

Support Ticketing System

by

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Document History

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Version	Date	Change
1.0	23.04.2017	Draft version prepared

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1 About this Document

1.1 Authors

Table 2 Authors

Name	Project Role
Ates, Ilkay	Business Analysis, Frontend Development
Luna, Marcia	User Interface Design, Frontend Development
Ritter, Marcus	Software Architecture, Frontend Development
Fayzullin, Shamil	Project Management, Backend & Frontend Development

1.2 Project Scope

Regarding the support requests of students in the previous years, necessity of a support ticketing system application has been established. This application is designed as a platform where students will find a variety of predefined solutions and additionally, they will have the possibility to create new tickets regarding their needs. There are three user types in this application: student, support team member and support team manager.

Students can search and view predefined solutions which will be organized by categories. In case they cannot find solutions regarding their requests or questions, they can create new tickets. After a ticket has been resolved, the student will be asked to fill a satisfaction questionnaire. This will provide the rating of the support and will be used for analytics to improve the system.

Support team members can create and edit solution categories which are necessary to facilitate solution search for students. They can create and edit predefined solutions and resolve tickets which are created by students.

Support team manager will be able to view all tickets. On the initial screen, a link to overdue tickets will be displayed. Support team manager can assign these tickets to support team members. Additionally, analytics will be provided for support team manager which can be filtered for a specific period and/or responsible support team member. Different analytics will be displayed based on the ticket status or ratings of the provided solution.

1.3 Document Structure

This document is structured as follows:

Chapter 1 of this document includes project scope and formal aspects about the project and team members.

Chapter 2 describes the design thinking with methods of personas and user experience journeys.

Chapter 3 includes software requirements.

Chapter 4 describes the solution in relation to requirements described in chapter 3.

Chapter 5 provides a list of references.

1.4 Glossary

Table 3 Glossary

Term	Abbreviation	Definition
SAP Cloud Platform		SAP HANA Cloud Platform is an in-memory cloud platform based on open standards. It provides access to a feature-rich, easy-to-use development environment in the cloud. The platform includes a comprehensive set of services for integration, enterprise mobility,

		collaboration, and analytics. (SAP, 2016b)
SAPUI5		JavaScript UI library that is maintained by SAP SE and based on the HTML5 standard. Used for building mobile and desktop applications running in a browser. (Andreas Kunz, 2013)
Fiori		Fiori applications are built with SAPUI5. SAP Fiori apps follow the SAP Fiori Design Guidelines (framework) to ensure consistent design and a high level of design quality and at the same time allow porting to mobile devices. For more information, please see https://experience.sap.com/fiori-design/ . (SAP, 2017e)
OData protocol	OData	OData (Open Data Protocol) is an OASIS standard that defines a set of best practices for building and consuming RESTful APIs. (ODATA, 2015)
SAP Adaptive Server Enterprise	SAP ASE DB	SAP ASE is a high performance relational model SQL database server optimized for transaction-based applications (OLTP), originally developed by Sybase Corporation. (SAP, 2017b)
SAP NetWeaver		SAP NetWeaver is the on-premise technical foundation for the SAP Business Suite and for the on-premise edition of SAP S/4HANA. The NetWeaver Application Server serves as runtime environment for the SAP applications and the Business Suite solutions. (Karl

		Kessler, 2015)
Hana Cloud Connector	HCC	<p>Now also known as SAP Cloud Platform cloud connector, it serves as the link between on-demand applications in SAP Cloud Platform and existing on-premise systems.</p> <p>The cloud connector acts like a reverse invoke proxy between the on-premise network and the SAP Cloud Platform, while it runs as a on-premise agent in a secured network. (SAP, 2017c)</p>

2 Design Thinking

2.1 Students

2.1.1 Persona

Jane is a master student with a Bachelor degree in business administration. She has average computer skills, so she needs some technical support when she has to deliver assignments for her lectures for which she needs to use some applications. She also needs help to get an access for student portal where all her lecture's content are published.

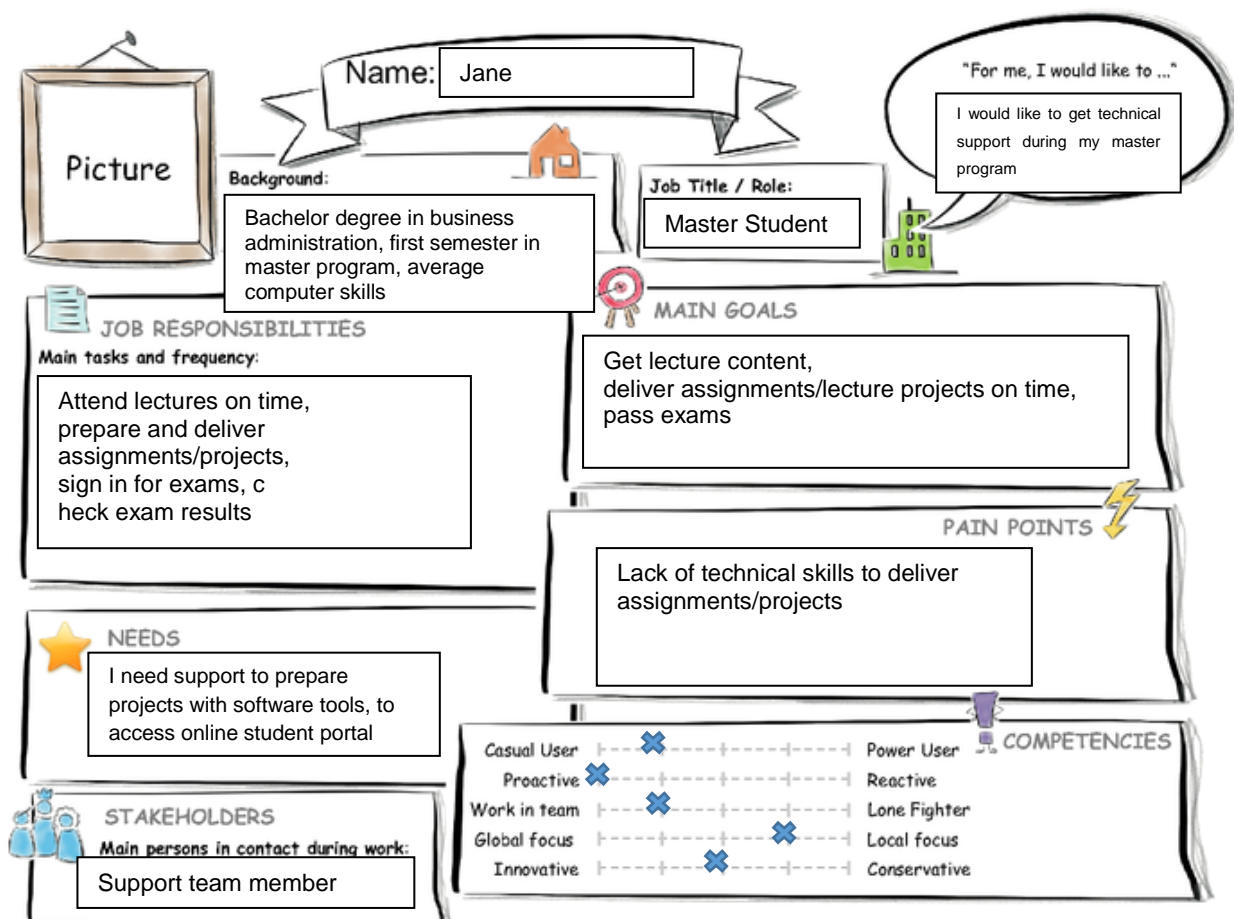


Figure 1 Student Persona (Bob Caswell, 2015)

2.1.2 Experience journey

A student needs the content of his lecture. To reach the content he needs access to student portal. He thinks of getting the content from a classmate but decides to ask for access to support team, because he will need it for the rest of his studies. He is concerned of being already late and considers talking to the teacher. After sending an email to support team he waits for a response. Next day he receives a response which describes how to get access to the portal.

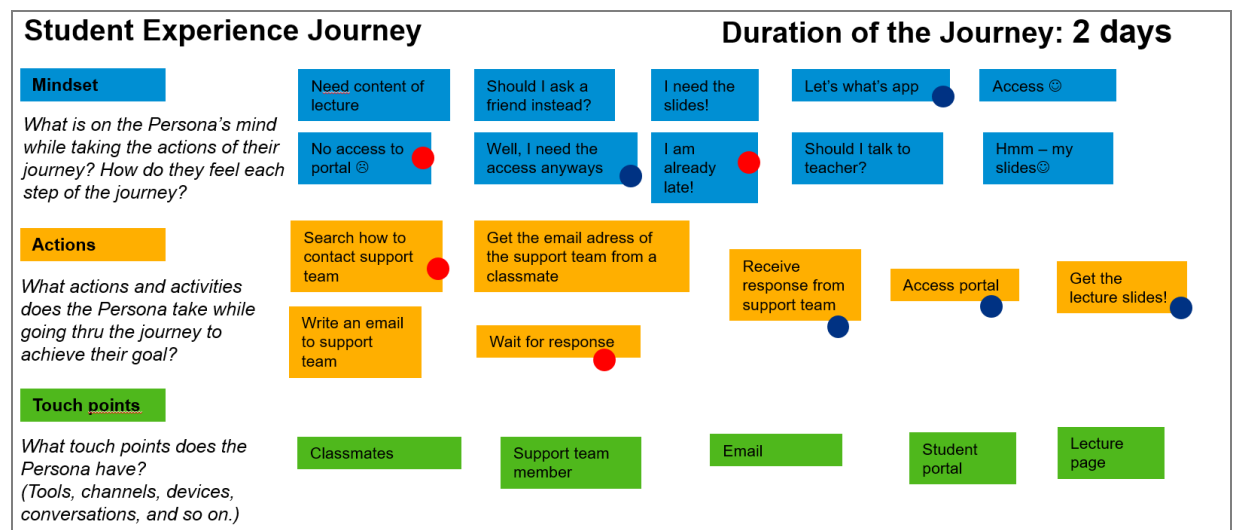


Figure 2 Student Experience Journey (Bob Caswell, 2015)

2.2 Support Team Member

2.2.1 Persona

Marc is a member of support team. He studied information systems and has 3 years of work experience in IT departments of several companies. He would like to achieve high performance on delivering support on time. To reduce his response time to the requests, a dashboard with a list of open tickets would be very helpful for him. The strongest pain point for him is the communication with the requester. He needs a platform where he can see all communication history to follow up the case easier.

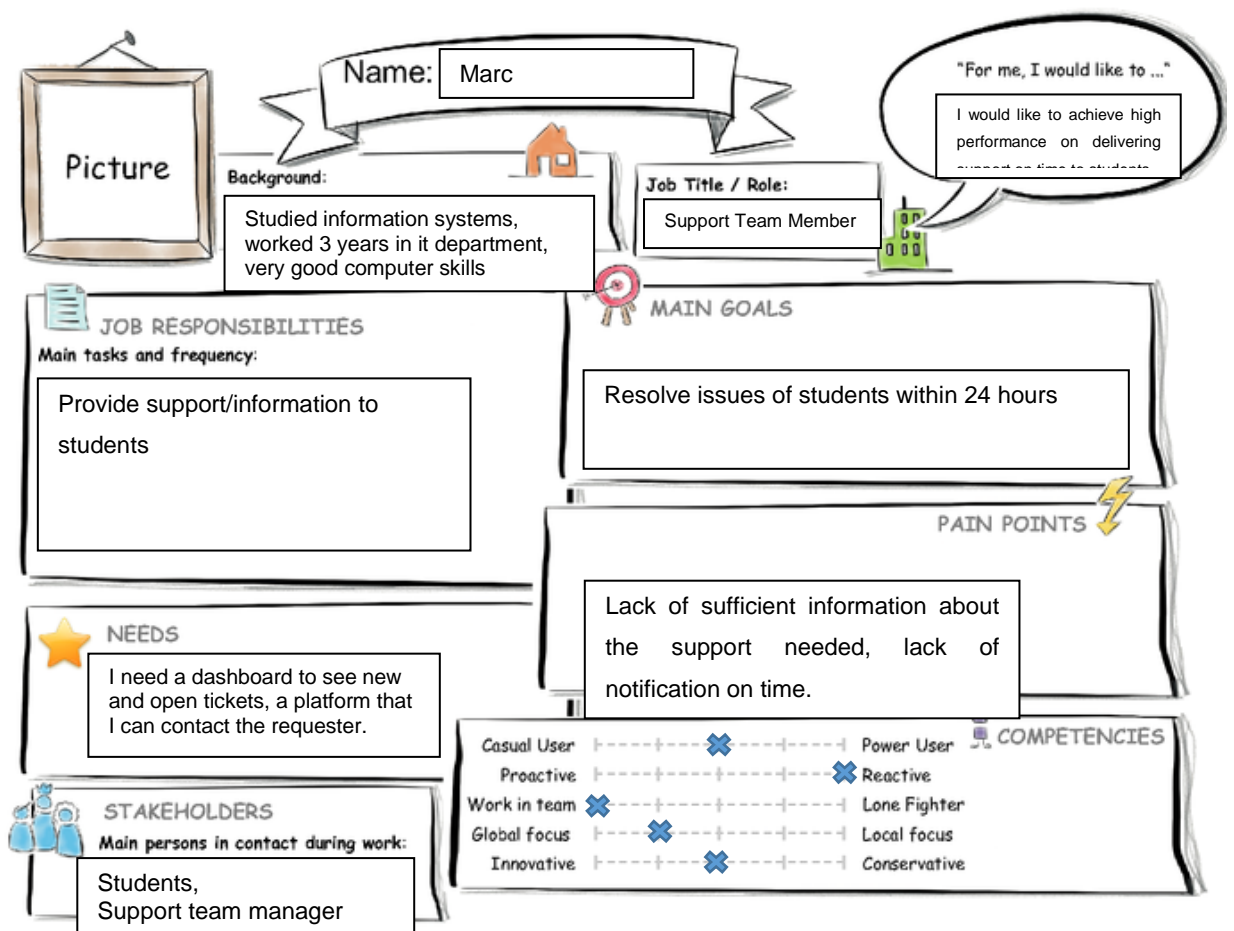


Figure 3 Support Team Member Persona (Bob Caswell, 2015)

2.2.2 Experience journey

Support team member opens his mailbox to read the support mails. He has to read them to find out which one is more urgent. In some cases he needs extra information from the requester and waits for his response to solve the issue. When he has all necessary information, he sends the solution to the requester and waits for his confirmation.

