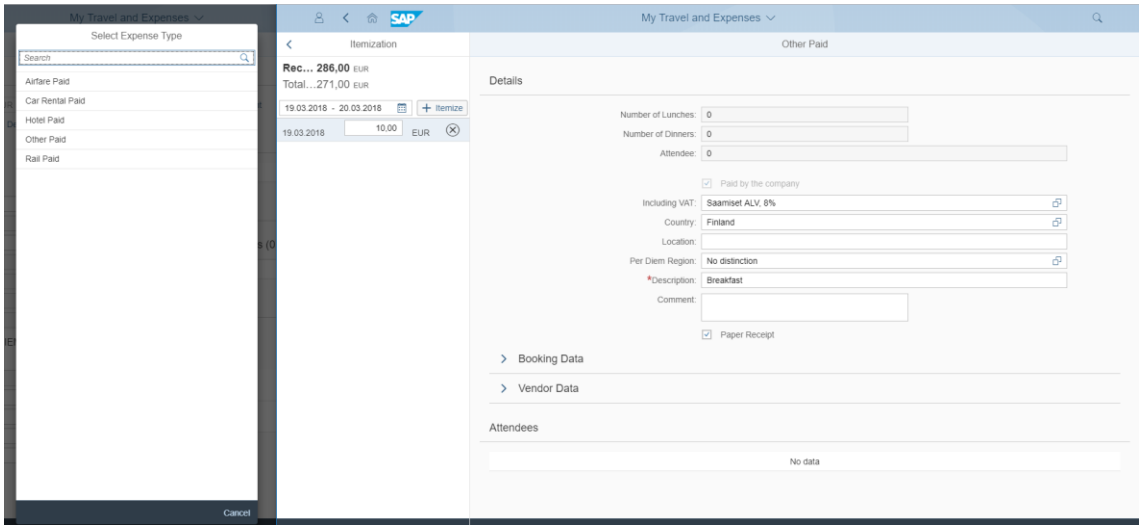


Figure 41 Create Travel Expense Report - Itemization - Fiori

Unlike the Portal Self-services application, when the expense report is submitted for approval the Fiori application displays the approver and requires the ticking of the confirmation text box, as illustrated in Figure 42.

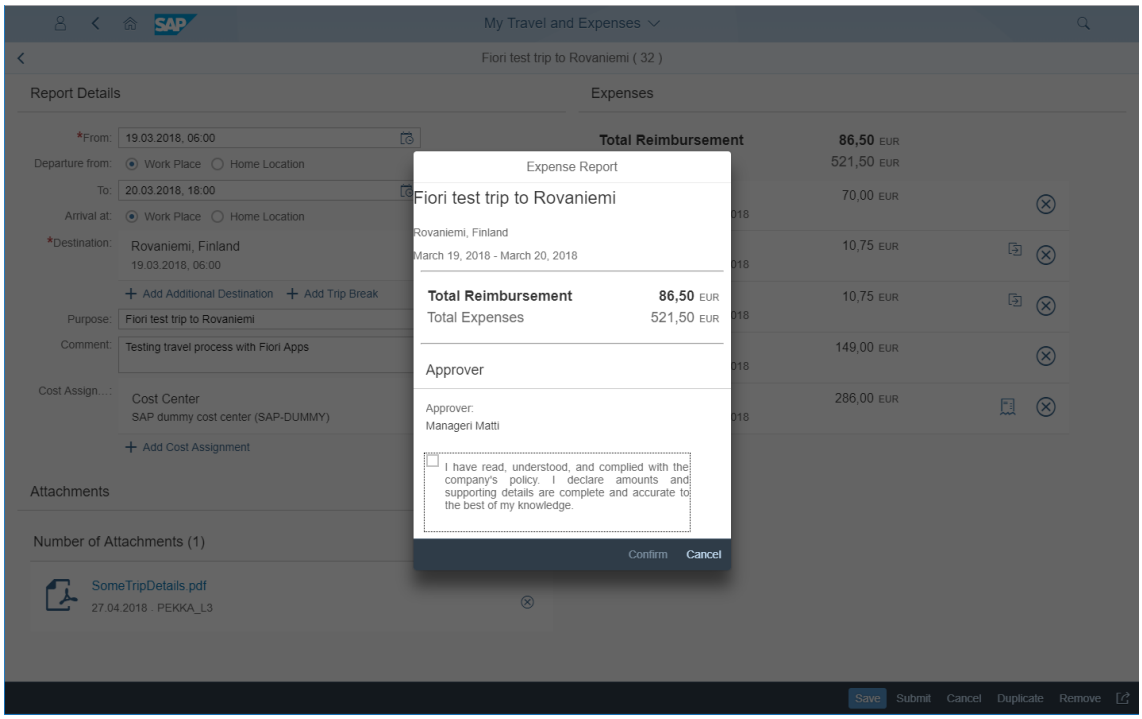


Figure 42 Create Travel Expense Report - Submit & Confirm – Fiori

Table 3 below presents the comparison of the different function features of the Portal and Fiori applications.

Function	Portal Self-Services	Fiori
Presentation of functions	A list of services. Services are links to applications.	Applications presented as tiles Tiles are links to applications, and they can display dynamic information e.g. open items
Concurrent employment	Supports	Supports (needs at least application version 1.7 with SAP Note 2598032 implement)
Travel assistant functionality	Own Travel Assistant Work center application	'On-behalf-of' feature (need note 2465451 and SAP note 2441151). There is no Fiori solution for maintaining a list of employees the on-behalf-of feature can be used for
General Data entry	Entered on the first opened view	Entered on the main view
Save draft	In every (sub)view	Only main view
Cost Assignment	Separate subview opened Sharing by using percentage values	Done in the same view, but cost elements are selected from the pop-up dialog list Sharing by using percentage and absolute values
Per diems for meals reimbursement	Check box at the General Data view Selected by default	Expense in the main view Automatically created by default
Per diems for accommodation reimbursement	Check box at the General Data view Not selected by default	Expense in the main view Created manually by selecting type from the pop-up dialog expense type list
Mileage reimbursement information	Separate subview opened from the 'General Data' view	Expense in the main view Created manually by selecting type from the pop-up dialog expense type list
Calculated compensation values of per diems and mileages	Total sums displayed on the 'Review and Send' view Total sums and detailed sums on the print view	Individual values displayed in the expense entry view Total sums and detailed sums on the main view and print view
Receipt expenses	Displayed as Receipts Expenses in the 'Enter Receipt' view Created manually by selecting type from the expense type list	Displayed as Expenses in the main view Created manually by selecting type from the pop-up dialog expense type list
Using available credit card transactions for creating Receipt expenses	Selected from Available credit card transactions table in the 'Enter Receipt' view	Selected from pop-up dialog Expense list when creating new expense
Copy request	Copy function in the separate Traveler Work Center application	No
Copy expense report	Copy function in the separate Traveler Work Center application	Duplicate function in the main view
Delete request / expense report	Delete function in the Separate Traveler Work Center application	Remove function in the main view
View unassigned credit card transactions	Credit Card Imports tab in the Traveler Work Center application	No, unassigned credit card transaction can only be seen when creating new expense
After entering data in subview	Press Accept button	Press back arrow
Leaving application before saving changes	Changes are lost	Next time when the application is visited the Recovery function asks if unsaved changes need to be recovered

Table 3 Comparison of functions

6.1.3 Approval

The Approval functionality for the Travel request in the Lean Workflow Inbox displays only the summary of the Travel request information from the workflow decision task description and the possible decisions as radio buttons for the approver, as illustrated in Figure 43.

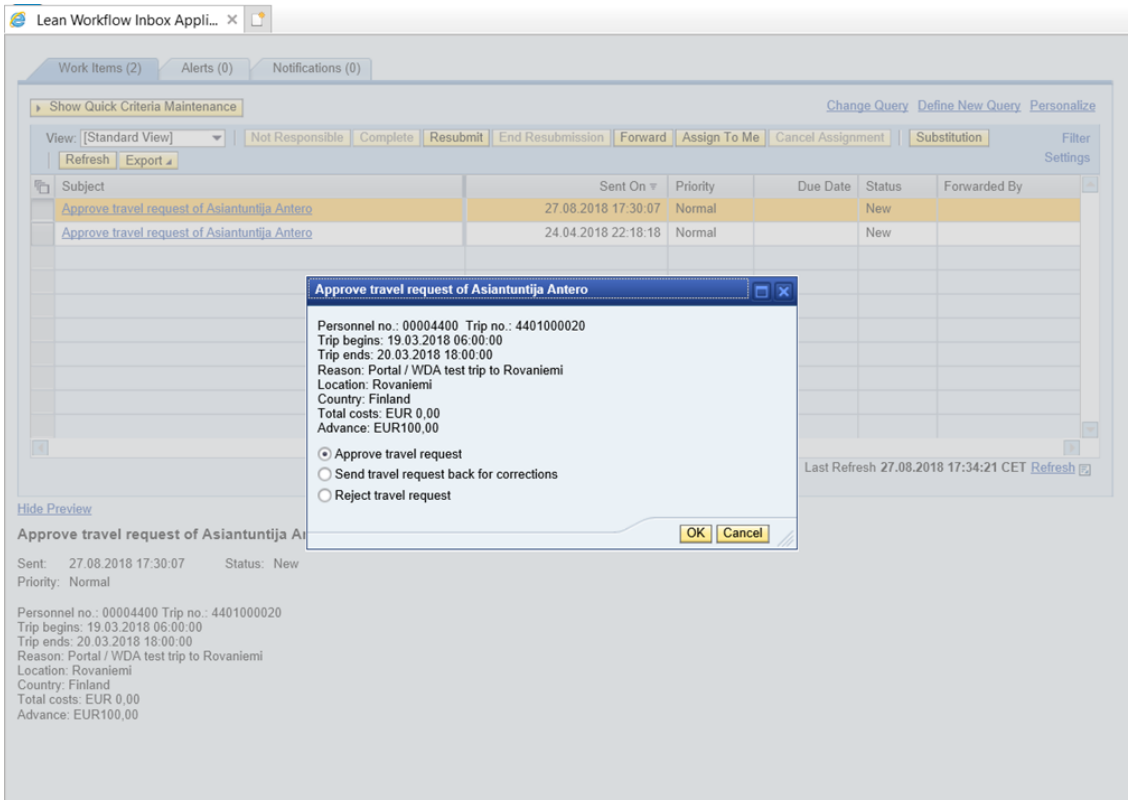


Figure 43 Approve Travel Request – Lean Workflow Inbox

In Fiori there is a standard application My Inbox - Approve Travel Requests which integrates to the My Inbox application and enables the approver to view detailed information and attachments from the Travel request in the My Inbox main view as presented in Figure 44. The approver can also open details in a printable pdf form.

