

Support Ticketing System

by

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Document History

Table 1 Document history

Version	Date	Change
1.0	23.04.2017	Draft version prepared
2.0	08.05.2017	Team review
3.0	11.05.2017	Final version

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1 About this Document

1.1 Authors

Table 2 Authors

Name (Matriculation number)	Project Role
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1.2 GITHUB Users

Table 3 GITHUB Users

Name	GIT Users
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Luna, Marcia	marcialu
Ritter, Marcus	RitterMa93, M11004061
Fayzullin, Shamil	sfayzullin86, 11008340

1.3 GIT Repositories

Table 4 GIT Repositories

Repository name	Description
https://github.com/sfayzullin86/SupportTicketingSystem	Project Documentation, Learning Material, System infrastructure, ODATA, Backend ABAP requests
https://github.com/sfayzullin86/SolutionCategories	Solution Categories application front-end development code
https://github.com/sfayzullin86/Analytics	Team Performance Analytics application front-end development code
https://github.com/RitterMa93/OpenTickets	Open Tickets application front-end development code
https://github.com/RitterMa93/TicketsManagement	Assign Responsible front-end development code
https://github.com/IlkayAtes/SupportSolutionsDisp	Support Solutions Display application front-end development code
https://github.com/IlkayAtes/SupportSolutionsCust	Support Solutions Customization application front-end development code
https://github.com/marcialu/MyTickets	My tickets application front-end development code
https://github.com/marcialu/NewTicket	Create new ticket front-end

	development code
https://github.com/infomediadesign/sad-2017-sw-01-marcialu	Individual assignment
https://github.com/infomediadesign/sad-2017-sw-01-11008340	Individual assignment
https://github.com/infomediadesign/sad-2017-sw-01-11008348	Individual assignment
https://github.com/infomediadesign/sad-2017-sw-01-M11004061	Individual assignment

1.4 Document Structure

This document is structured as follows:

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

Chapter 2 states the vision of the project.

Chapter 3 includes personas for each role of the support ticketing system.

Chapter 4 provides interviews with students, support team members and support team managers.

Chapter 5 includes user stories.

Chapter 6 explains user experience map for each role of the system.

Chapter 7 includes low and high fidelity prototypes.

Chapter 8 provides information about software architecture.

Chapter 9 displays user story to task mapping.

Chapter 10 provides group workload.

Chapter 11 includes references.

1.5 Glossary

Table 5 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	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. 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)

2 Vision Statement

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.

3 Personas

3.1.1 Student

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 several applications. She also needs help to get access for student portal where all her lecture's content are published.