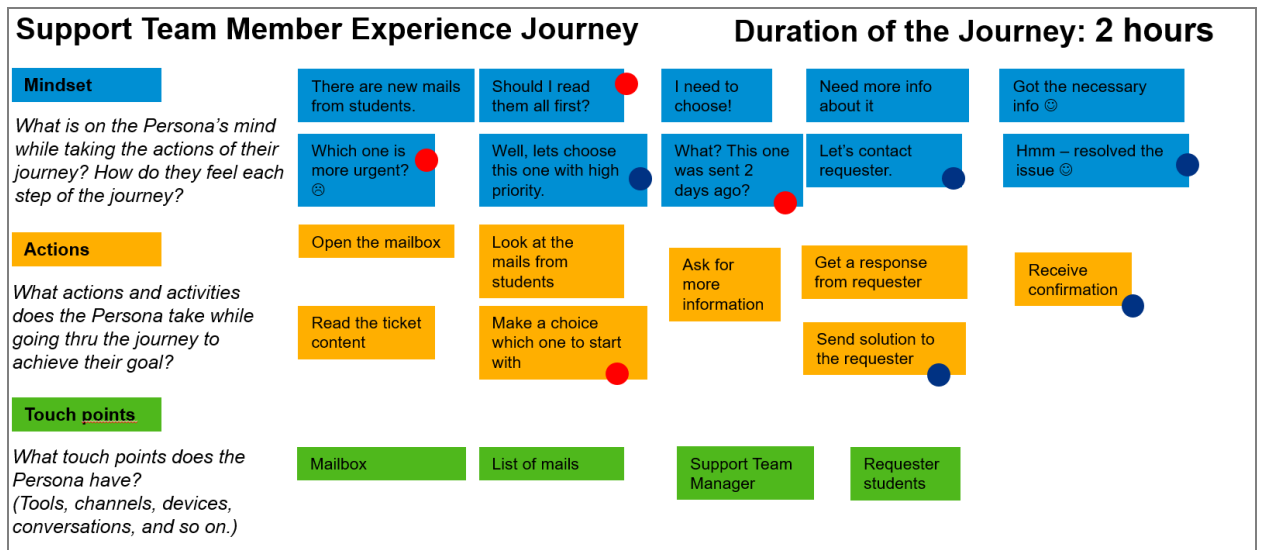
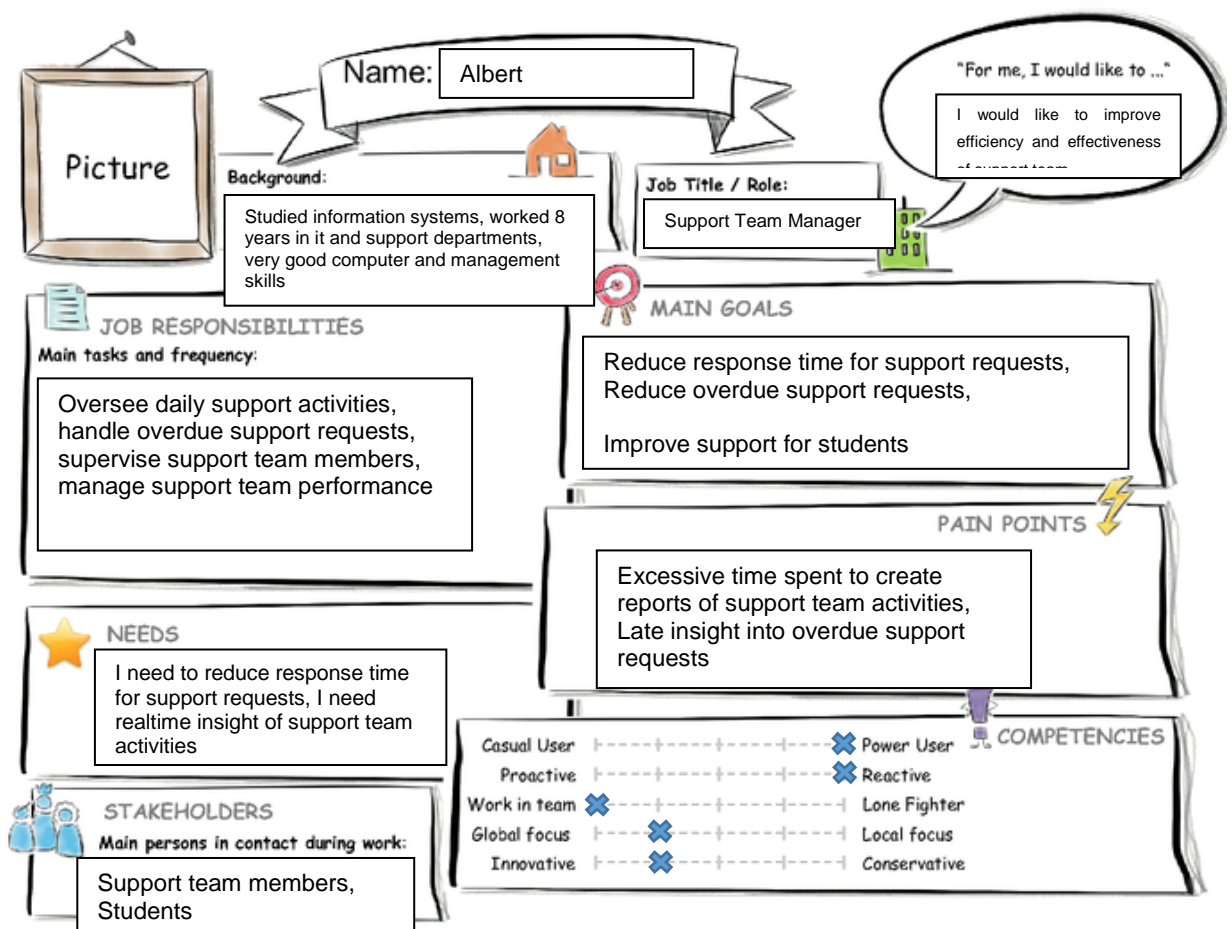


Figure 4 Support Team Member Experience Journey (Bob Caswell, 2015)

2.3 Support Team Manager

2.3.1 Persona

Albert is the support team manager. He studied information systems and worked for 8 years in IT and support departments of several companies. His goal is to improve efficiency and effectiveness of support team. He needs a real time insight for overdue requests so that he can assign them manually to avoid late support. He spends much time to create performance reports so analytics will facilitate his job to review performance of his team.



2.3.2 Experience journey

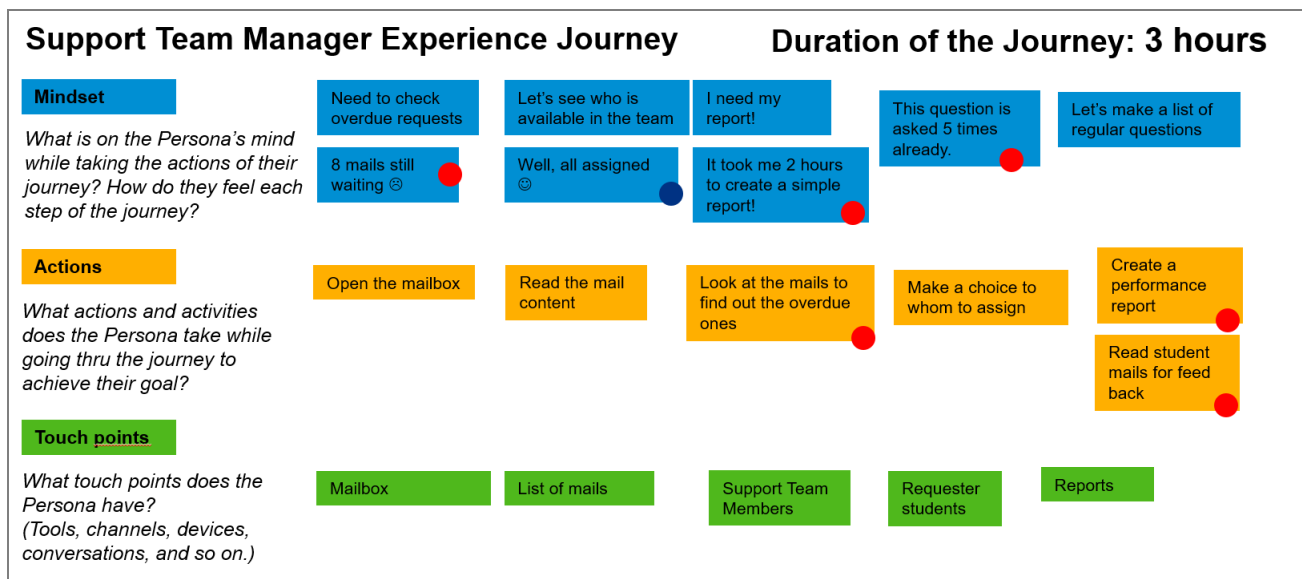


Figure 6 Support Team Manager Experience Journey (Bob Caswell, 2015)

3 Software Requirements

3.1 Business Requirements

Table 4 Business requirements

№	Requirement	Necessity
1	The Support Ticketing System should support the creation and maintenance of predefined solution categories.	Must have
2	The Support Ticketing System should provide functionality to create predefined support solutions and to categorize them.	Must have
3	The Support Ticketing System should support the creation of new support tickets.	Must have
4	For the process flow of a support ticket, the Support Ticketing System should support status changes of the ticket.	Must have
5	The support Ticketing System should provide notifications for the students, which will be displayed on initial screen and provide the number of tickets to be confirmed.	Nice to have
6	The support Ticketing System should provide notifications for the support team members, which will be displayed on initial screen and provide the number of open tickets.	Nice to have
7	The support Ticketing System should support support manager to assign tickets to support team members.	Must have
8	The support Ticketing System should provide notifications for the support manager, which will be displayed on initial screen and provide the number of overdue tickets.	Nice to have
9	After a ticket is been resolved, the Support Ticketing System should provide a questionnaire to gather the rating of the provided support.	Nice to have
10	The Support Ticketing System should provide analytics for support manager which will be filtered based on ticket status or rating of support team members.	Nice to have

3.2 User Stories

Table 5 User Stories

As a	I want to...	so that...
student	search for support solutions	I can find solutions for my issues.
student	create new tickets	I can get support for my issues which I cannot solve with predefined support solutions.
student	see a list of my tickets	I can follow up their status and view provided responses.
support team member	create support solution categories	I can categorize the support solutions.
support team member	create support solutions	I will not need to provide support for the same issues repeatedly.
support team member	see a list of open tickets	I can provide support on time.
support team manager	assign overdue tickets	I can reduce tickets which are waiting for support since more than 48 hours.
support team manager	see a list of overdue tickets	I can assign them.
support team manager	view analytics	I can have an insight of team performance.

3.3 User Interfaces

Support Ticketing System should comply with the following requirements:

1. Support Ticketing System should support use of the following web browsers (IE, Chrome, Edge).
2. Support Ticketing System should be used on PC, tablets and smartphones.
3. Support Ticketing System should be based on HTML5.