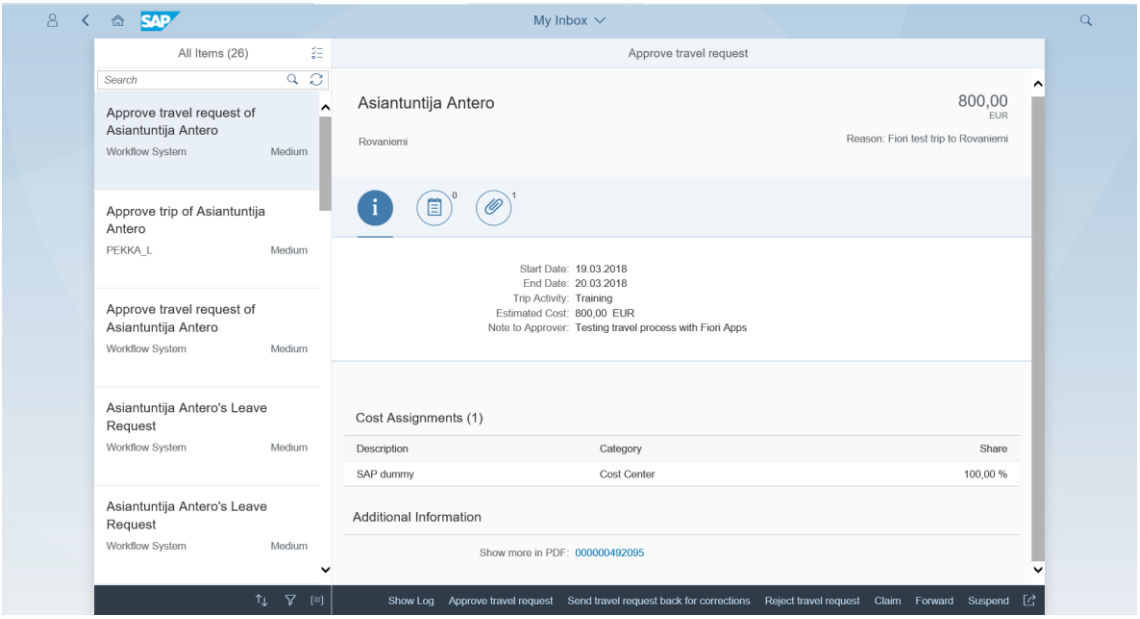


Figure 44 Approve Travel Request – My Inbox - Approve Travel Requests

The Approval functionality for the Travel expense report has the same logic as for the Travel request (Figure 43) and in the Lean Workflow Inbox it displays only the summary of the Travel expense report information from the workflow decision task description and the possible decisions as radio buttons for the approver, as illustrated in Figure 45.

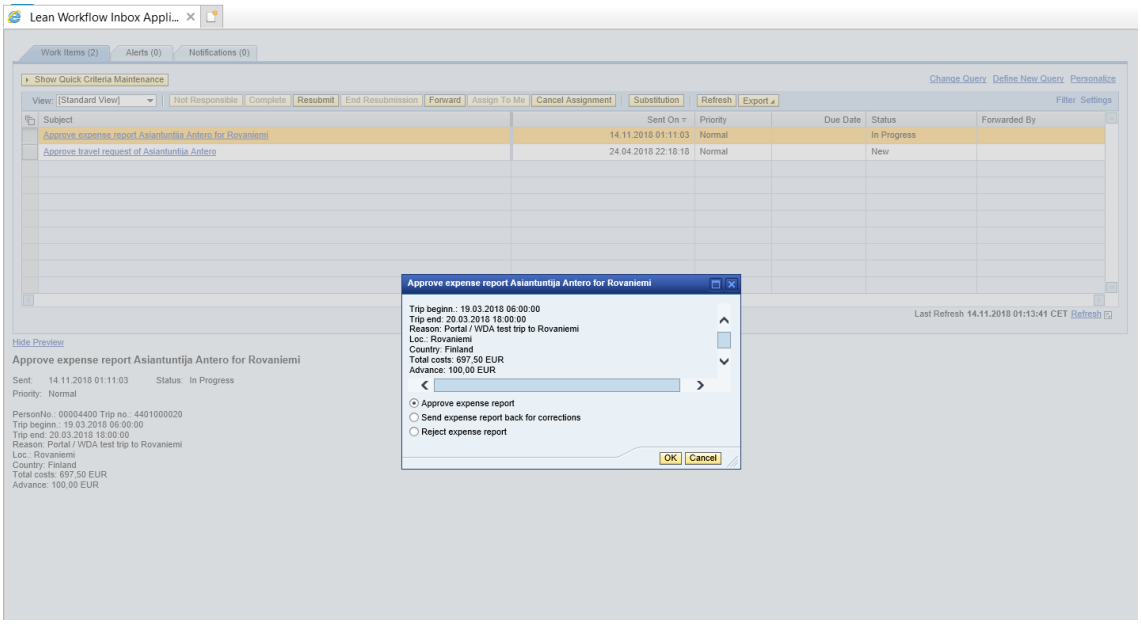


Figure 45 Approve Travel Expense Report – Lean Workflow Inbox

In Fiori the standard application My Inbox - Approve Travel Expenses integrates to the My Inbox application and enables the approver to view a detailed categorized summary

information from the Travel expense report in My Inbox application's main view (Figure 46). By clicking the arrow in the end of each summary line more details are displayed. The approver can open attachments and details as a printable pdf form.

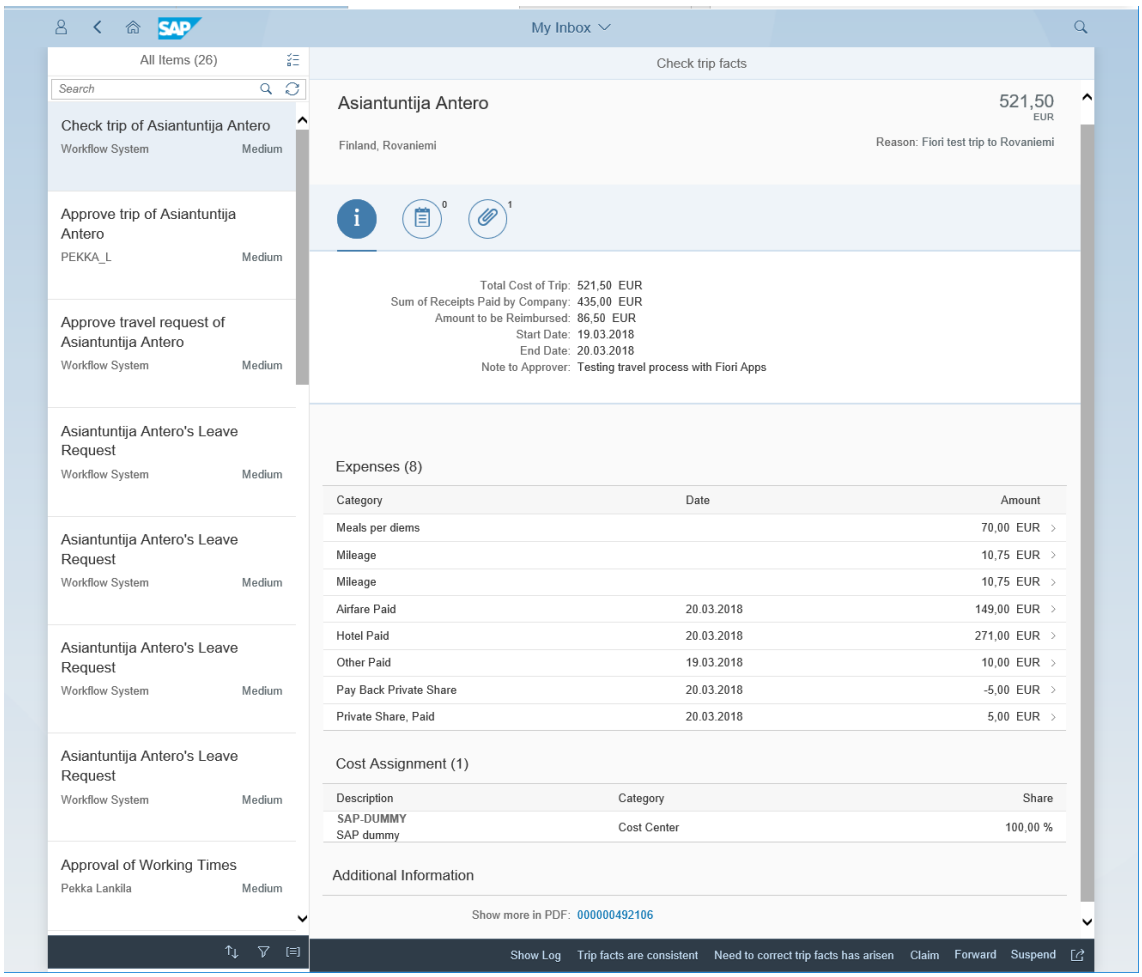


Figure 46 Approve Travel Expense Report – My Inbox - Approve Travel Expenses

6.2 Testing

The empirical part of this study included testing the Web Dynpro ABAP and Fiori applications by creating a Travel request and a Travel expense report, followed by a qualitative research interview comparing the applications of both technologies with each other. This chapter describes the whole testing process from setting up the test environments to the execution of the interviews.

6.2.1 Test Environments (Fiori & Portal)

The testing was executed using two already existing Accenture's sandbox/demo SAP environments running near standard configuration. One environment was running the SAP Portal self-service applications and another the Fiori launchpad and applications.

Fiori environment

The Fiori application testing was done in the sandbox system running on the premise SAP S/4HANA 1610 SP01, the SAP NetWeaver 7.51 SP01 and the SAP NetWeaver Gateway 7.5. The SAP S/4HANA 1610 is the first version where Fiori 2.0 is included.

Portal environment

The Web Dynpro application testing was done in the Portal sandbox system running the SAP ERP 6.0 EHP5, the SAP NetWeaver 7.0 EHP 2 and the SAP NetWeaver Portal 7.02.

6.2.2 Creating the Test Organization

To start the process, identical organizations were created into both testing systems. This organization consists of the root organization unit and one suborganization unit. The suborganization has two persons, Organization Unit Manager Matti Manageri and Specialist Employee Antero Asiantuntija. The testers logged in with Antero's user id and all the Travel requests and Travel expense reports were created for Antero. The created Travel requests and Travel expense reports were approved by using Matti Manageri's user id.