4. Support Ticketing System should follow user-friendly interface design principals.

3.4 Roles and Authorizations

Support Ticketing System should support a role-based authorizations and access control. This system will be used by different users that can have the following roles based on associated scenarios and authorizations:

1. Student
2. Support Team Member
3. Support Manager

The following table describes typical work tasks for each business role in more detail:

Table 6 Work tasks according to their business roles

Student	Support Team Member	Support Team Manager
<ul style="list-style-type: none">• Create new ticket• Response ticket• Confirm ticket• Give feed-back for provided support• Search predefined solutions	<ul style="list-style-type: none">• Create predefined solution categories• Create predefined solutions• Resolve Tickets	<ul style="list-style-type: none">• Assign Tickets• Display Analytics

4 Solution

4.1 Solution Overview

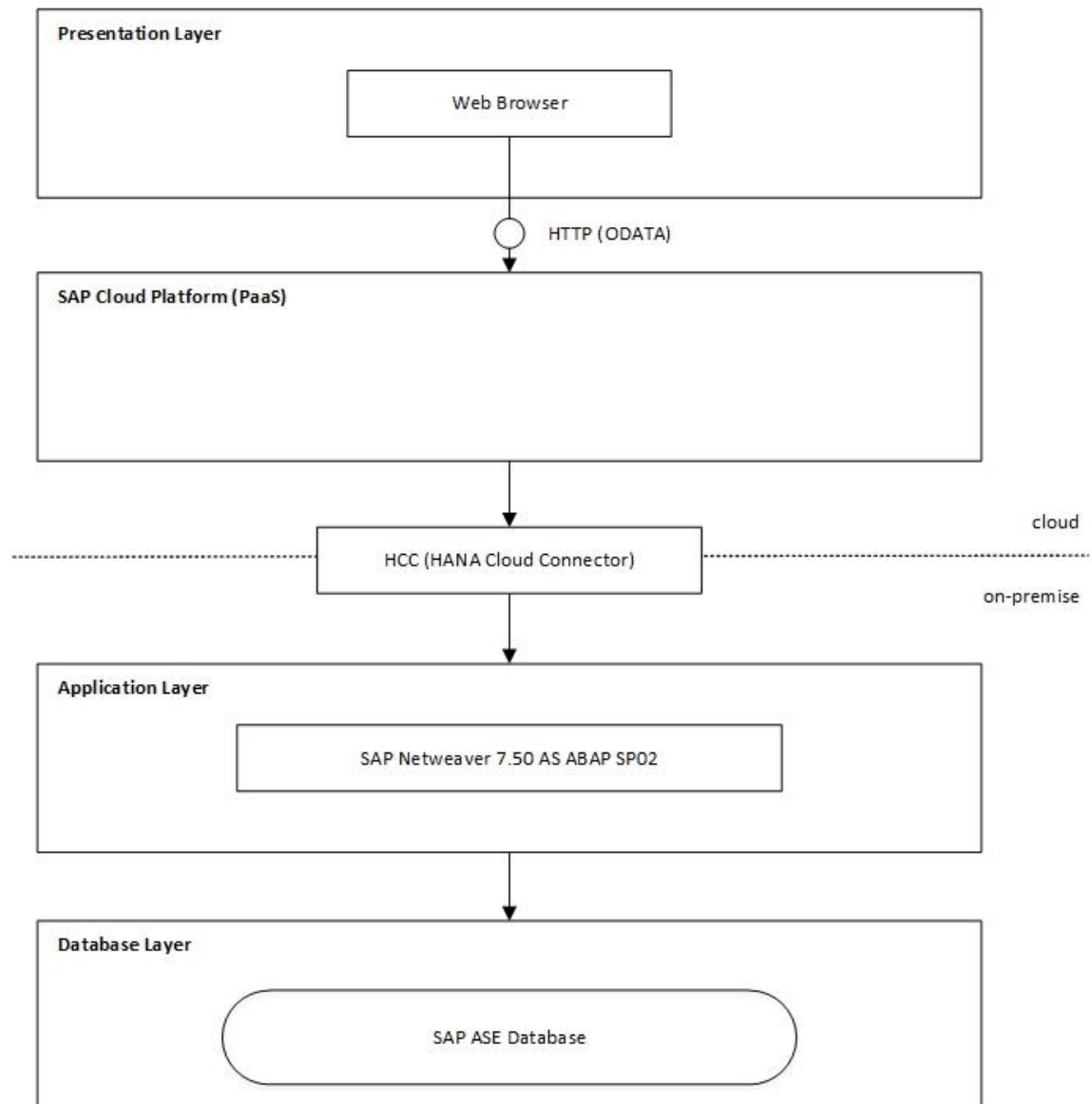


Figure 7 Solution architecture

The Support Ticketing System uses three tier client-server architecture pattern and therefore consists of three layers: presentation layer, application layer and data layer. Additionally, SAP Cloud Platform as a PaaS comes into play. The use of this architecture allows the development of the user-interface, business logic and database layer as independent modules. This also makes it possible to have the different layers on separate platforms using different technologies. In case an update is necessary only the effected layer needs to be updated or replaced without influencing the other ones. (Wikipedia, 2017) The idea behind this architecture was taken according to the SAP courses SAPUI5 and Build your own SAP Fiori app in the cloud. (Raz Korn, 2016) (Janina Bläsius, 2016) Additionally, the course Extending SAP S/4HANA with SAP HANA Cloud Platform was used to set up the required infrastructure. (Thomas Bieser, 2017)

Presentation layer:

The presentation layer is directly accessed by the user and presents the information computed or provided by the application, other layers. In this case the user accesses through a browser a SAPUI5 application which presents him the information processed by the business logic. The client side application uses the OData Protocol to communicate with the SAP Cloud Platform per REST Api (Http calls). (ODATA, 2015)

SAP Cloud Platform and HCC:

The SAP HANA Cloud Platform is an in-memory cloud platform based on open standards. It is a PaaS (Platform as a Service) that offers a comprehensive set of services for integration, enterprise mobility, collaboration and analytics. In this case SAP Cloud platform is used for client side application development with SAPUI5, Fiori and hosting the developed services, so that they can be accessed by the users.

The HCC (Hana Cloud Connector) serves as the link between the on-demand applications hosted on the SAP Cloud Platform and the existing on-premise system these applications need to be connected to.

Application layer:

The application layer contains the business logic of the application and controls the functionality. In this case the application layer consists of a on-premise SAP NetWeaver 7.5 system, which is connected via the HCC to the on-demand hosted SAPUI5 applications on the SAP Cloud Platform. The SAP NetWeaver builds the technical foundation and brings the runtime environment for the ABAP backend of the application, that's is running on this system.

Data layer:

The database layer stores data persistently and makes it available to the services and applications which want to access it. In this case a SAP Adaptive Server Enterprise (ASE) relational model SQL database server is used. The ABAP backend in the SAP NetWeaver will accesses the ASE database server and get the needed data and process it for the client side of the application.

4.2 User Interfaces

In order to meet the customer's user interface requirements, the SAP Fiori design guidelines were applied (SAP, 2017e). Additionally, SAP Design Stencils for Microsoft PowerPoint were used to create low-fidelity Wireframes and in a second step enhanced to Visual Designs (SAP, 2016a). Furthermore a high-fidelity prototype was created with build.me (SAP, 2017a). According to this high-fidelity prototype the Support Ticketing System will be developed using the SAP Fiori framework. This framework is based on SAPUI5 libraries (HTML5) which allow the creation of responsive interfaces for different types of devices like laptops, mobiles, PCs and browsers e.g. IE, Chrome or Edge. The pursued approach and used methodology is based on the SAP Course "Build your own SAP Fiori App in the Cloud – 2016 Edition" (Raz Korn, 2016).

The high-fidelity prototype does not cover all possible use case scenario. Nevertheless, it shows the key functionality of the Support Ticketing System and provides an example for the look and feel of the finalized user interface. The following subsections present three basic usage scenarios in respect of the different user groups: Students, Support Team Members, Support Team Managers.

4.2.1 Student

Login

Following figure displays the login screen of the Support Ticketing System. Based on the entered user credentials, role of the user will be identified and next screen will be displayed based on the role of the user.



Figure 8 Fiori Launchpad Login screen

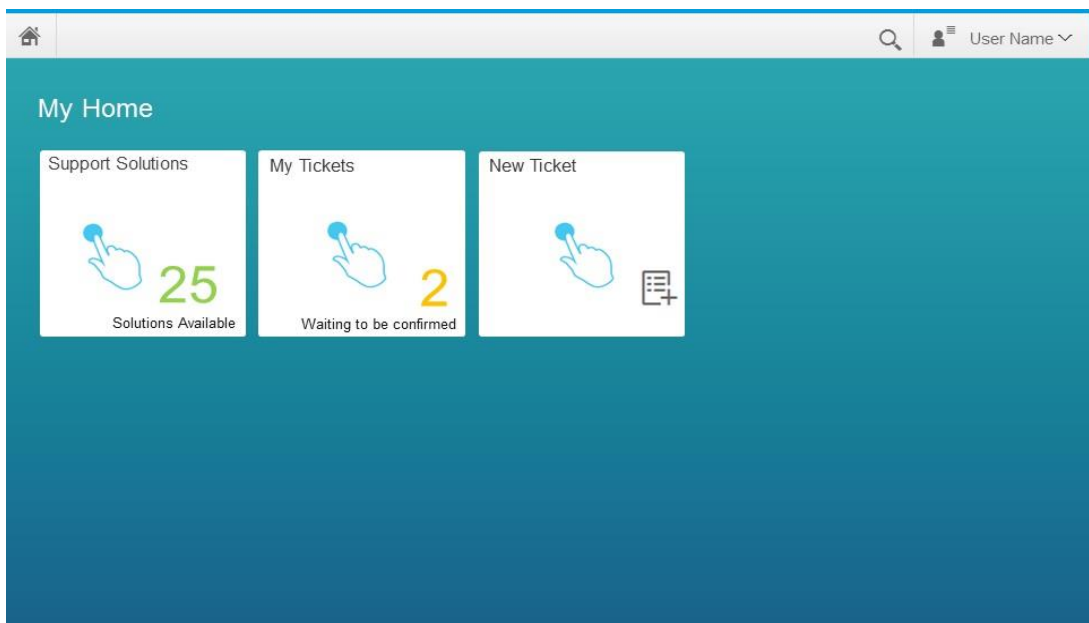


Figure 9 Fiori Launchpad Home screen for Student

My Home

On the initial screen of student, three links will be displayed; predefined solutions, tickets created by the student and new ticket.

Support Solutions

This screen consists of two panes. On the left pane, categories which include predefined support solutions will be displayed. Based on the choice of student, a list of predefined support solutions which belong to the related category will be displayed on the right pane.

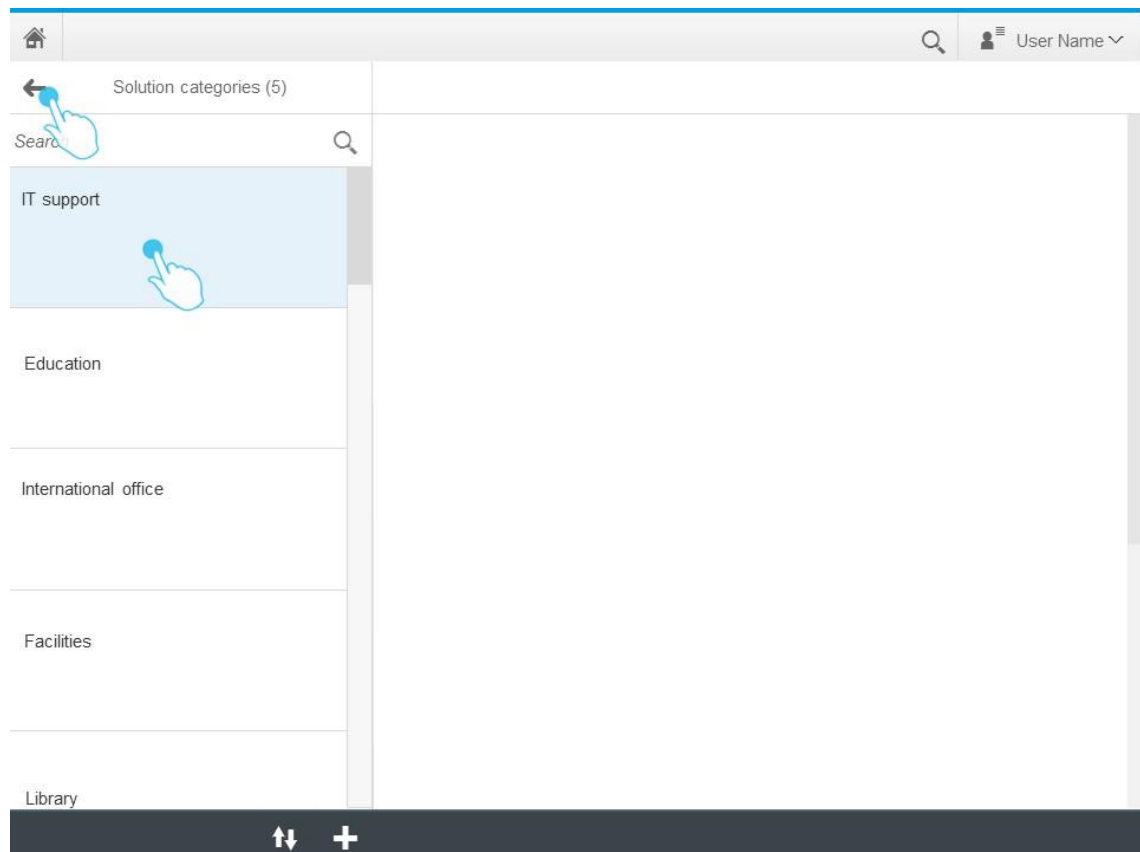


Figure 10 Predifined Support Solution Categories

Based on the choice of student, the content of selected predefined support solution will be displayed on the right pane.

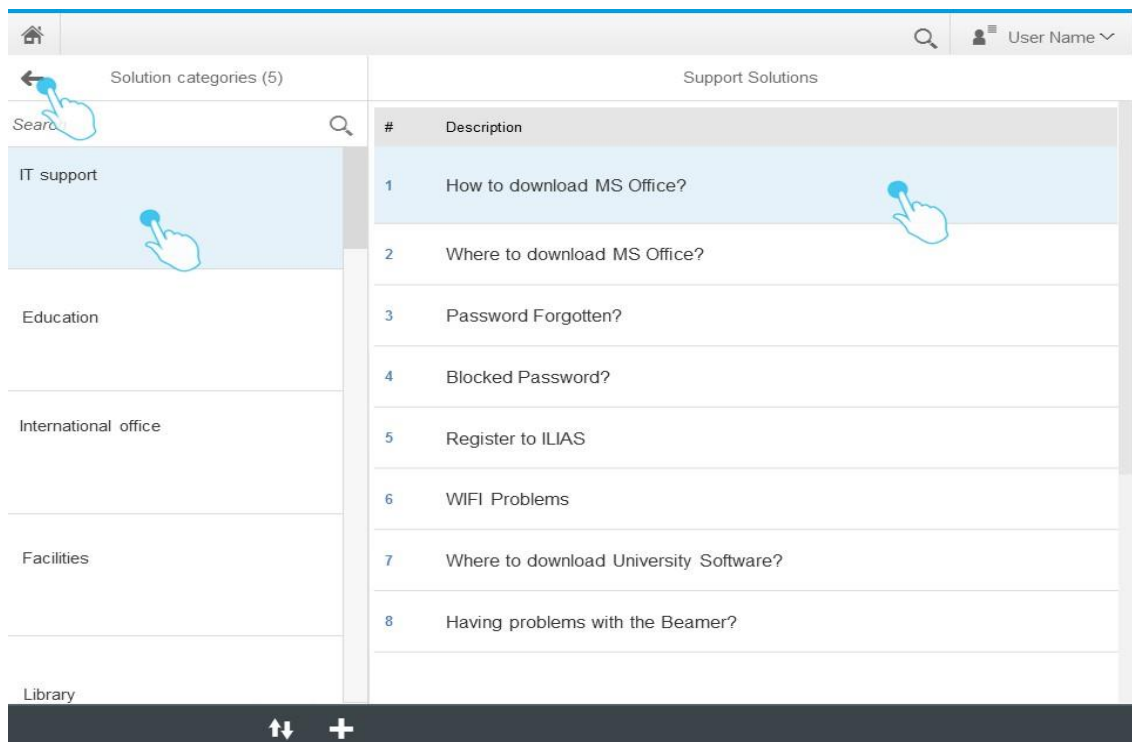


Figure 11 List of Predefined Support Solutions

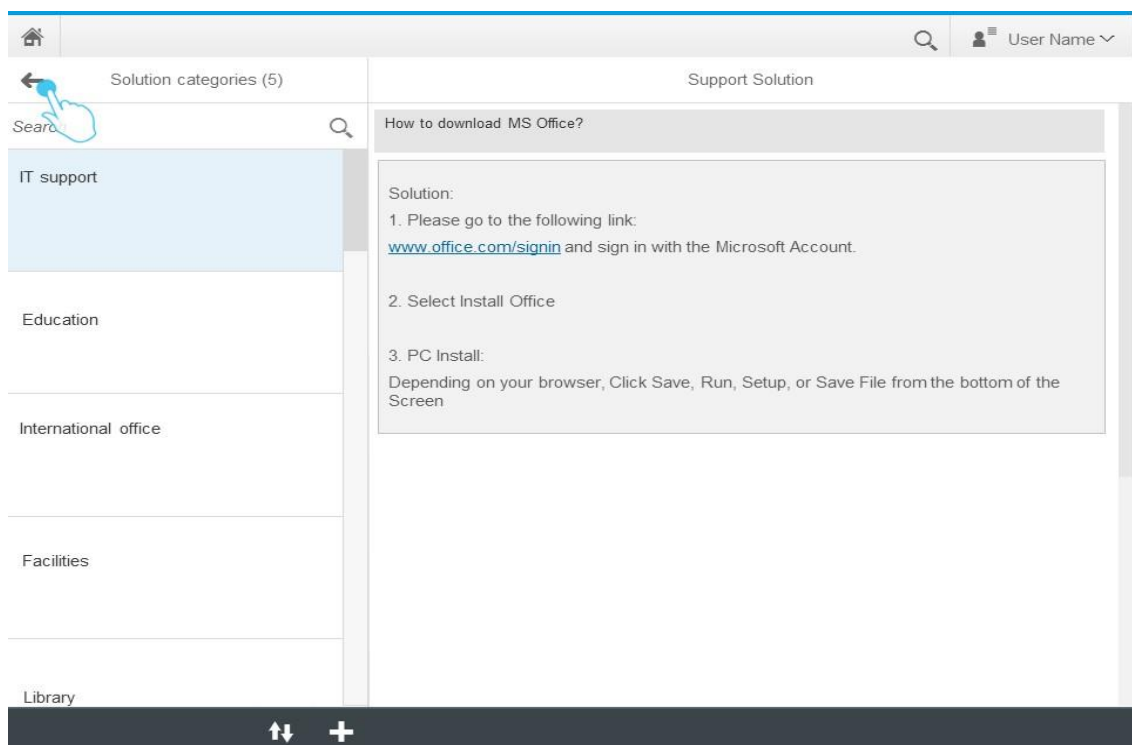


Figure 12 Predefined Support Solution

My Tickets

My Tickets screen consist of two panes; on the left pane, the list of tickets which are created by the student will be displayed. On the header, the number of tickets will be provided. Each ticket number will be listed with the current status of the ticket.

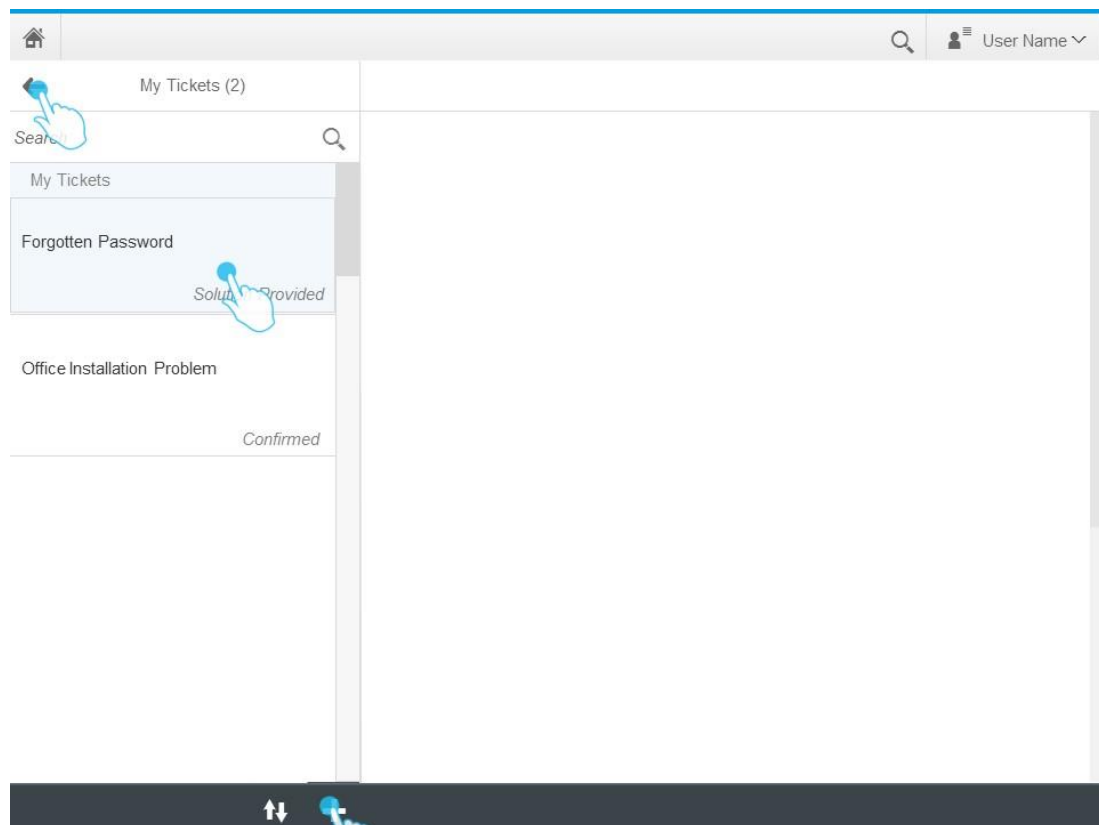


Figure 13 List of My Tickets

When the student clicks on of the tickets on the list, the details of this ticket will be displayed on the right pane. Based on the status of the ticket, student will be able to send a response or confirm the ticket.

The screenshot shows a web application interface for ticket feedback. The top navigation bar includes a home icon, a search icon, and a user profile dropdown labeled 'User Name'. The left sidebar has a 'My Tickets (2)' section with a search icon and a list of tickets: 'My Tickets', 'Forgotten Password' (marked 'Solution Provided'), and 'Office Installation Problem' (marked 'Confirmed'). The main content area is titled 'Ticket Details - Feedback'. It features a section 'Overall Service' with a text prompt: 'Considering your last IT support request, please rate on a scale of 1-5, 5 being extremely poor and 1 being perfect, the level of performance in each area of service'. Below this is a 5-point rating scale with radio buttons. A hand cursor is clicking the '2' button. Underneath the rating is a 'Comments:' label followed by a large text input area. At the bottom of the form are two buttons: 'Send' and 'Cancel'.

Figure 15 Feedback

New Ticket

On the New Ticket screen, following fields will be displayed:

Description: Short title, which will describe the content of the ticket.

Priority: A list with three options: low, medium, high.

Status: Disabled field to display the status of the ticket.

Category: Category of the ticket, which can be edited also by the support team members.

Issue Detail Description: Detailed description of the issue which needs support.

The screenshot shows a web application interface for creating a new support ticket. The interface is split into two main panels. The left panel, titled 'My Tickets (2)', contains a search bar with a magnifying glass icon and a hand cursor pointing to it. Below the search bar, there is a list of tickets. The first ticket is 'Forgotten Password' with the status 'Solution Provided'. The second ticket is 'Office Installation Problem' with the status 'Confirmed'. The right panel, titled 'New Ticket', contains a form titled 'Create New Ticket'. The form has four fields: '*Description:' with the value 'Block Password', '*Priority:' with the value 'High', 'Status:' with the value 'New', and '*Category:' with the value 'IT'. Below these fields is an 'Issue Detail' section with a 'Description:' label and a text area containing the text: 'I'm not able to access to any app, because my password has been expired and I didn't set up one before. Unfortunately, also my password is blocked. Could you please support?'. At the bottom of the interface, there is a dark blue bar with a search icon, a plus icon, and two buttons: 'Create' and 'Cancel'.

Figure 16 Create New Ticket

4.2.2 Support Team Member

Login

Following figure displays the login screen of the Support Ticketing System. Based on the entered user credentials, role of the user will be identified and next screen will be displayed based on the role of the user.