Staff assignments (structure)	Code	ID	Relationship text	Chief	Valid from	Valid to
Finland Test ORG	FINLAND_000	O 50001879		Directori Taneli	01.01.2017	Unlimited
Director	FIN_DIRE1	S 50001881	Incorporates		01.01.2017	Unlimited
Directori Taneli	Directori	P 00000490	Holder		01.01.2017	Unlimited
Sihteeri	FIN_SIHT1	S 50001880	Incorporates		23.11.2017	Unlimited
Finland Test Sub ORG	FINLAND_001	O 50001875	Is line supervisor of	Manageri Matti	01.01.2017	Unlimited
Manager	FIN_MANA1	S 50001876	Incorporates		01.01.2017	Unlimited
Manageri Matti	Manageri	P 00000489	Holder		01.01.2017	Unlimited
Specialist	FIN_SPE1	S 50001877	Incorporates		01.01.2017	Unlimited
Asiantuntija Antero	Asiantuntija	P 00000488	Holder		01.01.2015	Unlimited

Figure 47 Test organization

6.2.3 Test Group

The software licenses of the sandbox environments allow only Accenture's employees act as users. The test group consisted of five voluntary senior and manager level Accenture's specialists of different fields. No one in the test group had earlier experience on the Fiori applications of SAP Travel management. One tester had created her own travel expense reports using the SAP Portal Self-services years ago. Two of the testers had experience on the SAP Travel management Portal Self-services as a system tester. One tester had used the SAP Travel management Portal Self-services only for testing purposes. Finally, one tester had no earlier experience on the SAP Travel management. None of the testers had experience on other providers' Travel management software or, in any case, they did not remember the system anymore. Thus, except for one person, the test group had only used the company's custom application for reporting their own travel expenses.

6.2.4 Test Case

The test case included the creation of a Travel request and a Travel expense report for a 3-day trip as a traveler and the approval of the created Travel request and Travel expense report as an approver. The test trip included the per diems for meals and accommodation with deductions, mileages, cost assignment, imported credit card transactions, splitting expenses, manually entered expenses and adding a scanned receipt as an attachment. The used test case is included as Appendix 1.

6.2.5 Test Situation

The testing was executed by one tester at a time with the organizer who acted also as an observer. The test case and the interview questions were sent beforehand to the testers. Before the testing and the interview, the tester and the organizer went briefly through the test case and the interview questions to make sure that the tester had a clear understanding what is expected of the tester. The testers were not trained before testing. The organizer guided the testers during the test run when necessary. The testing situation and the interview were recorded using the dictaphone and the testers were encouraged to think aloud. During the testing, the organizer observed the execution of the test run and wrote down the observations such as difficult things to find out or execute.

6.2.6 Interview Survey

After the testing the testers were interviewed to collect their thoughts and feelings about the experience, the functions and the outlook when comparing the both systems with each other. The interview was conducted by following the list of the application features being compared and using the pre-prepared general open-ended questions. It was also asked which one of the applications the interviewee prefers and why. The interview questions used are listed in Appendix 2. The interview was conducted in Finnish, although the questions were in English. After getting feedback from the first interviewee that it was hard to quote from the memory all the functions during the interview, the process was modified so that the same feature was opened to the screens from the both systems at the same time when that specific feature in question was discussed. After the interview, the feedback request that had earlier been informed of was sent via email. This message also included the used questions and screenshots from both systems providing the attendees a possibility to give more comments if they felt like doing so.

7 Fiori Development

The secondary goal of this study was to study the Fiori software development by creating one simple custom Fiori/SAPUI5 application. The Fiori application is actually a SAPUI5 application developed using the Fiori design principles and methodology. The following IDEs were installed and configured when planning which one to use for the development. The final selection for the development environment was the SAP Web IDE. The decision was based on the facts that it has more functions and SAP recommends using it.

SAP Web IDE + Cloud connector

SAP Web IDE is a web-based development environment in the SAP Cloud Platform. Only a browser is required for using it. The development environment includes wizards and templates for building SAPUI5 applications and a code editor with features such as code completion, code validation, code beautify and code templates. The development environment can be connected to the on-premise systems located in the internal network using the SAP Cloud connector. The SAP Cloud connector creates a link between systems using the HTTPS connection.

SAP Web IDE Personal Edition

SAP Web IDE Personal Edition can be installed on a personal workstation where it is running like a local web server and used with a web browser from the local address. SAP does not include in the personal edition all the features of the SAP Web IDE and SAP has meant it to be a complementary IDE for the offline development for a single developer. The personal edition also fits situations when the Cloud connector and SAP Web IDE cannot be used e.g. due to security reasons.

SAPUI5 Tools for Eclipse

Eclipse is a well-known open-source IDE supporting a wide range of different programming languages via plug-ins. SAP offers SAPUI5 as well as ABAP tools for Eclipse, but there are no WYSIWYG user interface design capabilities.

SAPUI5 application uses the OData service to retrieve data from the back-end and for experimenting the OData service developments the ABAP application server was needed.

SAP NetWeaver Developer Edition

SAP NetWeaver Developer Edition is a trial SAP ABAP application server on the ASE database without business modules. It suits for experimenting the development tools and ABAP developments. The facts that the SAP NetWeaver Developer Edition includes the back-end and front-end servers as well as the Fiori launchpad and the needed SAP Office functions, and that it can be installed and run on the Linux virtual machine running on a desktop pc, makes it a perfect development system for experimenting the Fiori development by developing the custom SAP Office Inbox Viewer application with the companion of the SAP Web IDE.

7.1 Custom Application

During this study it became clear that unlike the Universal Worklist, which is commonly used as a workflow inbox in the Portal, the My Inbox Fiori application does not have a functionality to show the SAP Office mail messages. The Fiori launchpad itself shows the notifications but doesn’t support the SAP Office mails either (SAP Note 2520673).

This was the reason why the SAP Office Inbox Viewer was selected to be developed as an example application when studying the Fiori application development.

The development environment consisted of a web-based SAP Web IDE and a local SAP NetWeaver AS ABAP Developer Edition environment including a HANA Cloud Connector running on a openSUSE Leap 42.3. The OpenSUSE Linux system was running on VMware workstation software as a virtual machine. The SAP Web IDE was configured to connect to the ABAP environment through the HANA Cloud Connector.

The development outcomes include a SAPUI5 application and OData services for the application and tile. Fiori catalog, group, tile, semantic object and the role configurations were created to enable the use of the application from the Fiori launchpad.

The following functions for the SAP Office Inbox Viewer were implemented:

- Display number of unread messages in the dynamic tile in the launchpad
- Display table of all messages (header data) in the main view
- Display the selected message in the subview
- Display whether the message is read or not
- Mark the message as read if not already
- Delete message
- Two languages for the user interface: English or Finnish

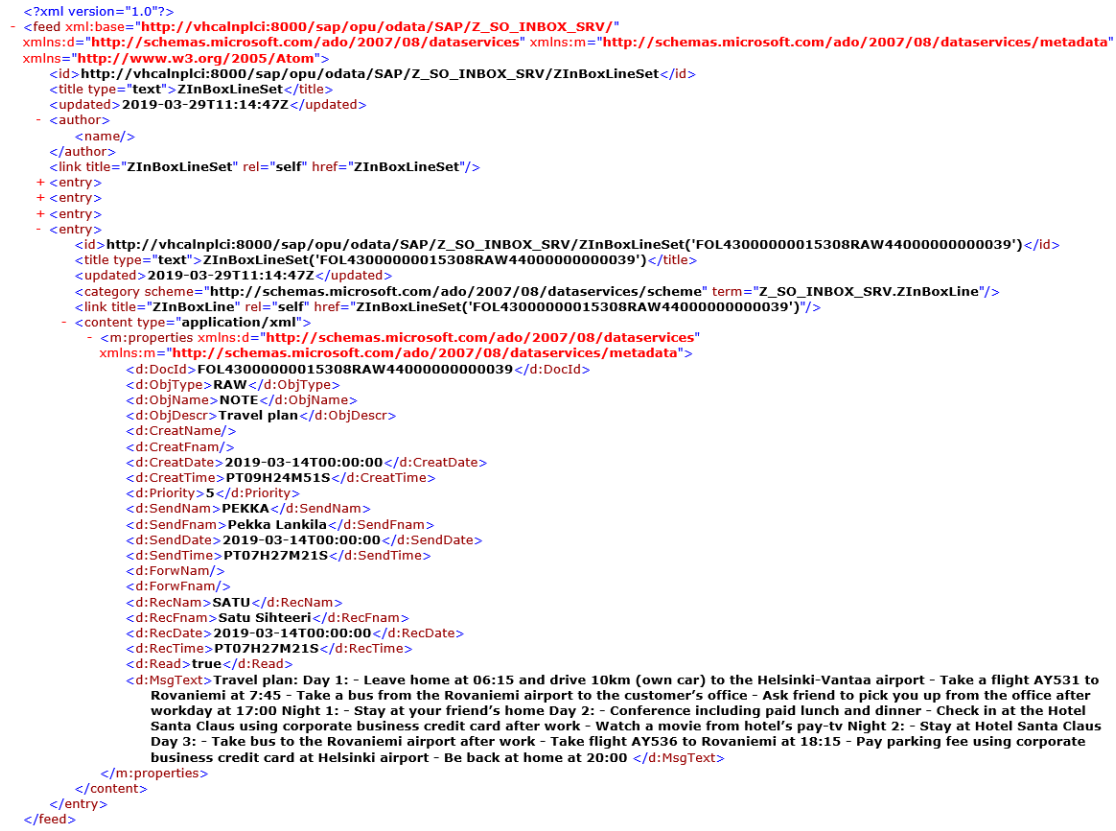
7.2 OData Service

The Custom OData service SAP Office InBox messages (Z_SO_INBOX_SRV) for the SAP Office Inbox Viewer Fiori application was created by using the SAP Gateway Service Builder and the custom DDIC structure as a data model. The data for the service is fetched from the back-end by using the SAP's standard function modules and the remote function calls. This design was selected with a view to having multiple back-ends when it only is necessary to modify one OData service by adding calls to other back-ends with no need to modify the front-end Fiori application.

The OData service has four functional services:

- GetEntitySet: returns all messages from user's inbox as an entity set. Has a functional system query option '$count' which is used for the dynamic tile in the Fiori launchpad to show the number of the unread messages
- GetEntity: returns one message from user's inbox as a single entity
- Update: updates the status of a single message as read
- Delete: deletes a single message from the user's inbox

Figure 48 below illustrates an example reply message for requesting the EntitySet from the developed OData service.



```
<?xml version="1.0"?>
- <feed xml:base="http://vhcalnplci:8000/sap/opu/odata/SAP/Z_SO_INBOX_SRV/"
xmlns:d="http://schemas.microsoft.com/ado/2007/08/dataservices" xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata"
xmlns="http://www.w3.org/2005/Atom">
    <id>http://vhcalnplci:8000/sap/opu/odata/SAP/Z_SO_INBOX_SRV/ZInBoxLineSet</id>
    <title type="text">ZInBoxLineSet</title>
    <updated>2019-03-29T11:14:47Z</updated>
  - <author>
        <name/>
    </author>
    <link title="ZInBoxLineSet" rel="self" href="ZInBoxLineSet"/>
  + <entry>
  + <entry>
  + <entry>
  - <entry>
        <id>http://vhcalnplci:8000/sap/opu/odata/SAP/Z_SO_INBOX_SRV/ZInBoxLineSet('FOL43000000015308RAW44000000000039')</id>
        <title type="text">ZInBoxLineSet('FOL43000000015308RAW44000000000039')</title>
        <updated>2019-03-29T11:14:47Z</updated>
        <category scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" term="Z_SO_INBOX_SRV.ZInBoxLine"/>
        <link title="ZInBoxLine" rel="self" href="ZInBoxLineSet('FOL43000000015308RAW44000000000039')"/>
      - <content type="application/xml">
          - <m:properties xmlns:d="http://schemas.microsoft.com/ado/2007/08/dataservices"
            xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata">
                <d:DocId>FOL43000000015308RAW44000000000039</d:DocId>
                <d:ObjType>RAW</d:ObjType>
                <d:ObjName>NOTE</d:ObjName>
                <d:ObjDescr>Travel plan</d:ObjDescr>
                <d:CreatName/>
                <d:CreatFnam/>
                <d:CreatDate>2019-03-14T00:00:00</d:CreatDate>
                <d:CreatTime>PT09H24M51S</d:CreatTime>
                <d:Priority>5</d:Priority>
                <d:SendNam>PEKKA</d:SendNam>
                <d:SendFnam>Pekka Lankila</d:SendFnam>
                <d:SendDate>2019-03-14T00:00:00</d:SendDate>
                <d:SendTime>PT07H27M21S</d:SendTime>
                <d:ForwNam/>
                <d:ForwFnam/>
                <d:RecNam>SATU</d:RecNam>
                <d:RecFnam>Satu Sihteeri</d:RecFnam>
                <d:RecDate>2019-03-14T00:00:00</d:RecDate>
                <d:RecTime>PT07H27M21S</d:RecTime>
                <d:Read>true</d:Read>
                <d:MsgText>Travel plan: Day 1: - Leave home at 06:15 and drive 10km (own car) to the Helsinki-Vantaa airport - Take a flight AY531 to
                    Rovaniemi at 7:45 - Take a bus from the Rovaniemi airport to the customer's office - Ask friend to pick you up from the office after
                    workday at 17:00 Night 1: - Stay at your friend's home Day 2: - Conference including paid lunch and dinner - Check in at the Hotel
                    Santa Claus using corporate business credit card after work - Watch a movie from hotel's pay-tv Night 2: - Stay at Hotel Santa Claus
                    Day 3: - Take bus to the Rovaniemi airport after work - Take flight AY536 to Rovaniemi at 18:15 - Pay parking fee using corporate
                    business credit card at Helsinki airport - Be back at home at 20:00 </d:MsgText>
            </m:properties>
        </content>
    </entry>
</feed>
```


Figure 48 Custom OData Service - EntitySet

The creation process of the service consisted of the following steps:

1. Copying standard structure SOFOLENTI1 as ZSOLENTI1 and enhancing copied structure with the MSG_TEXT (type String) field in the ABAP Dictionary Maintenance

2. In the SAP Gateway Service Builder
    a. Creating a new Project Z_SO_INBOX
    b. Importing the data model from the DDIC structure ZSOLENTI1 as an entity type ZInBoxLineSet
    c. Generating the run time objects
    d. Redefining the class methods GetEntitySet, GetEntity, Update and Delete and writing the program code for the services
    e. Registering the created service to the gateway

Figure 49 below illustrates the created OData service and its data model in the SAP Gateway Service Builder.

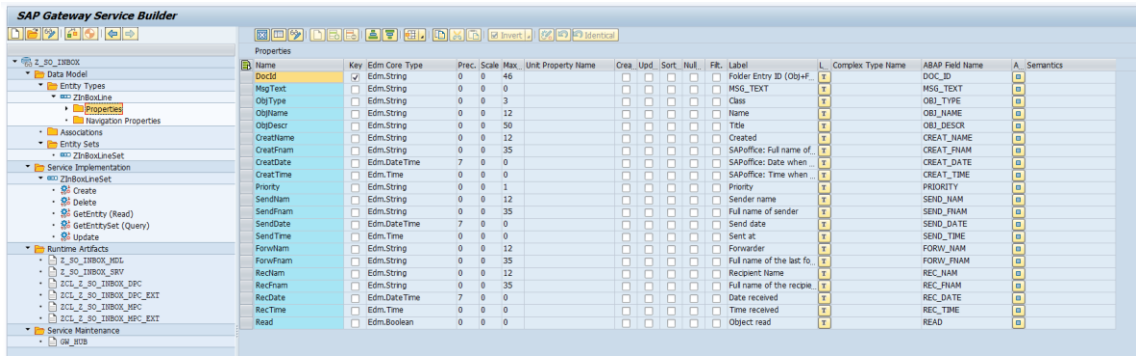


Figure 49 Custom OData Service - SAP Gateway Service Builder

7.3 SAPUI5 Application

The SAP Office Inbox Viewer application has a main view and a subview. The main view displays all the messages from the user's inbox as a table and the envelope icon indicates whether the message is already read or not (Figure 50).

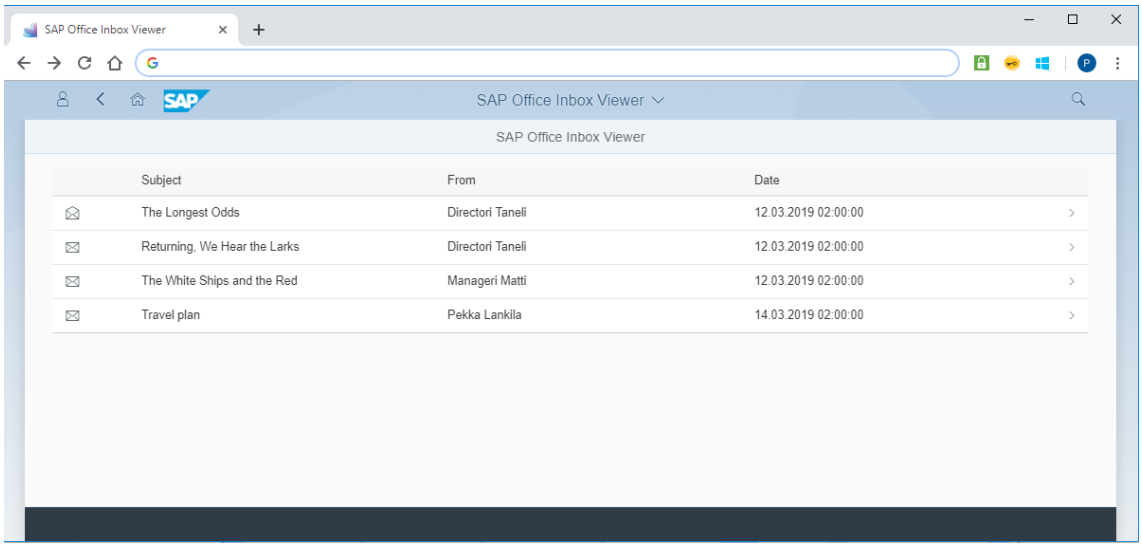


Figure 50 Custom SAPUI5 application - Main view

Clicking the message line opens a subview showing the content of the selected message as well as the provided functions for marking the message as read or for deleting the message, as illustrated in Figure 51.

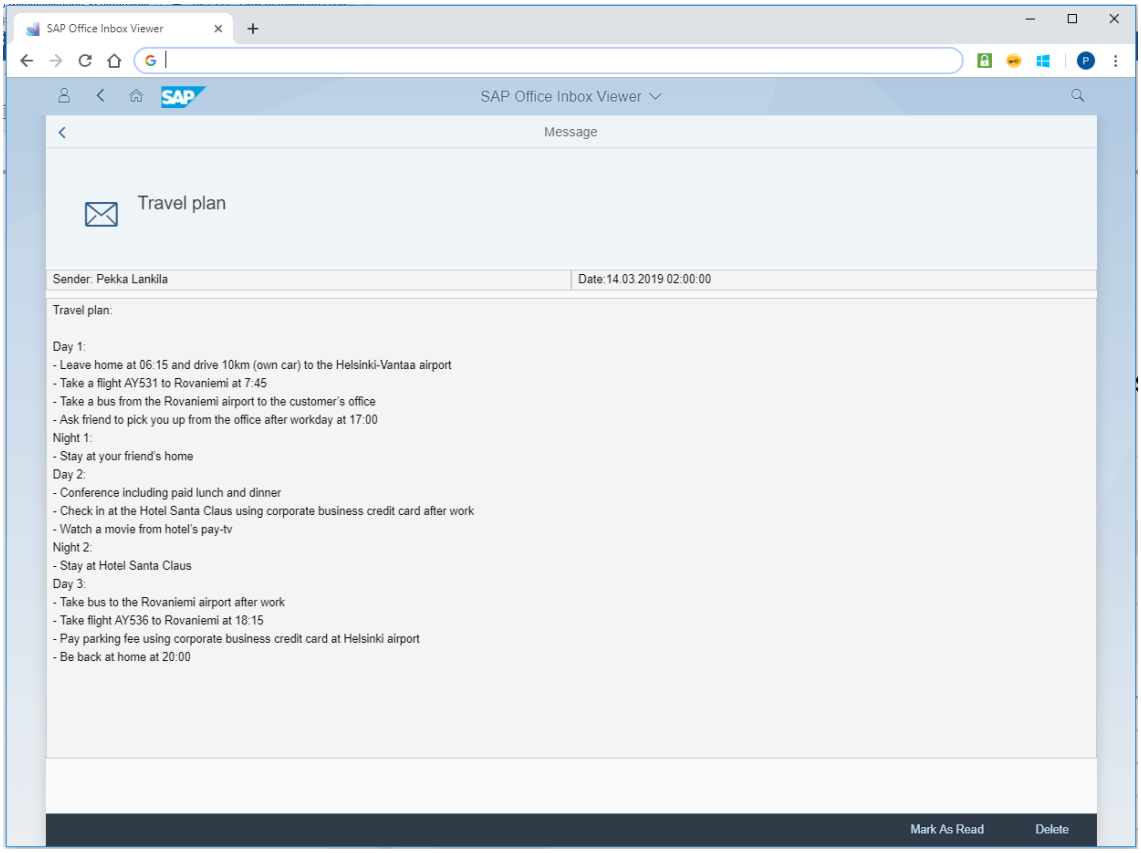


Figure 51 Custom SAPUI5 application - Subview

The SAP Office Inbox Viewer application was developed in the SAP Web IDE. The development was started by using the SAP Worklist application template project as a basis. During the project creation the data model was automatically created by selecting the OData service from the local Fiori front-end server using the configured HANA cloud connection in the connection creation tool. When the template project was generated it contained a structure of a basic SAP Worklist application. After setting up the development environment, the actual application development consisted of the following steps:

1. Creating a new application based on the SAP Worklist application template project and setting a data connection to the created OData service during the project creation
2. Modifying the design of the created template worklist and the object view by cleaning it and adding all the required data in the right format as well as the read/unread icons
3. Setting up the icons and all texts in the user interface to be read from the i18n resource
4. Configuring Finnish as another language and creating the i18n file with the translation
5. Programming the functionality to change the status icons, Mark as Read and Delete buttons

Figure 52 below illustrates the file structure of the application development project and a subview in the SAP Web IDE. The view is constructed in the xml format and the Worklist.view.xml file represents the application's main view and the Object.view.xml represents the subview. The application has also two error views NotFound.view.xml and ObjectNotFound.view.xml. The model formatter.js contains the icon switcher logic and Object.controller.js contains the programmed functions for the main view and subview. The Finnish and English texts for the views are in the properties files located in the i18n folder.