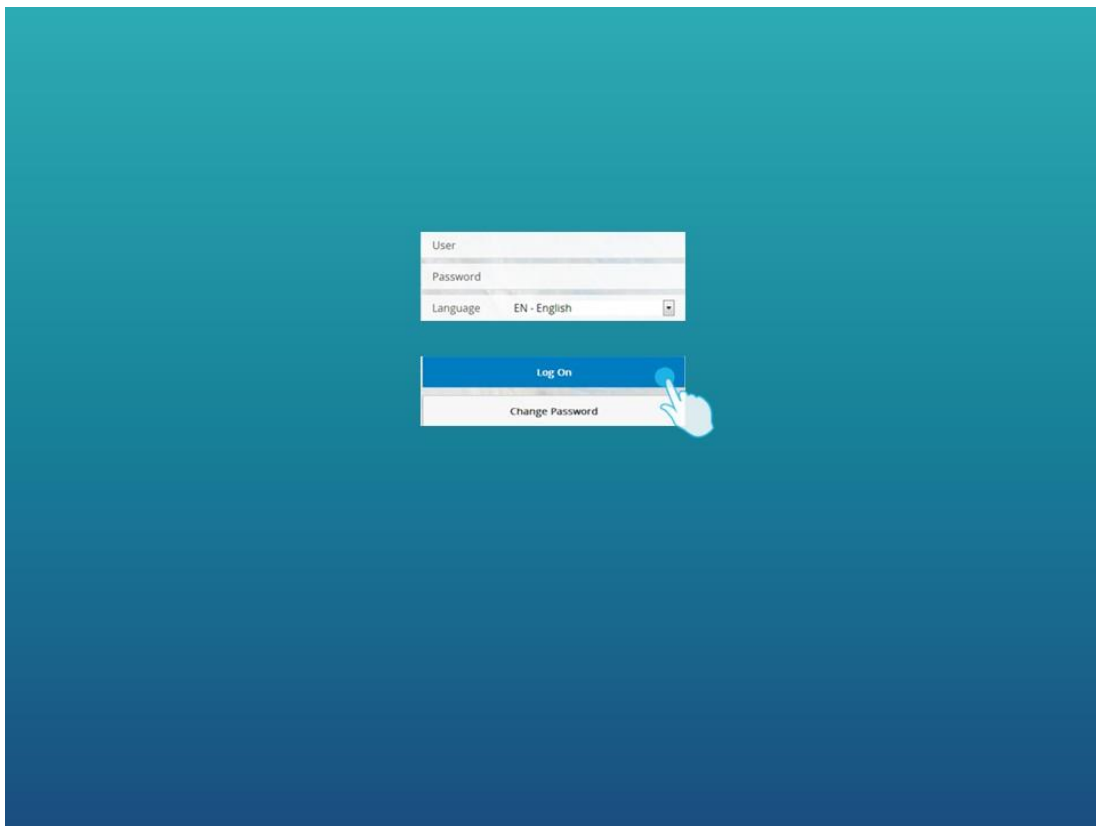


Figure 17 Fiori Launchpad Login screen

Home Screen for Support Team Members

On the initial screen of support team members, three links will be displayed; solution category, support solutions, open tickets.

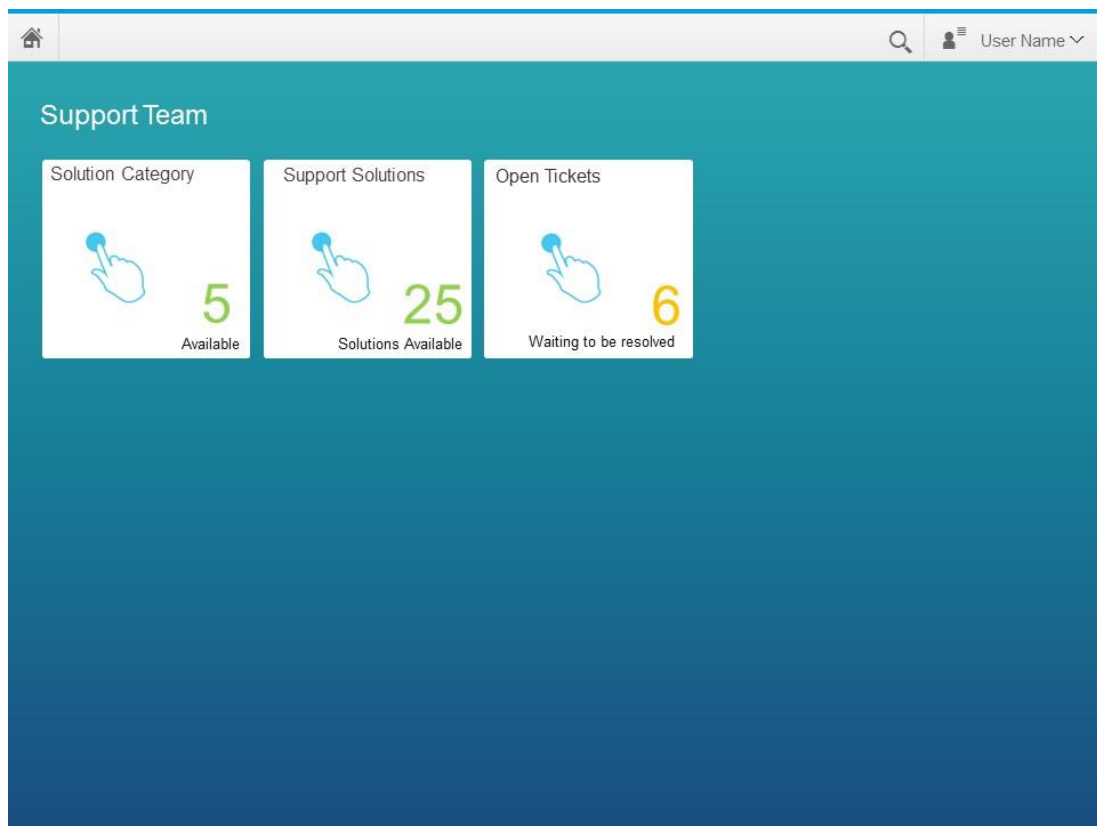


Figure 18 Fiori Launchpad Home screen for Support Team Member

Solution Category

This screen consists of two panes. On the left pane, categories which include predefined support solutions will be displayed. Based on the choice of the support team member, the details of the selected category is displayed on the right pane of the screen.

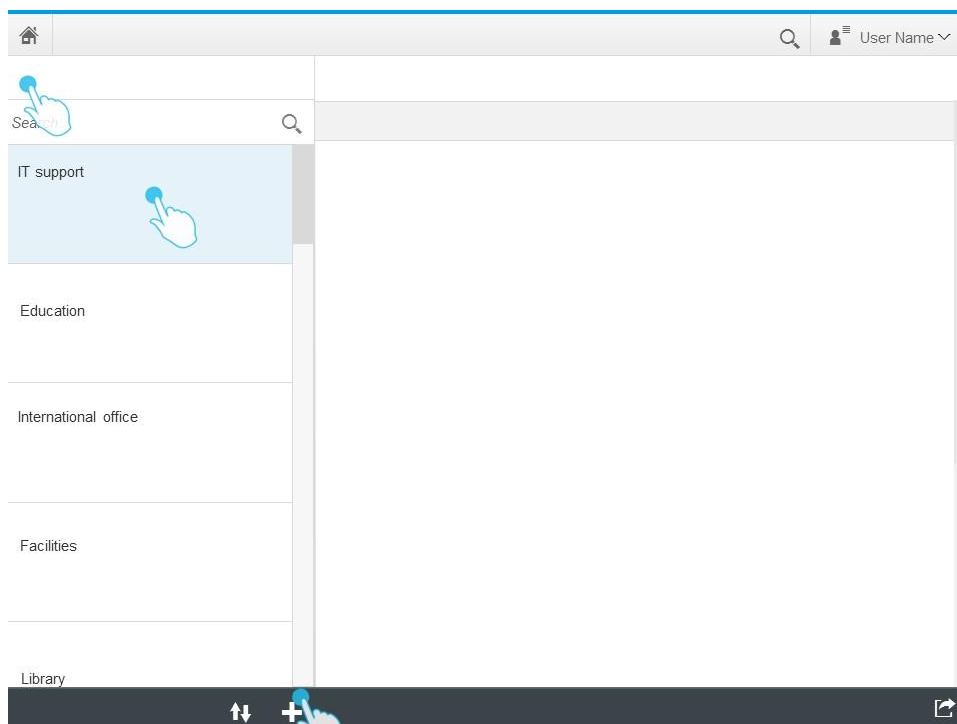


Figure 19 Solution Category Maintenance

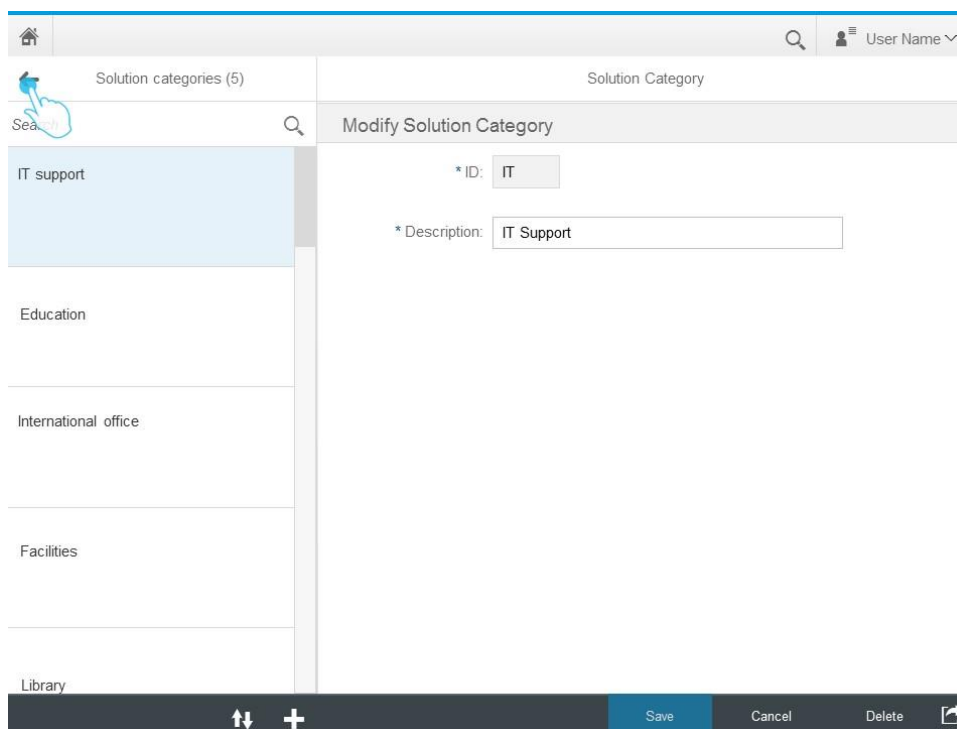
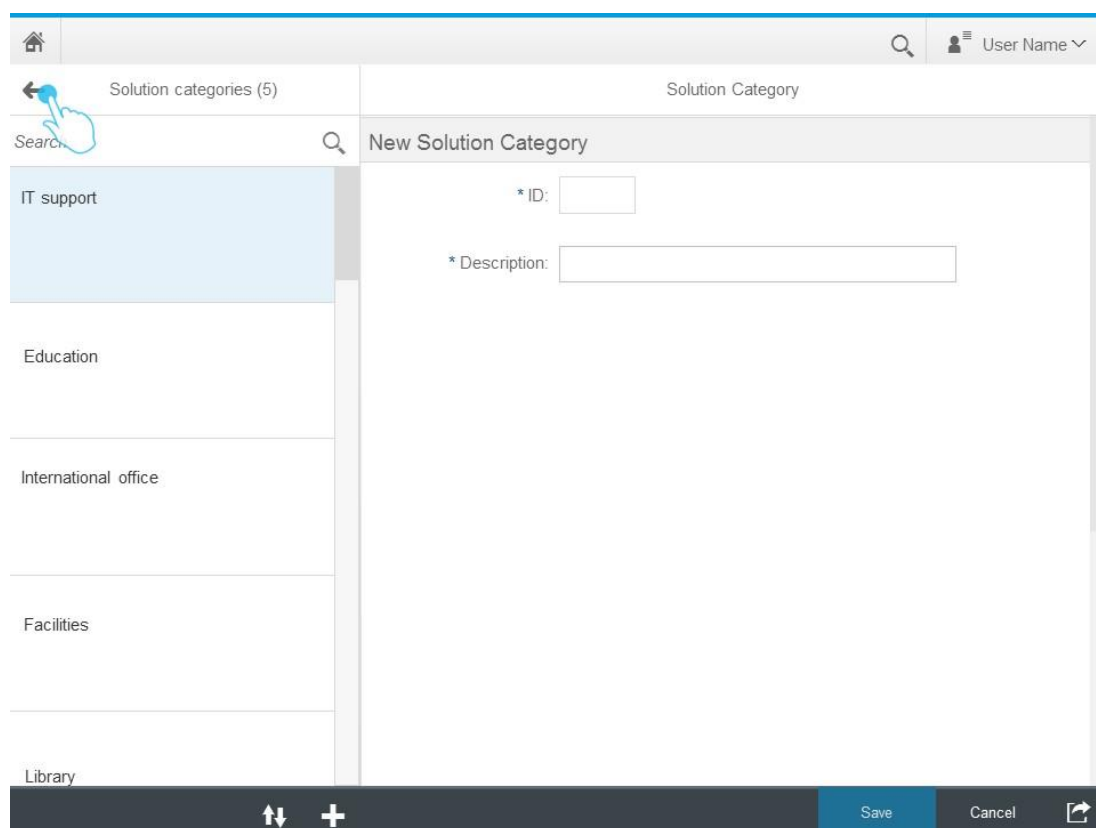


Figure 20 Solution Category Details

New Solution Category

When the support team member clicks on the plus button which is located bottom at the bottom of left pane, new solution category form will be displayed on the right pane of the screen. To create a new solution category, id and description fields should be inputted.