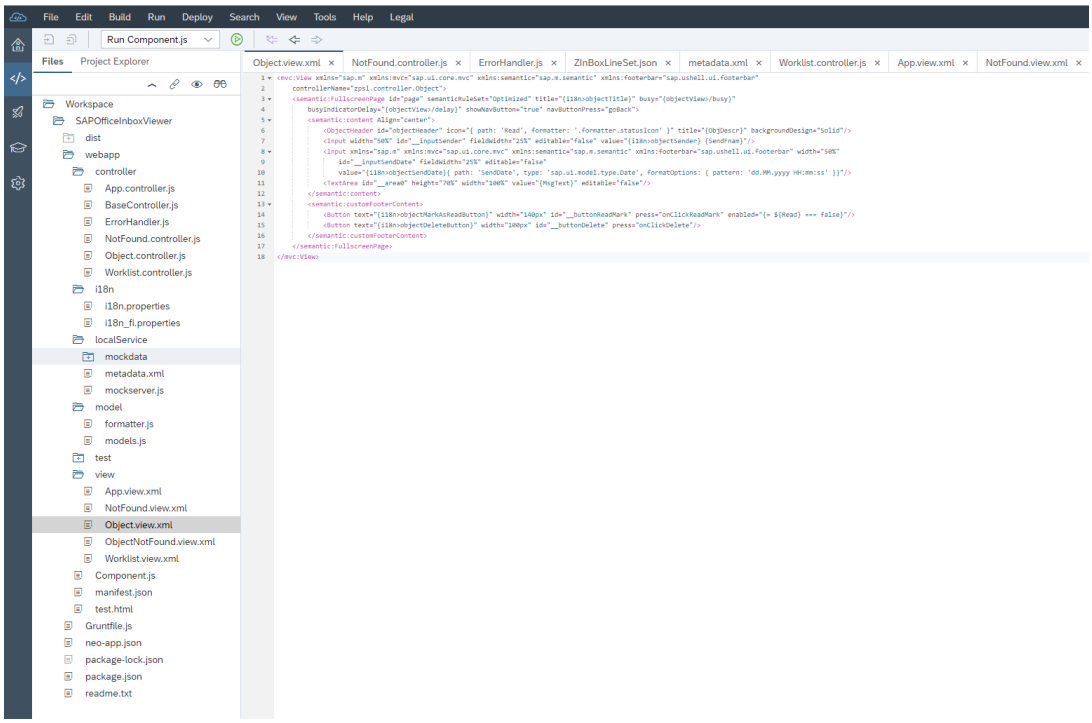


Figure 52 Custom SAPUI5 application - Project file structure

The SAP Office Inbox Viewer app was developed in the SAP Web IDE without a connection to the actual target sandbox environment. After the development the application project was exported from the SAP Web IDE as a zip package file. The files from the zip file were extracted into the local disk and the content of the webapp folder uploaded to the SAP Fiori front-end server by executing the program /UI5/UI5_REPOSITORY_LOAD in the transaction SE38.

After uploading the following index.html page with a bootstrap the script was created manually for the created BSP application in the transaction SE80. Then the created page was configured as a BSP start page and activated. After this the application could be tested using a test function of the builder.

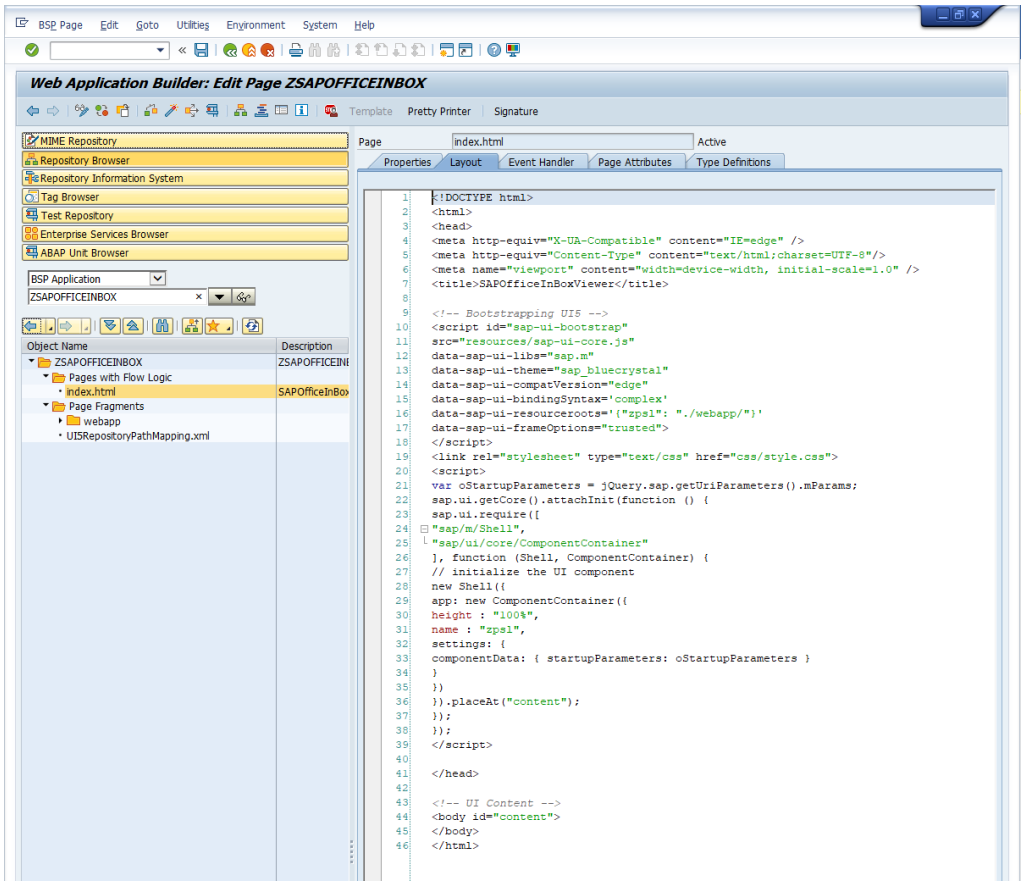


Figure 53 Custom SAPUI5 application - index.html

7.4 Configurations for the Launchpad

The semantic Object presented in Figure 54 was defined in the transaction /UI2/SE-MOBJ.

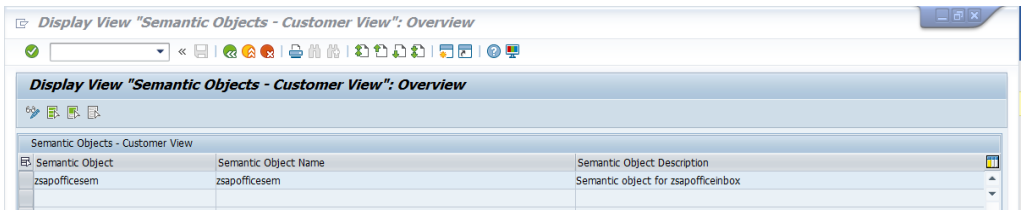


Figure 54 Custom SAPUI5 application - Semantic Object

The launchpad Role ZSAPOINBOX for the application was created in the transaction LPD_CUST as presented in Figure 55.

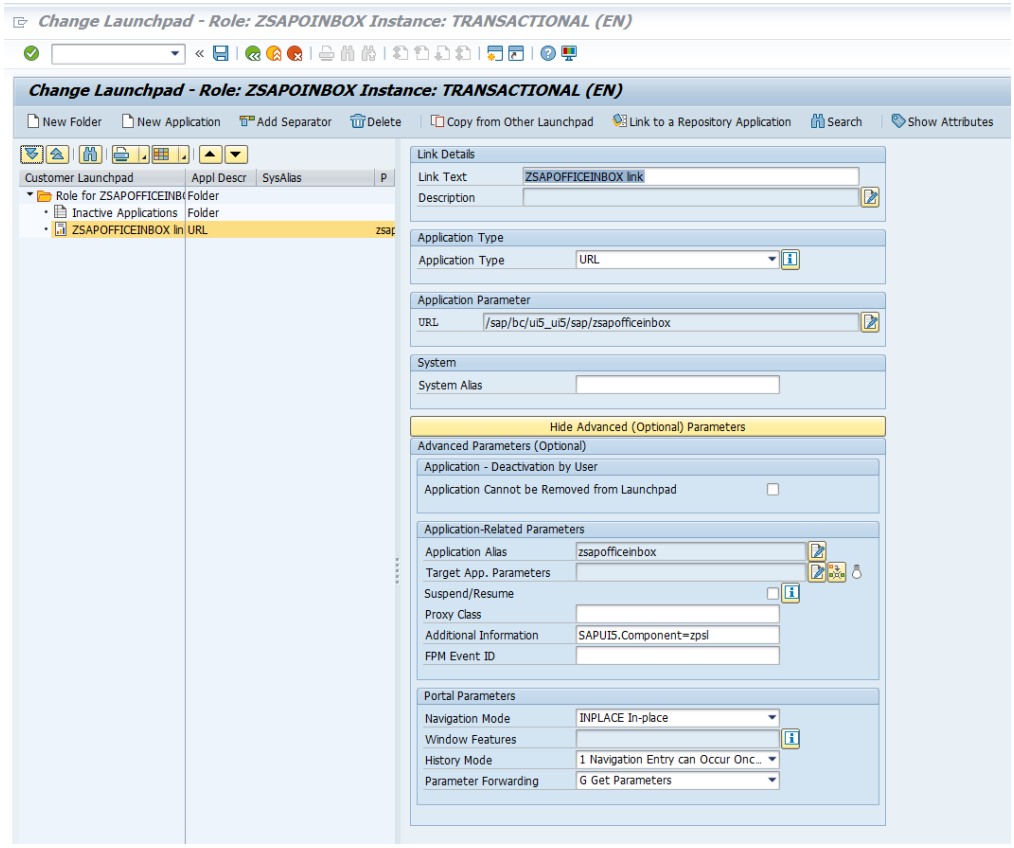


Figure 55 Custom SAPUI5 application - Launchpad role

A new catalog, group, target mapping and a dynamic tile for the application were created in the Launchpad Designer. Figure 56 illustrates the dynamic tile configuration in the Launchpad Designer. The service URL in the figure is the relative URL to the OData services which is used to fetch the number of unread messages to the tile. In this phase also the other desired applications were added to the new catalog and the group.

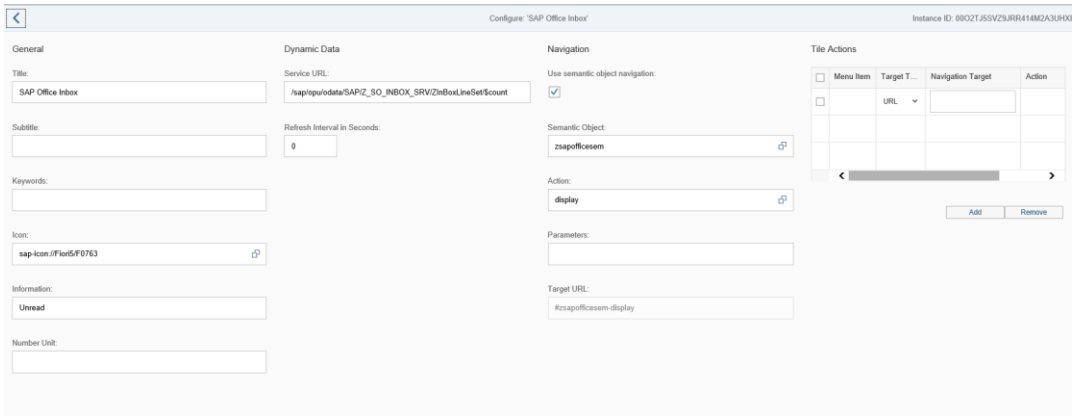


Figure 56 Custom SAPUI5 application - Tile configuration

The users need to get authorization to the new catalog and the group. A new role containing authorization to the new catalog and the group were created in the transaction PFCG as presented in Figure 57.

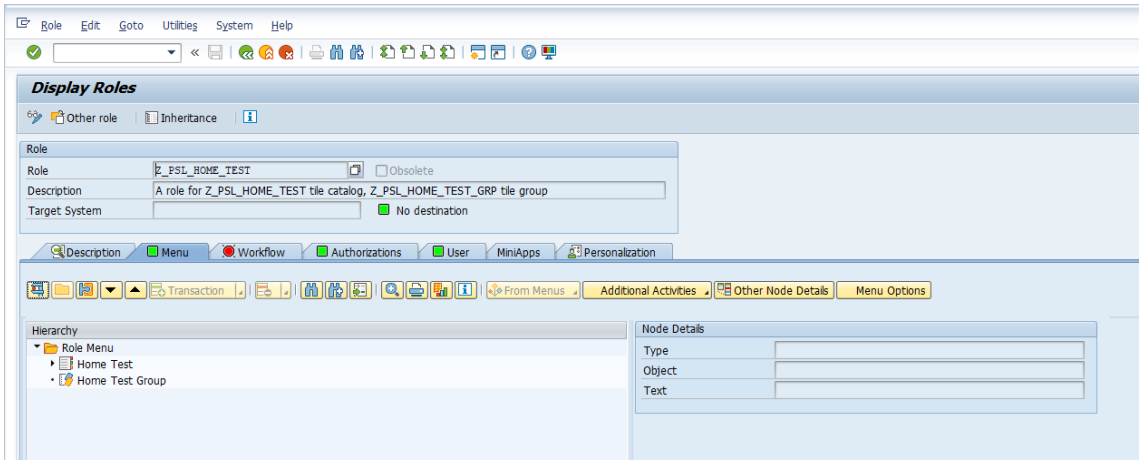


Figure 57 Custom SAPUI5 application - The role configuration

The final step for getting the application to the Fiori launchpad of the users, is to assign the created new role to the users. To use the application the user also needs the authorization to the created OData service, the Fiori launchpad and the back-end data. The SAP Fiori apps reference library's application-specific implementation information contains role information on the needed reference roles for the standard applications. The reference roles include the needed authorization for the standard applications. Figure 58 below represents the created group and its applications. The SAP Office Inbox is the tile created for the SAP Office Inbox Viewer application.

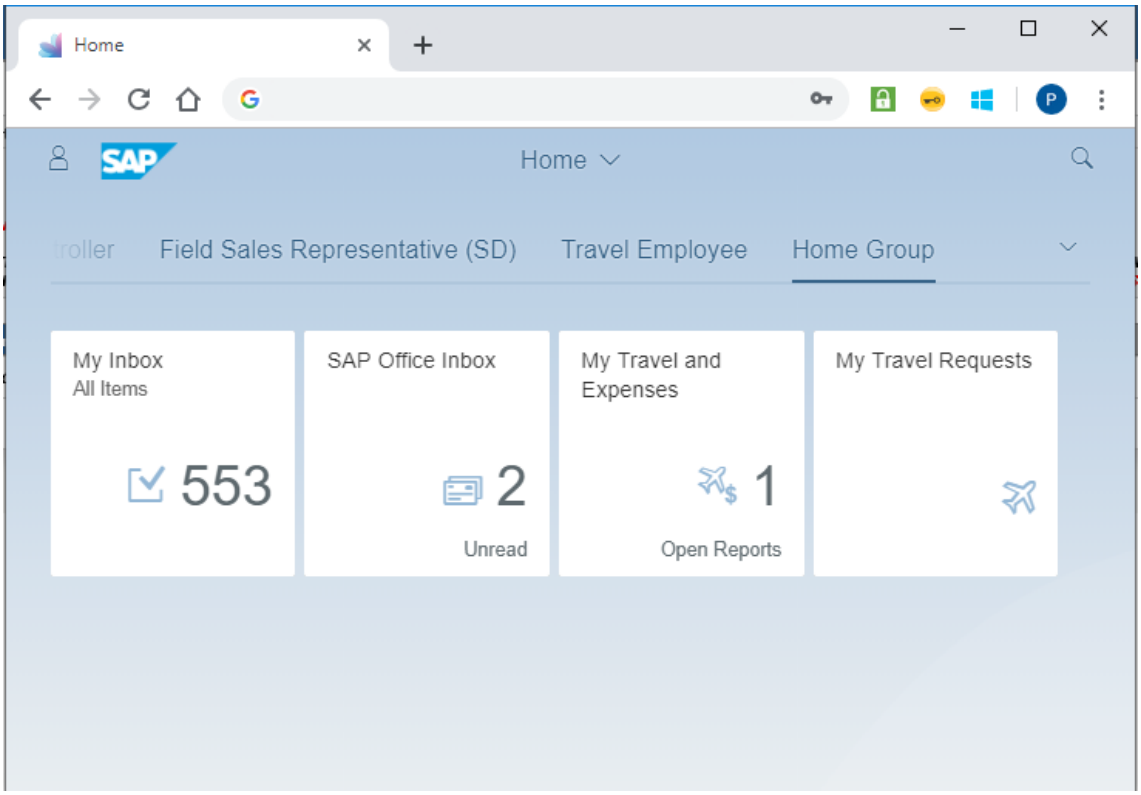


Figure 58 The Demo - Fiori launchpad – Custom 'Home Group' group and applications

8 Results and Analysis

When different platforms, applications and UIs are concerned the user experience is always a subjective matter. Each user has his/her own view on what is good and easy to use and what is not. Starting from the mobile revolution and accelerated by the emergence of the cloud services, different devices, platforms, applications and approaches have become part of people's everyday lives – not only during working hours, but also during free time. As a result, meeting the users' expectations is becoming increasingly challenging. In this study the qualitative research method was used to be able to gather and document all the user experiences as well as possible.

The empirical material of this study consisted of testing and comparing the platforms and applications, interviews and observations made during the testing. The application testing and interviews were used to gather the user experiences and thoughts from the five testers, how they saw the two different interfaces, the Portal Self-services and its WDA applications as well as the Fiori launchpad and its applications, and their approaches to do the exactly same thing.

8.1 Interview Results

The interview was conducted in Finnish. One tester gave also additional feedback in English afterwards. The results are presented for one function at a time.

The main page

After logging in to the main page of each system, the testers needed to navigate to the right application. In the Portal the navigation is presented as Service maps and Areas and the functions are presented as Services (Figure 17), and each Service is a link to open the application.

In Fiori the navigation is presented as Groups and the functions as tiles which can show dynamic information and/or open an application (Figure 18).

The test group was asked how they feel about these different approaches to the main page, and the Fiori's approach was mostly seen as better and when describing it the words like 'simpler', 'clearer' and 'more modern' were used. Three testers mentioned that the Portal has too much of everything which could make it confusing.

Two testers experienced that Fiori is more user friendly and has a better approach without any doubt. The other three were not so unequivocal.

One tester liked Fiori up to a certain limit but felt that in the Portal it is easier to find specific functions since all the options are immediately visible and in Fiori you need to open the application to see them. However, this tester also pointed out that earlier experience with the Portal will affect this.

Another tester felt that as long as a laptop is used instead of a mobile device, the Portal is also fine. In the Portal one will also see immediately what is going to be done while this is not the case with Fiori. The same tester also pointed out that sometimes in big screens Fiori's tiles can be annoying when there are only a couple of tiles scaled to a huge size.

The third tester felt that even though the Portal has other good qualities, the main page approach is easier in Fiori, and also pointed out that especially if you have only a couple of tiles then the main view is clearer in Fiori.

Document creation

In the Portal applications, the user is guided through a roadmap containing views presented as steps and subviews presented as substeps until all information is gathered. After inserting the needed information step by step, the summary is displayed, and the Travel request / Travel expense report can be sent for approval.

In the Fiori applications, the needed information is gathered into the main view by inserting it there directly or adding the information as expenses and entering details in the subviews in any order (it is not necessary to proceed step by step in a certain order as in Portal). The summary is displayed in the main view and the Travel request / Travel expense report can be sent from there for approval.

After entering the data in a subview of the Portal applications the Accept button is pressed when in the Fiori applications the back arrow is used.

All the testers except for one felt the Fiori's approach to entering information is better. The most appreciated feature was the ability to see and do everything from one view without going back and forth to see the calculated amounts or if e.g. adding attachments was forgotten.

The one who preferred the Portal's approach to entering information thought that maybe she is used to the systems where the information is entered in steps and saved between them and that might be the reason why this way feels like her own.

General data entry

The general data such as travel dates and time, destinations, purpose and detailed explanation are entered both in the Portal and the Fiori applications in the view which opens when the application starts. The actual entering of the data has minor differences such as how the date and time can be inserted and whether they are inserted in the same field or in two different fields.

The testers did not find conclusive differences when it comes to the general data entry, but the differences in the outlook and entering the dates and times were mentioned. The Portal application was ranked as slightly better by two testers.

Saving draft

When comparing the possibility to save draft during the data entry without sending the request or the report for approval, in the Portal application the Save draft button is placed in every (sub)view and in the Fiori application the draft can be saved only in the main view.