The screenshot shows a web application interface for creating a new solution category. The interface is divided into two main panes. The left pane, titled 'Solution categories (5)', contains a list of predefined categories: 'IT support', 'Education', 'International office', 'Facilities', and 'Library'. A blue highlight is visible over the 'IT support' category. The right pane, titled 'Solution Category', contains a form titled 'New Solution Category'. The form has two input fields: '* ID:' and '* Description:'. The bottom of the interface features a dark grey bar with a plus sign icon, a 'Save' button, a 'Cancel' button, and a share icon.

Figure 21 New Solution Category

Support Solutions

This screen consists of two panes. On the left pane, categories which include predefined support solutions will be displayed. Based on the choice of the support team member, the predefined solutions of the selected category are displayed on the right pane of the screen.

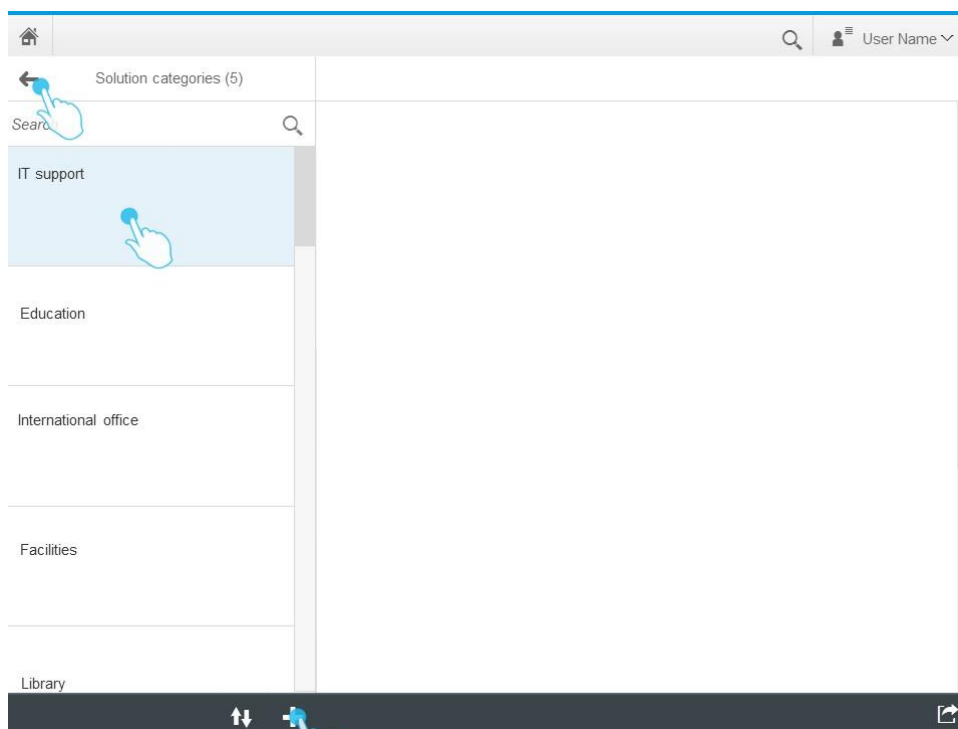


Figure 22 Predefined Support Solution Maintenance Category List

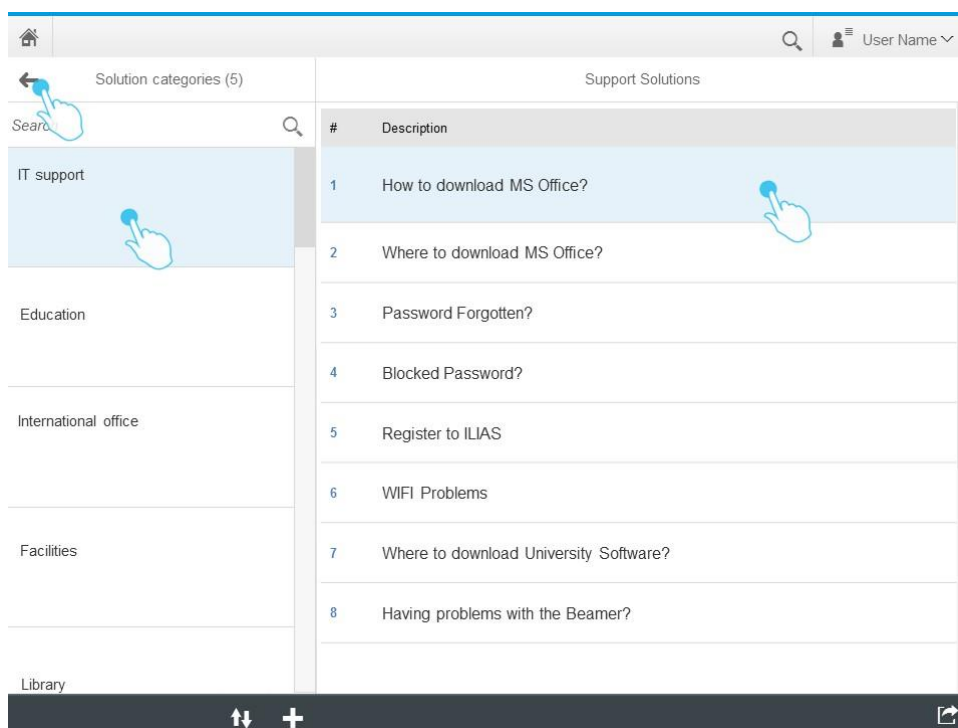


Figure 23 Predefined Support Solutions Maintenance Solution List

Modify Support Solutions

When support team member clicks on a predefined support solution description, which is listed on the right pane, the details of the selected predefined support solution will be displayed on the right pane of the screen. Here, the predefined support solution can be modified and saved.

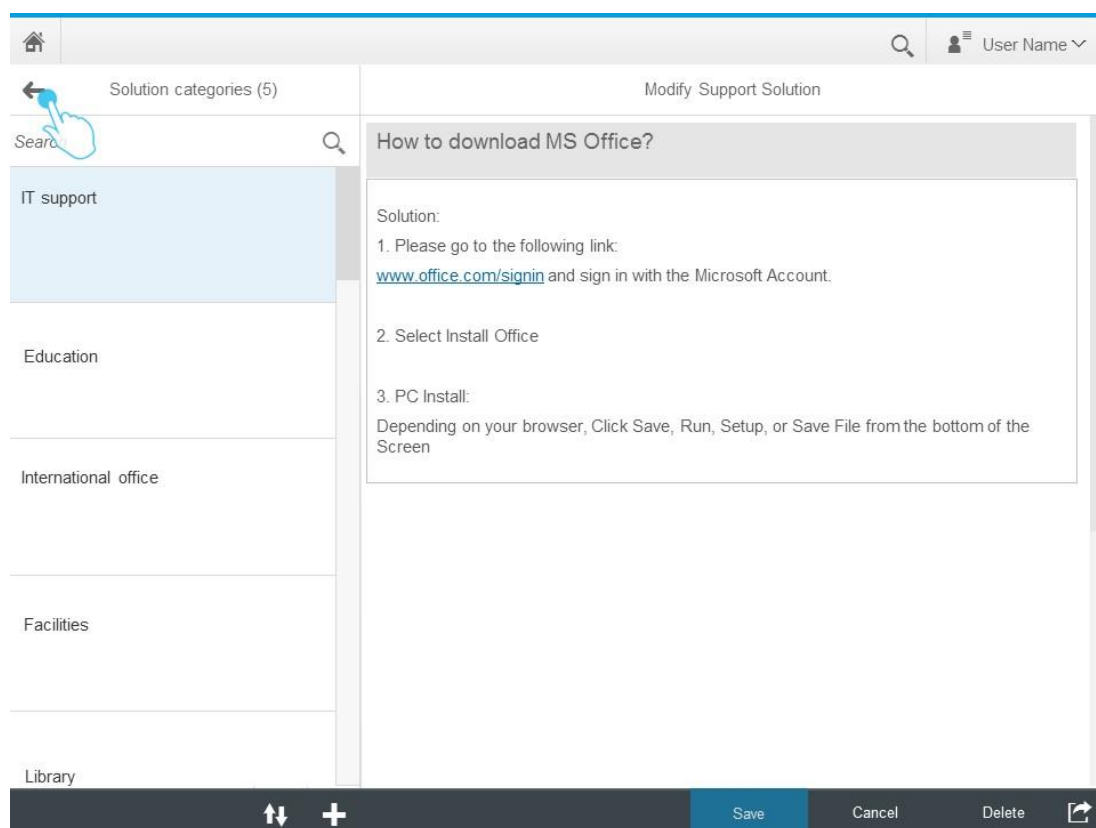


Figure 24 Predefined Support Solutions

New Support Solutions

When the support team member clicks on the plus button, which is located at the bottom of left pane, new support solution form will be displayed on the right pane of the screen. To create a new support solution, issue description, category and solution description fields should be inputted.

Home Search User Name ▾

Solution categories (5)

IT support

Education

International office

Facilities

Library

New Support Solution

Create New Support Solution

Issue Description:

Category:

Solution Description:

Save Cancel Delete

Figure 24 New Support Solution

Home Search User Name ▾

Tickets (6)

My Tickets

Forgotten Password Open

Office Installation Problem Open

Email not Working Open

No information in my Profile Open

No access to ILIAS

Save Cancel Delete

Figure 25 Open Tickets List

Open Tickets

This screen consists of two panes. On the left pane, descriptions of the open tickets will be listed. When the support solution member clicks on a specific open ticket, details of the selected ticket will be displayed on the right pane. To provide support, the support team member will fill the solution field and click on send button.

The screenshot displays the 'Open Tickets' interface. The left pane, titled 'Tickets (6)', lists several tickets under the 'My Tickets' section. The 'Forgotten Password' ticket is selected, indicated by a blue highlight and a hand cursor. The right pane, titled 'Ticket', shows the details for the selected ticket. The 'Description' field contains 'Forgotten Password'. The 'Priority' is set to 'High', 'Status' is 'Open', and 'Category' is 'IT'. The 'Detail Description' field contains the text: 'Hello IT, I do not remember my Password. Could you please support me with a new password. Thank you and Regards'. The 'Solution' field is empty. At the bottom of the interface, there are 'Send' and 'Cancel' buttons.

Figure 26 Open Ticket Details

4.2.3 Support Team Manager

Login

Following figure displays the login screen of the Support Ticketing System. Based on the entered user credentials, role of the user will be identified and next screen will be displayed based on the role of the user.

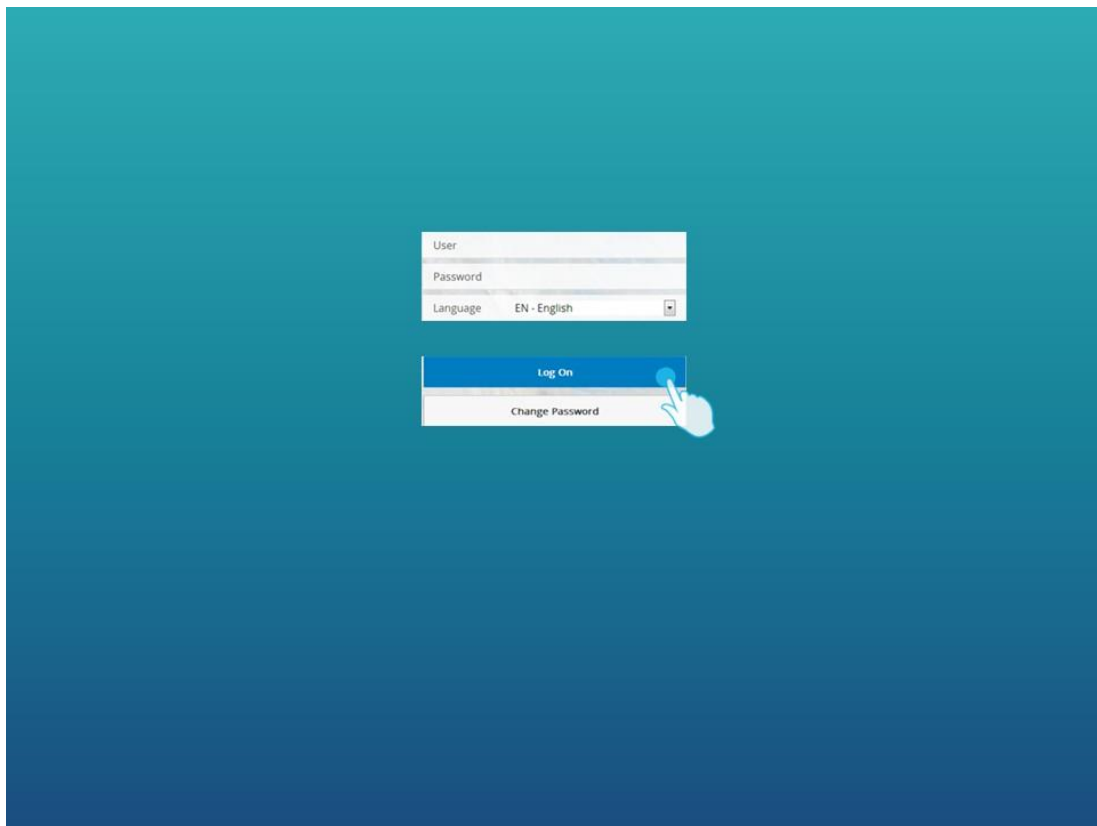


Figure 27 Fiori Launchpad Login screen

Home Screen for Support Team Manager

On the initial screen of the support team manager, two links will be displayed; assign responsible and team performance analytics.