Four testers paid attention to the Save draft button in the Portal application and assumed that the Save button has the same functionality in the Fiori application and they did not feel a significant difference in how this function is implemented. One tester did not notice the possibility in Fiori at all and thus felt that this function is implemented in a clearer way in the Portal application.

Making alternative Cost Assignment

In the Portal the Cost assignment is always done in its own subview (Figure 26). The cost objects are picked from unfiltered lists using the search function.

In the Fiori application the cost objects are picked one by one to the main or expense subview using the filtered list and with one search field. Dividing the expenses between different objects is done in the same view using the fixed amounts or percentages (Figure 37).

One tester felt that the Cost assignment function was clearer in the Portal application and the other four testers experienced it was easier in the Fiori application. Regarding the experienced difficulties in creating the Cost assignment in the Portal application the testers mentioned having (too) many different fields on the screen and that it is hard to find the right object since the search returned all objects from the system as default. Two testers highlighted that even though they had experience on how to do it in the Portal they felt the usability is better in the Fiori application and that in the Portal application creating the Cost assignment is 'painful'.

Per diems for meals reimbursement data entry

In the Portal application the Per diems for meals reimbursement is displayed as a tick box (which is selected as default) in the first view and next to it is a button to open the deduction subview (Figure 27).

In the Fiori application the Per diems for meals reimbursement is in turn displayed as an expense line which exists in the view as a default and the deduction view (Figure 39) opens by clicking the expense line.

Three testers found the Fiori application's solution better. One of them felt that the pictures of a knife and a fork as selection buttons make the Fiori application clearer, but another one mentioned that due to the use of the pictures it was a little bit unclear when the lunch was selected for deduction. The clock field appears only when the lunch is selected and that was perceived as the indication of the selection.

Two testers felt that this function is clearer in the Portal application. One of them mentioned that the tick boxes makes the function of the Portal application clearer and the other one thought that the superiority is probably associated with having used the portal application earlier and it is more familiar due to that.

Per diems for accommodation reimbursement data entry

In the Portal application the Per diems for accommodation reimbursement is displayed as a tick box in the first view and next to it is a button to open the deduction subview (Figure 27).

In the Fiori application the Per diems for accommodation reimbursement is added as an expense by selecting the expense type from the Add new expense list and then the deduction view (Figure 39) opens by clicking the expense line. The deduction view is shared with the Per diems for meals meaning that the user can add deductions for the both allowances in the same view.

In the Portal application the deduction is done by checking the tick box and in the Fiori application by clicking the picture of the bed.

Three testers ranked the Fiori application's solution better based on the following reasons: it is easier to find, the visualization is better and the both deductions are in the same view. The testers who found the Portal application's solution better felt that it is clearer and one is used to it.

Mileage reimbursement data entry

In the Portal application the Mileage reimbursement has a total amount input box in the first view and next to it is a button to open the subview (Figure 28).

In the Fiori application the mileage reimbursement is added one driven trip at a time as expense by selecting the expense type from the Add new expense list and the details are entered in the subview (Figure 38).

One tester could not decide the superiority between the applications. Three testers answered that the Fiori application was better. The simpler view was mentioned as one argument, but otherwise the testers didn't see a big difference. One tester preferred the Portal application because in the simple cases it provides the possibility to enter the kilometers in the main view without needing to go to the subview.

Information on the calculated compensation values of per diems and mileages

In the Portal application the calculated compensation values are displayed in the 'Review and Send' view (Figure 31) and in the expense print form.

In the Fiori application the calculated values can be viewed in the main view (Figure 35) and the individual values also in the subviews.

All the testers preferred the solution used in the Fiori application. The argument for this was that the values are displayed in the main view all the time, and again there is no need to go to a different view to see the values since they are visible in the same view where the data is entered.

Receipt expenses data entry

In the Portal application the manual entry of the Receipt expenses is in the Enter receipt view (Figure 29). The expenses are entered to a table.

In Fiori the receipt expenses are added by selecting the expense type from the Add new expense list and the details are entered in the subview (Figure 40).

Four testers ranked the solution in the Fiori application as better, though two of them did not see a big difference. The testers pointed out several positive aspects, like the simpler view, the more modern outlook and the possibility to insert expenses and add an attachment in the same view. They also felt that in Fiori it is easier to see and understand the entity.

One tester found the solution of the Portal application better because it feels clearer and one knows where the expenses go and where to enter them.

Using available Credit card transactions for creating Receipt expenses

In the Portal application the list of the unhandled imported credit card transactions is displayed as a table on the Enter Receipt view (Figure 29). The credit card transactions from the travel period are displayed as a default but also the transactions from any given period or all the existing transactions can be selected to be displayed. When a certain transaction is selected and assigned to the trip the matching receipt expense is created to the table below the other table listing the unhandled important credit card transactions.

In the Fiori application the list of the unhandled imported credit card transactions is displayed in the Add new expense list as a tab. The list contains just a few pieces of information about the transaction. All the credit card transactions are displayed as a default. The tab contains a search field which can be used to filter the displayed transactions. When a transaction is selected from the list, a new expense matching it is created in the main view.

Four testers experienced the solution in the Portal application better. The testers especially appreciated the following features: the functionality is clearer, it is easier to find the right transaction, and only the transactions from a certain travel period can be displayed.

One tester rated the Fiori application better because it is easier there to select all the transactions at once. He did mention the lack of chronology and sorting as shortcomings but thought that probably those can be implemented as custom features.

Approvals

In the Portal application the items waiting for approval are displayed in a table (Figure 43). Items can be sorted and filtered according to the column data. The preview of the selected item is displayed under the table. Clicking the line opens the selection on the screen, containing the summary data of the Travel request or the Travel expense report and the approval options for the item as radio buttons.

In the Fiori application the items waiting for approval are displayed as a list on the left side of the view. Fiori offers two approval applications which integrate to the worklist application and display the summary data and browse it in detail on the Travel request and on the Travel expense report on the screen or on the pdf print form. The processing options such as approval are displayed on the bottom bar as buttons.

Three testers rated Fiori solution better as the detailed information can be easily viewed in the right side of the application and the tile displays if there is anything to be approved without opening the actual application. But also some criticism was given to the Fiori application for lacking the date from the item list and because the application is harder to find from the Fiori launchpad than the Portal application from the Portal self-services. One tester didn’t see a noticeable superiority between the solutions and another one perceived the Portal application as better because only a couple clicks are needed for making approval in the Portal application.

The user experience and outlook

All the testers agreed that the Fiori applications are better for the touch screen usage as it is designed for it and the Portal has too much small items to tap with fingers. One tester felt that still he/she would not consider entering such a big task as a trip using a touch screen and a tablet, and would use it only for approvals.

The outlook of the Fiori applications was considered 'more modern', 'cooler' and 'nicer', although at least one tester was expecting something fancier than a simple blue-gray theme.

Regarding the general user experience, the testers raised the following points:

- Both applications get the things done.
- The appearance is simpler in the Fiori application and finding right things is easier than in the portal.
- The usage through the Portal self-services is a little bit unwieldy; Fiori is smoother and there is no need to follow a roadmap. Things can be done in kind of any order you wish.
- In the Portal there is more information.
- Portal guides better through the process due to the steps.

Four testers indicated that they had at least in some cases problems to find or figure out functions in both systems. Two of them mentioned that the situation with the Portal could be worse without earlier experience with it.

About Fiori the testers mentioned it was easier to understand the big picture, and it is faster and easier to intuitively find functions. It is also easy to find the applications from the clear start screen, but the applications themselves were not so clear.

One tester raised the following points concerning the easiness to find or figure out the functions:
Portal Self-services: *'Mostly (easy), but I knew what to look in most cases, the situation with the portal could have been different if I didn't have any previous experience on using this.'*
Fiori application: *'Quite easy with Fiori because all the needed functions could be seen at once or at least with very few clicking.'*

8.2 Noticed Problems and Development Points

The following problems and development points are collected from the test supervisor's observation notes and from the testers during the testing and the interviews.

The Fiori applications

- The creation of the Travel request is the starting point of the process, but Fiori's My Travel Request application doesn't contain a hint on how to start it like the My Travel and Expenses does. The creation starts by clicking small '+' button on the bottom bar, and only one of the testers figured it out by herself and but was still confused with the location.
- The testers felt unsure if the entered data is saved when returning from the expense subview using the back arrow, since the system does not give any indication whether the data is saved or not.
- The multiple back arrows in the top left of the view caused the testers accidentally to leave the application and through that possibly lose the entered data.
- It is difficult to find the right credit card transaction for assigning into the travel expense report when user has a lot of imported credit card transactions.
- It is difficult to be sure whether the selected credit card transaction is the right one before assigning it to the travel expense report since the description is not displayed in the selection dialog.
- Only one attachment can be inserted at a time.
- My Inbox Fiori application does not display the information when the Travel request or the Travel expense report is sent for approval.
- Entering the travel time using a touch screen is difficult.

Some problems were noticed during the testing, e.g. entering the travel time by using the touch screen is difficult since the time values cannot be entered using scrolling clock time and thus the time was needed to enter by tapping '+' and '-' buttons. Also the whole unsaved Travel expense report was lost if the wrong back button was clicked when returning from the expense subview. After the testing the system was updated and a new version of the 'My Travel and Expenses' application was released. It has a scrollable travel time entry and a working recovery function which prevents losing the whole unsaved expense report if the user accidentally exits from the application.

The Portal Self-services

- Minor difficulties were encountered in noticing the entry field for the kilometers on the Enter Mileage Details view.
- Minor difficulties were encountered in noticing the entry field for the amount on the Enter Receipts view.
- The travel time values cannot be entered from the touch screen (without a keyboard).
- Only one attachment can be inserted at a time.

8.3 Summary of Pros and Cons

In the above section the Portal and Fiori Travel management applications were compared feature by feature when going through the test and interview results. Table 4 below brings together the pros and cons which were noticed during the tests, comparisons and interviews executed in this study.

Portal Self-Services	
Pros	**Cons**
The calendar functionality which displays the existing requests and expense reports.	The user has to go to the 'Review and Send' or the print view to see the calculated amount of the mileages or per diems.
The unassigned credit card transactions can be viewed in the Traveller Work Center application without starting to create new expense report.	The keyboard is needed when entering the times.
The Express expense sheet enables the creation and changing of multiple simple expense reports in one entry screen.	Too much stuff on the screen.
Possibility to use the travel planning functionality.	For the desktop use.
Fiori	
Pros	**Cons**
The calculated Per diems and mileage compensation values can be viewed in the main and the entry view.	Doesn't have all the same functionalities and supported languages than earlier applications.
The Cost assignment can be done using the absolute values not just percentage (%) values.	No support for the travel planning.
The Recover function which allows the recovering of the unsaved changes if the user accidentally exits from the application before saving the entered data.	Cannot copy the Travel requests.
The receiving approver is displayed in the Send phase.	The user cannot see if she/he has unhandled credit card transactions without starting to create a travel expense report.
The integrated My Inbox - Approve Travel Requests and the Approve Travel Expenses applications enable the My Inbox Fiori application to show the summary or the complete details of the Travel request or the Travel expense reports without opening any extra views or windows.	Poor filtering capabilities and only the default expense type, purchase date and amount are displayed for the user when selecting the imported credit card transactions from the expense selection to include them into the expense report.
The private share deduction in the expense view.	No travel advance functionality in the 'My Travel and Expenses' application (can be added as customer extension SAP Note 2008622).
For the multiple devices such as mobile phones, tables and desktops.	No separate application for the company's travel assistant and no Fiori solution to maintain a list of employees the on-behalf-of feature can be used for.
The Native client for the Windows, iOS and Android enables the fingerprint authorization and the easy use of the device's camera to take photos from receipts as attachments.	The My Inbox Fiori application does not display the information when the Travel request or the Travel expense report is sent for approval.
	The cost objects cannot be used as combinations.
	Different level back arrows are stacked on top of each other, which easily causes accidental exits from the application during the data entry.
	Missing the hint for how to start the creation of the Travel request in the My Travel Request application.

Table 4 Summary of Pros and Cons

8.4 Analysis of the Key Results

It was interesting to see how clear and easy the Fiori applications were to use with both the desktop PC and with the touch screen of a mobile device. The Native client also enables the applications to use the device's hardware such as camera. This means that the traveler can start creating the travel expense report already during the trip and take a photo on the receipt directly from the attachments section right after purchasing something. The interviews gave a clear result that changing the approach from the Portal's roadmap where data was entered step by step to the Fiori's master view where all the information is concentrated to one view was the right choice although the roadmap approach was found to give more guidance for the data entry.

In general, it is very important to notice that the Fiori applications don't have all the same functionalities as the Web Dynpro ABAP applications. This was at least the case at the time this study was done. This means that the companies planning a transition to the Fiori applications first need to check carefully whether the Fiori applications offer all the functionalities they need. If the answer is no, it needs to be decided whether that constitutes a showstopper or if it is possible to do custom development to enhance the application with the needed functions. The same applies for the supported languages as Fiori doesn't offer all the same language translations as Web Dynpro ABAP and this could cause extra work if a custom translation is required for a certain language. Since the SAP Travel management is in the maintenance mode, only the development due to the legal requirements will be done but there will be no more big enhancements. New versions of the applications are released as notes also containing the information if any new features are added.

Although the Fiori applications were perceived as better, there is still room for development in the already existing functions in Fiori. For example, the assigning imported credit card transactions for creating receipt expenses function was ranked as better in the WDA application as it automatically provides a list of all the credit card transactions that occurred during the trip.

9 Summary

The purpose of this study was to answer the question why to change from the Portal self-service Web Dynpro applications to the Fiori applications. The goal was to look at the pros and cons of the both systems through the applications used in the Travel management process, and then draw conclusions on their usability based on the results. The secondary goal was to study Fiori software development by creating one simple custom application by using one of the Fiori development tools, which was also recommended by SAP. The custom application to be developed was chosen based on the identified gap in the Fiori launchpad functionality.

The perspective of the study was how the change would affect the user and the support person and thus the attention was largely on the test group's user experience and instant feeling of the both applications in question.

9.1 Key Findings and Conclusions

The SAP Enterprise Portal is a traditional and long-lived platform which has been used to serve web-based self-service for the PC users from the turn of the millennium. But this is changing, the demand for the mobility as well as for the platform and device independent services which are presented in the same user-friendly way regardless of where and on which device you are using them, has been a huge trend for a while. Based on this research, Fiori seems to be more agile to respond to these needs and is thus more in line with the user expectations.

In the empirical part of this study, the first step was to set up the both types (SAP Portal Self-services and Fiori) of the applications used in the travel management process with the needed configurations, organizations, test data etc. After that they were looked into very carefully and compared to each other, and the SAP Portal and Fiori platforms were studied also in a general level. All these processes provided valuable research data for this study.

Empirical data was also collected from a specific test group (N=5) formed by voluntary senior and manager level specialists from Accenture that didn't have earlier experience on the Fiori applications of the SAP Travel management. The data from the test group

was gathered in the interviews on the selected basic functions of the travel management system and on the noticed special features of the both compared systems.

The interview results gave a clear picture of the reciprocal ranking of the two tested applications. The majority of the testers ranked all the feature solutions in the Fiori application better except for one. This feature was the assignment of the imported credit card transactions into the Travel expense report as expense which can be done more easier in the Portal Self-services. Otherwise based on this study Fiori offers the users more modern and clearer user experience with the possibility to use the mobile devices. For example, with a Fiori client it is possible to start the creation of the Travel expense report already during the trip by adding photos on the receipts as attachments by utilizing the mobile device camera.

The replacement of the Portal with Fiori sets new requirements also for the personnel. As for the maintenance, replacing the Portal with Fiori launchpad and applications means smaller licensing fees since in contrast to the Portal, Fiori does not need separate SAP licenses. This means the change brings also financial benefits, but on the other hand there will be some training costs in order to upgrade the knowledge to the needed level in the organization. The maintenance personnel need new skills since instead of maintenance of the Portal they need to maintain the SAP Content gateway and the ABAP front-end servers (FES) as well as the OData services. And when it comes to the support personnel, earlier they have maintained the Portal roles and the WDA application authorizations, but with the Fiori they need to maintain the roles and authorization to the OData services, the Application catalogues and the group.

Also, the developers will face some changes in their work. Until the transition, when developing the WDA applications, the developer could have managed with the build-in transaction SE80 acting as IDE, and the Web Dynpro ABAP and ABAP OO knowledge. For the Fiori development SAP recommends the SAP Web IDE and the developer needs a new set of skills such as HTML5, Java script, SAPUI5, OData, ABAP and CSS.

The outcome of studying the development of the custom Fiori application was the SAP Office Inbox Viewer. This application was developed to fill a clearly identified gap in the Fiori functionalities, more precisely to show the SAP Office mail messages. The development process of the SAP Office Inbox Viewer was relatively easy and fast as the basic UI concept and data model could be created with the application wizard. This part of the

process didn’t require any programming skills. The details needed for the front-end functionality and the business logic of the OData service as well as the overall finalizing required more work and programming skills because they had to be programmed from the beginning.

The custom application provides a view to the SAP Office mail messages separating the unread from the already read messages and gives the user an opportunity to delete selected messages or mark them as read or unread.

The chosen SAP development tool’s wizards and templates provide an easy way for the creation of the specific type SAPUI5 application user interfaces in accordance with the Fiori design philosophy. The needed custom OData Service for the application was created using the SAP Gateway Service Builder which provided a general framework for the OData service on which the actual business logic was programmed.

9.2 Future Recommendations

When making a transition to Fiori, it should be noted that at least the Fiori's Travel management applications, despite of many benefits, do not contain all the functionalities of the previous Web Dynpro ABAP applications and Fiori will not provide the language translations for all the supported country versions. This should be paid attention to in the resource planning as time, money and training will be needed in case some custom functionalities or language translations are required. However, before starting the custom development one should check the latest SAP notes regarding the possible new application versions to avoid unnecessary double work as SAP still seems to add missing functions to the applications.

In this study the area of interest was Fiori's Transactional applications. There are two other application types, the Fact Sheet applications and the Analytical applications, which require the SAP HANA database. Due to the link to the SAP HANA database and the possibility to use informative graphic charts in the Fiori launchpad it would also be interesting to look more closely into these applications which could not be included here in more detail due to the limited size of this study.

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Appendix 1: Test Case

The following test case was used when test group tested and compared creation of Travel requests and travel expense report and approval using SAP Portal Self-services and Fiori apps from Fiori launchpad.

Test and compare creation of Travel requests and travel expense report and approval using Web Dynpro ABAP applications from SAP Portal Self-services and Fiori apps from Fiori launchpad.

You are planning a 3-day business trip to the Rovaniemi starting on the 1st of October 2018.

Your plan is:

Day 1:
- Leave home at 06:15 and drive 10km (own car) to the Helsinki-Vantaa airport
- Take a flight AY531 to Rovaniemi at 7:45
- Take a bus from the Rovaniemi airport to the customer's office
- Ask a friend to pick you up from the office after the workday at 17:00

Night 1:
- Stay at your friend's home

Day 2:
- Conference including a paid lunch and dinner
- After work, check in at the Hotel Santa Claus using corporate business credit card
- Watch a movie on the hotel's pay-tv

Night 2:
- Stay at the Hotel Santa Claus

Day 3:
- Take a bus to the Rovaniemi airport after work
- Take the flight AY536 to Rovaniemi at 18:15
- Pay the parking fee using corporate business credit card at Helsinki airport
- Be back at home at 20:00

Tasks:

1. Create a ‘Travel request’ for ‘Workshop and conference in Rovaniemi’ and estimate costs to be roughly 900€
2. Act as a supervisor and approve the ‘Travel request’ (Manager self-service)
3. Create a ‘Travel expense report’ including
    a. Per diems according to the travel time - deduct paid lunch and dinner
    b. Per diems for accommodation
    c. 2 x 10km mileages to airport and home
    d. Flight tickets 516€ as imported credit card transaction
    e. 2 x bus tickets 5,50€ as manually entered expenses with scanned receipts
    f. Hotel expenses 217€ as an imported credit card transaction, assign it to different cost center
    g. Pay-tv fee 5€ separated as private from hotel expenses
    h. Parking fee 35€ as an imported credit card transaction
4. Act as a supervisor and approve the ‘Travel expense report’

Appendix 2: Interview Questions

The following questions were used during the interview

1. Before this testing event, what kind of experience you have on travel management systems and travel management self-service functions?
   a) In SAP
   b) Other service providers

2. How do you feel about the different approaches to
   a. The main page view (Links to Services vs. Tiles), how well do they represent the needed functions?
   b. Document creation (roadmap with steps vs. master view and expenses)?

3. When comparing the functions of these two systems one function at the time:
   - Observations on the implementation of the following basic functions?
     - Outlook
     - The user experience
     - +/-
   - Which system do you prefer?

   a. Presentation of functions: Services vs. Tiles?
      - Thoughts?
      - What was easy?
      - What was difficult or unclear?
      - Which system do you prefer?
   b. General Data entry
   c. Saving draft
   d. Cost Assignment
   e. Per diems for meals reimbursement
   f. Per diems for accommodation reimbursement
   g. Mileage reimbursement information
   h. Calculated compensation values of per diems and mileages
   i. Receipt expenses
   j. Using available credit card transactions for creating Receipt expenses
   k. Viewing unassigned credit card transactions

4. Was it easy to find or figure out required functions? Explain?
   – Portal Self-services
   – Fiori apps

5. Was it easy use / figure out how to use them? Explain?
   – Portal Self-services
   – Fiori apps