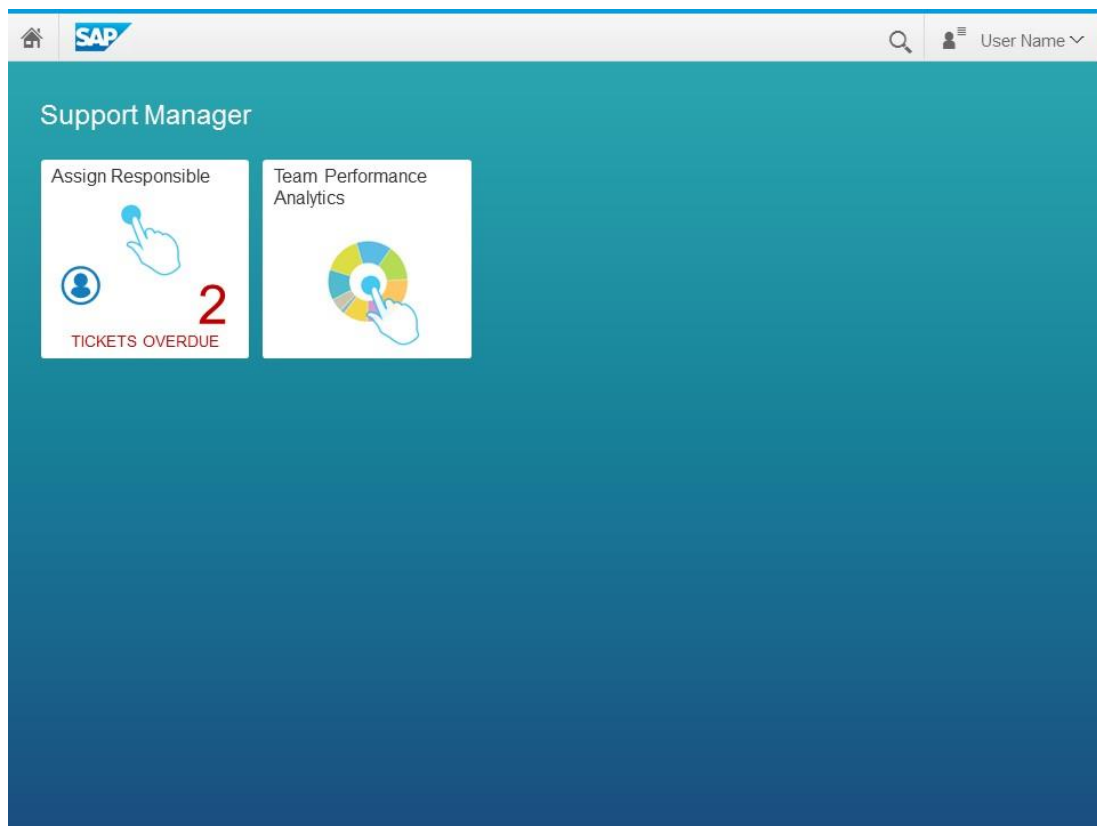


Figure 28 Fiori Launchpad Home screen for Support Team Manager

Assign Responsible

The overdue tickets will be displayed on this screen. This screen consists of two panes. On the left pane, the description of the open overdue tickets will be listed. Based on the selection of the solution manager, the details of the selected ticket will be displayed on the right pane.

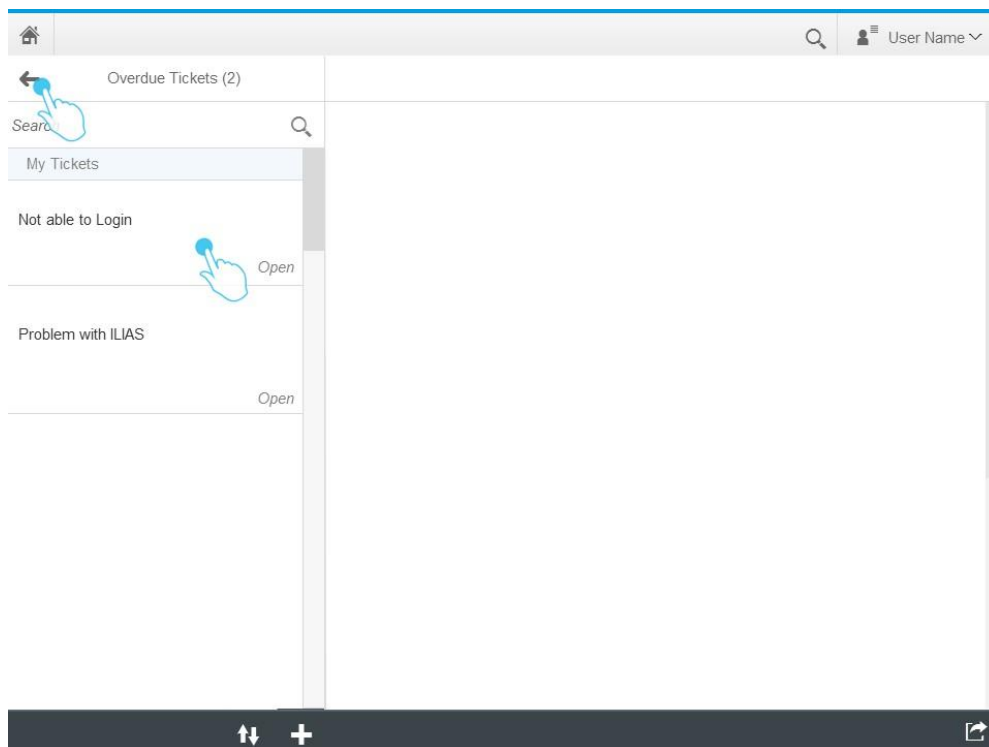


Figure 29 Overdue Tickets List

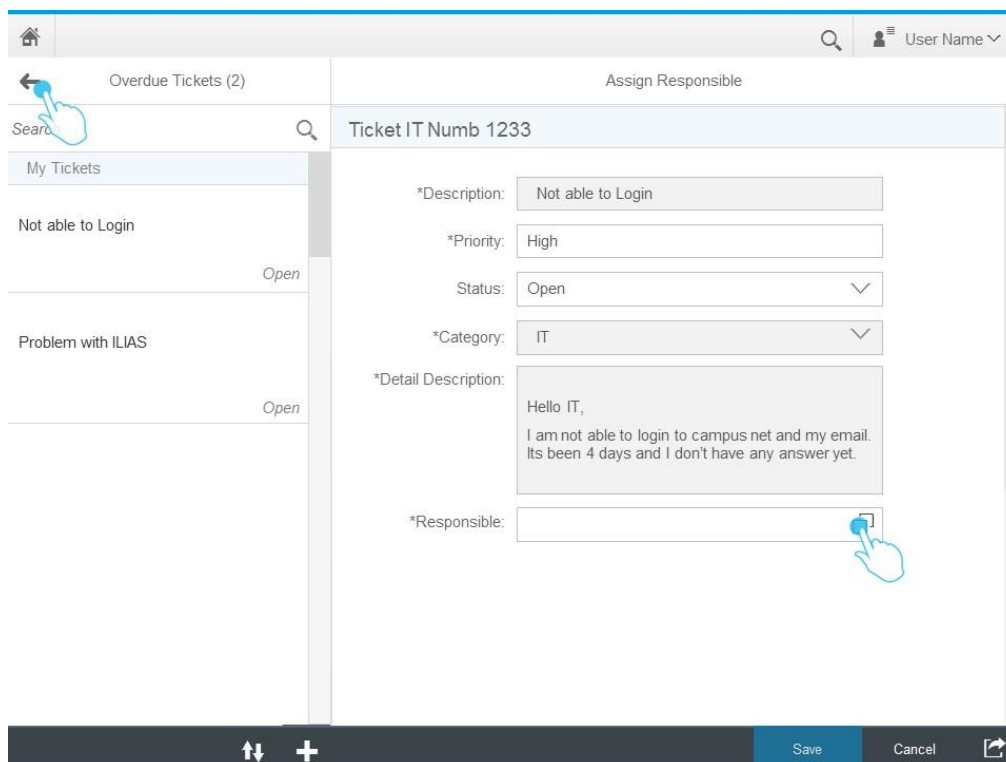


Figure 30 Overdue Ticket Details

By selecting a support team member from the list of responsible, the support team manager can assign the ticket.

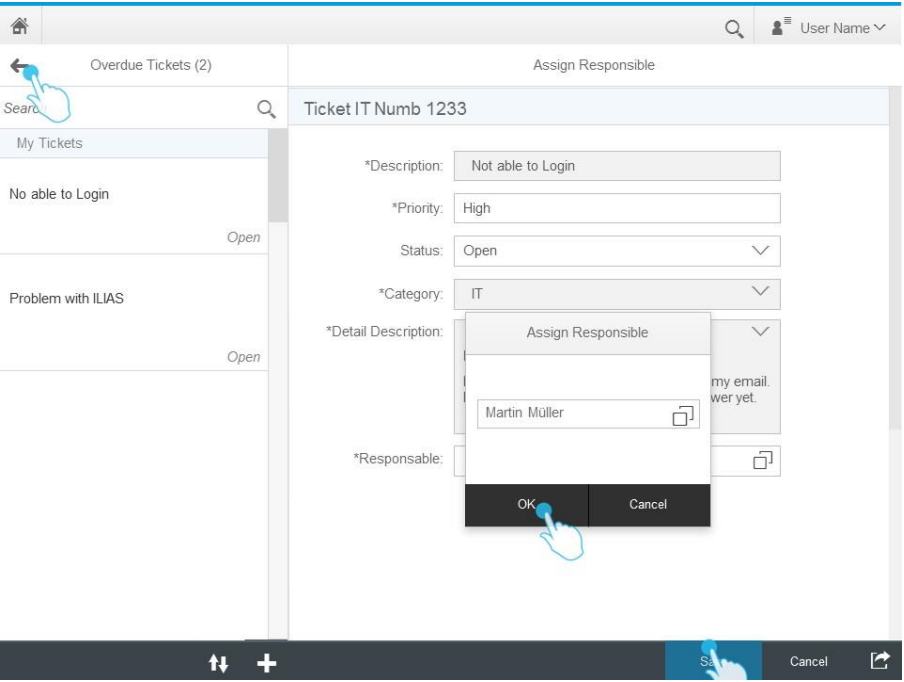


Figure 31 Overdue Ticket Responsible Selection

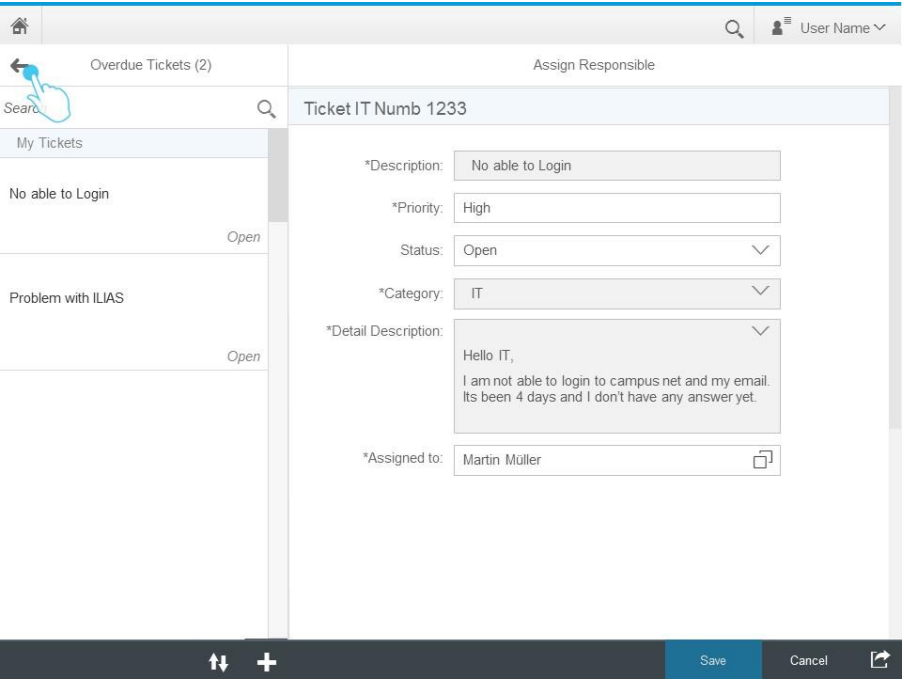


Figure 32 Overdue Ticket Assignment

Team Performance Analytics

On the team performance analytics screen, the solution team manager can view analytics for tickets based on their status or rating which will be calculated by the feedback results of students. The results can be filtered by a specific period and/or a specific support team member.

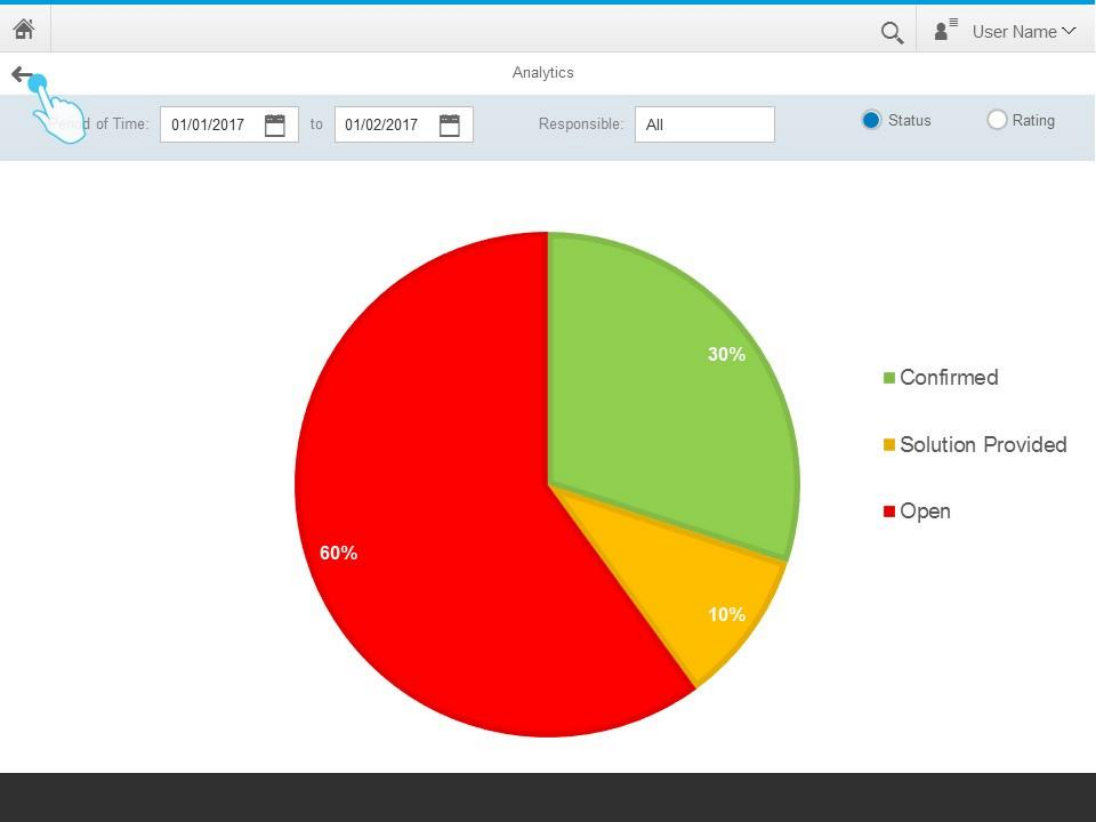


Figure 33 Team Performance Analytics

4.3 Roles and Authorizations

There are two separate authorization concepts for backend and frontend layer. The APIs provided by the backend already have their authorization check. The frontend authorization manages only what the users see in their Fiori Launchpad.

Backend

In general, there are three different roles which require varying levels of authorization: end-users, support team members and managers. On the backend level this is realized by the creation of three different roles in the App Layer using standard SAP NetWeaver functionality. (SAP, 2017f)

Frontend

On the frontend level the administrator manages the user access to the Support Ticketing System application by using the role-based authorization concept provided by SAP Cloud Platform. To enable the role based access to an application in a site, roles must be assigned to the catalog, or to groups which are then assigned to the catalog. First it is possible to assign roles directly to a user, but this makes administration quite expensive. Therefore, it is also possible to create user groups and assign roles to these groups. A user will then be assigned to a group and the inherit roles. So, there are two possibilities. 1.) Assign roles to a catalog so that a user with a specific role can access an app in a site. 2.) Assign roles to a group, in that case users with this role can view the group in their launchpad and can launch apps in the group. In both cases the users can only access the app (in the group), if the app is assigned to the same catalog as the user's role. Figure **Error! Reference source not found.** illustrates this role-based authorization concept implemented in the SAP Cloud Platform. (SAP, 2017d)

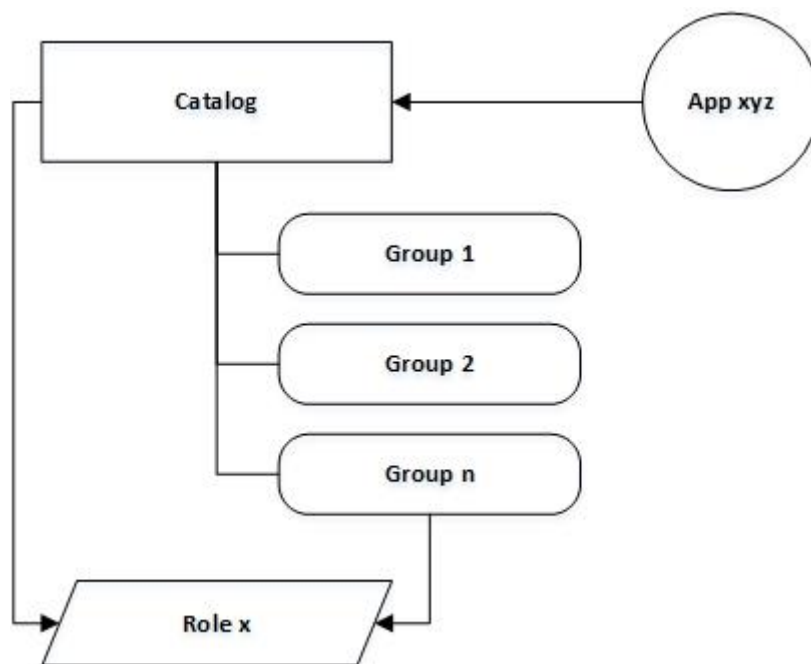


Figure 34 Frontend Roles and Authorizations

4.4 Database diagram (ERM)

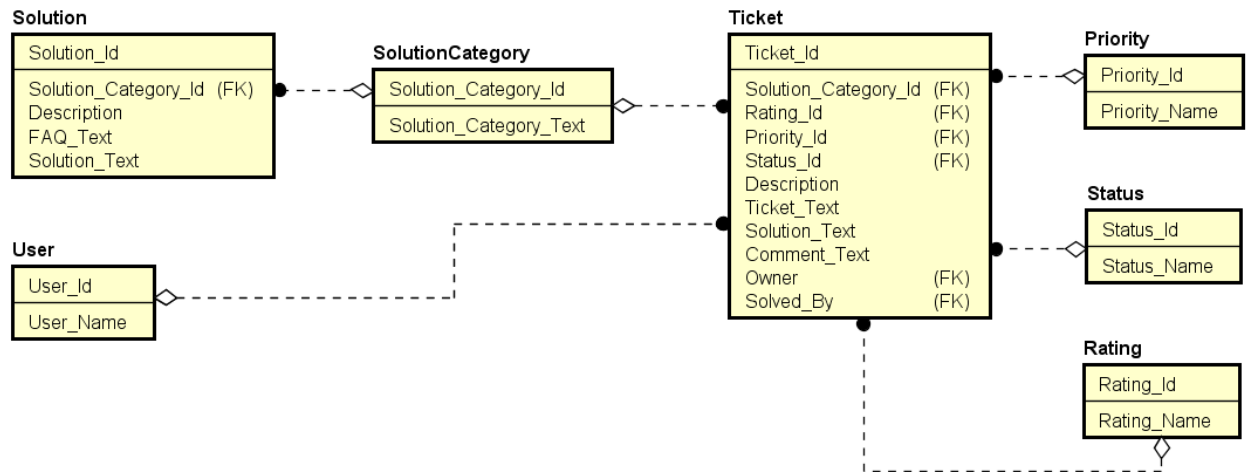


Figure 35 ERM Support Ticketing System

Error! Reference source not found. shows a high-level diagram of the Entity Relationship Model for the Support Ticketing System and thereby roughly its database structure. The later implemented database structure can differ from this diagram. The ERM model consists of seven main entities: Solution, Solution Category, User, Ticket, Priority, Status and Rating.

5 References

ANDREAS KUNZ, 2013. *What is OpenUI5 / SAPUI5 ?* [online]. 11 December 2013, 12:00 [viewed 15 April 2017]. Available from: <https://blogs.sap.com/2013/12/11/what-is-openui5-sapui5/>

BOB CASWELL, 2015. *Build your own SAP Fiori App in the Cloud* [online]. 5 May 2015, 12:00 [viewed 12 April 2017]. Available from: <https://open.sap.com/courses/fiux2>

JANINA BLÄSIUS, 2016. *Developing Web Apps with SAPUI5* [online]. 29 June 2016, 12:00 [viewed 17 April 2017]. Available from: <https://open.sap.com/courses/ui51>

KARL KESSLER, 2015. *SAP NetWeaver 7.5* [online]. 21 September 2015, 12:00 [viewed 17 April 2017]. Available from: <https://archive.sap.com/documents/docs/DOC-67587>

ODATA, 2015. *OData - the Best Way to REST* [online]. *OData - The Protocol for REST APIs* [viewed 15 April 2017]. Available from: <http://www.odata.org/>

RAZ KORN, 2016. *Build Your Own SAP Fiori App in the Cloud* [online]. 5 May 2016, 12:00 [viewed 12 April 2017]. Available from: <https://open.sap.com/courses/fiux2>

SAP, 2016a. *Design Stencils* [online]. *SAP Fiori Design Guidelines*. 11 November 2016, 12:00 [viewed 12 April 2017]. Available from: <https://experience.sap.com/fiori-design-web/downloads/>

SAP, 2016b. *SAP Cloud Platform Documentation* [online]. *Overview* [viewed 15 April 2017]. Available from: <https://help.hana.ondemand.com/help/frameset.htm?e7c9982cbb571014a97a8a675cf28c15.html>

SAP, 2017a. *BUILD* [online] [viewed 12 April 2017]. Available from: <https://www.build.me/splashapp/>

SAP, 2017b. *Database and Data Management - SAP Adaptive Server Enterprise* [online] [viewed 17 April 2017]. Available from: <https://www.sap.com/germany/product/data-mgmt/sybase-ase.html>

SAP, 2017c. *SAP Cloud Platform* [online]. *SAP Cloud Platform Cloud Connector* [viewed 17 April 2017]. Available from: <https://help.sap.com/viewer/65de2977205c403bbc107264b8eccf4b/Cloud/en-US/e6c7616abb5710148cfcf3e75d96d596.html>

SAP, 2017d. *SAP Cloud Platform Portal* [online]. *About Roles* [viewed 18.04.2017]. Available from: <https://help.sap.com/viewer/3ca6847da92847d79b27753d690ac5d5/Cloud/en-US/1e5d10b9f00a4e1aac73f2aaf8334798.html>

SAP, 2017e. *SAP Fiori Design Guidelines* [online]. *SAP Fiori and Design Principles*. 11 November 2016, 12:00 [viewed 12 April 2017]. Available from: <https://experience.sap.com/fiori-design-web/design-principles/>

SAP, 2017f. *SAP Help - Creating Single Roles* [online] [viewed 20 April 2017]. Available from: https://help.sap.com/saphelp_nw70ehp2/helpdata/en/52/6714b6439b11d1896f0000e8322d00/content.htm

THOMAS BIESER, 2017. *Extending SAP S/4HANA with SAP HANA Cloud Platform* [online]. 2 March 2017, 12:00 [viewed 20 April 2017]. Available from: <https://open.sap.com/courses/hcp3a1/items/51PBYzGFUqgGfEPPMMOWoj>

WIKIPEDIA, 2017. *Multitier architecture* [online]. 27 March 2017, 12:00 [viewed 17 April 2017]. Available from: https://en.wikipedia.org/wiki/Multitier_architecture