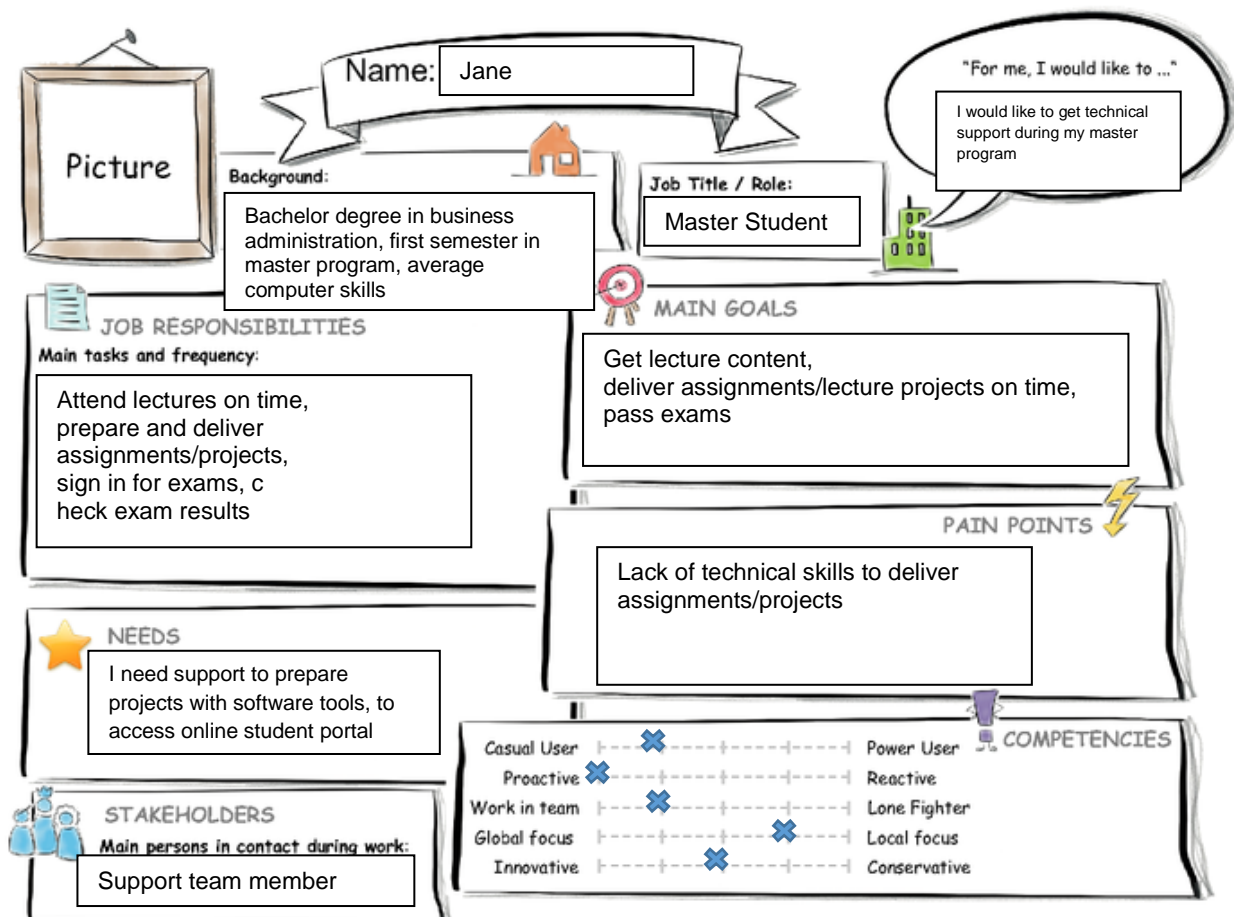


Figure 1 Student Persona (Bob Caswell, 2015)

3.1.2 Support Team Member

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.

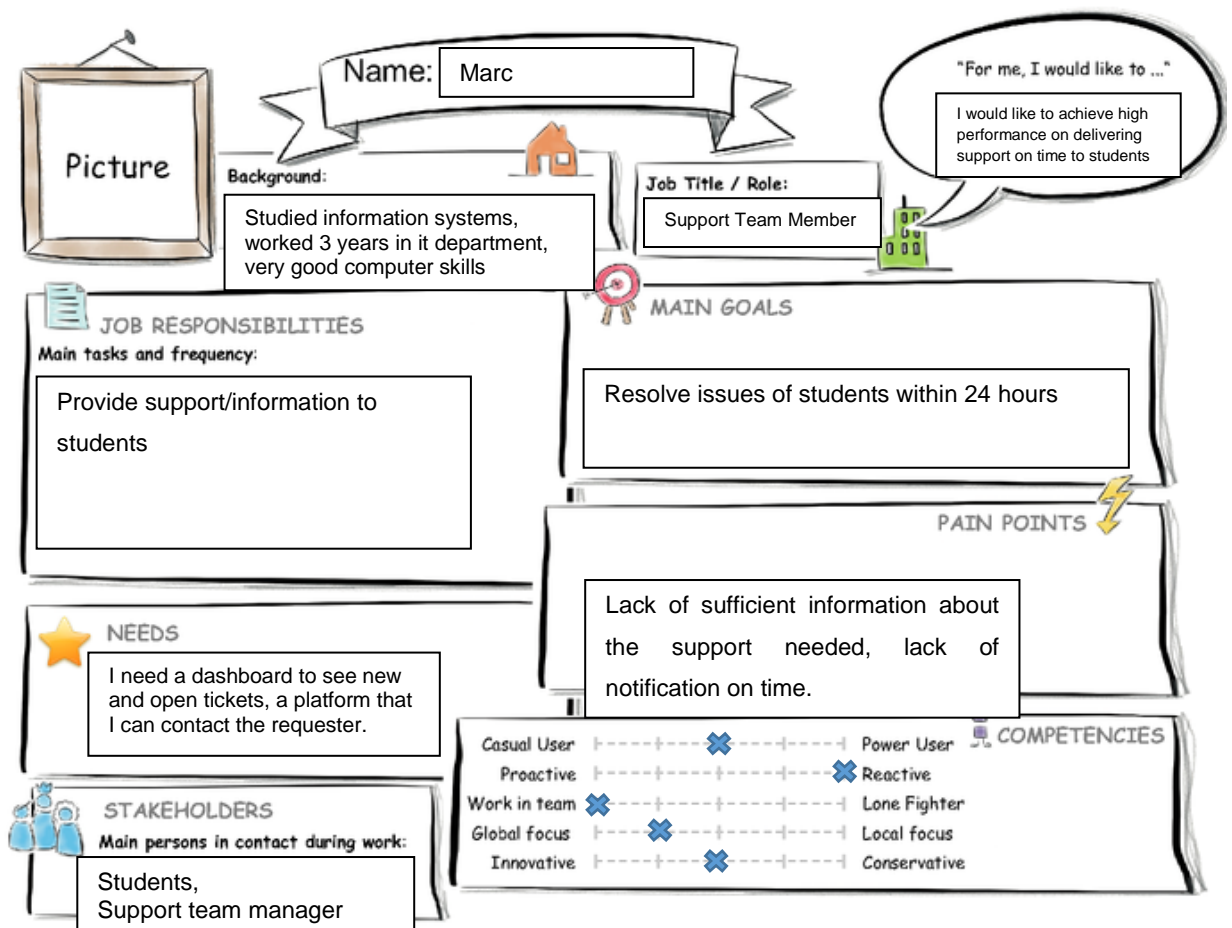


Figure 2 Support Team Member Persona (Bob Caswell, 2015)

3.1.3 Support Team Manager

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.

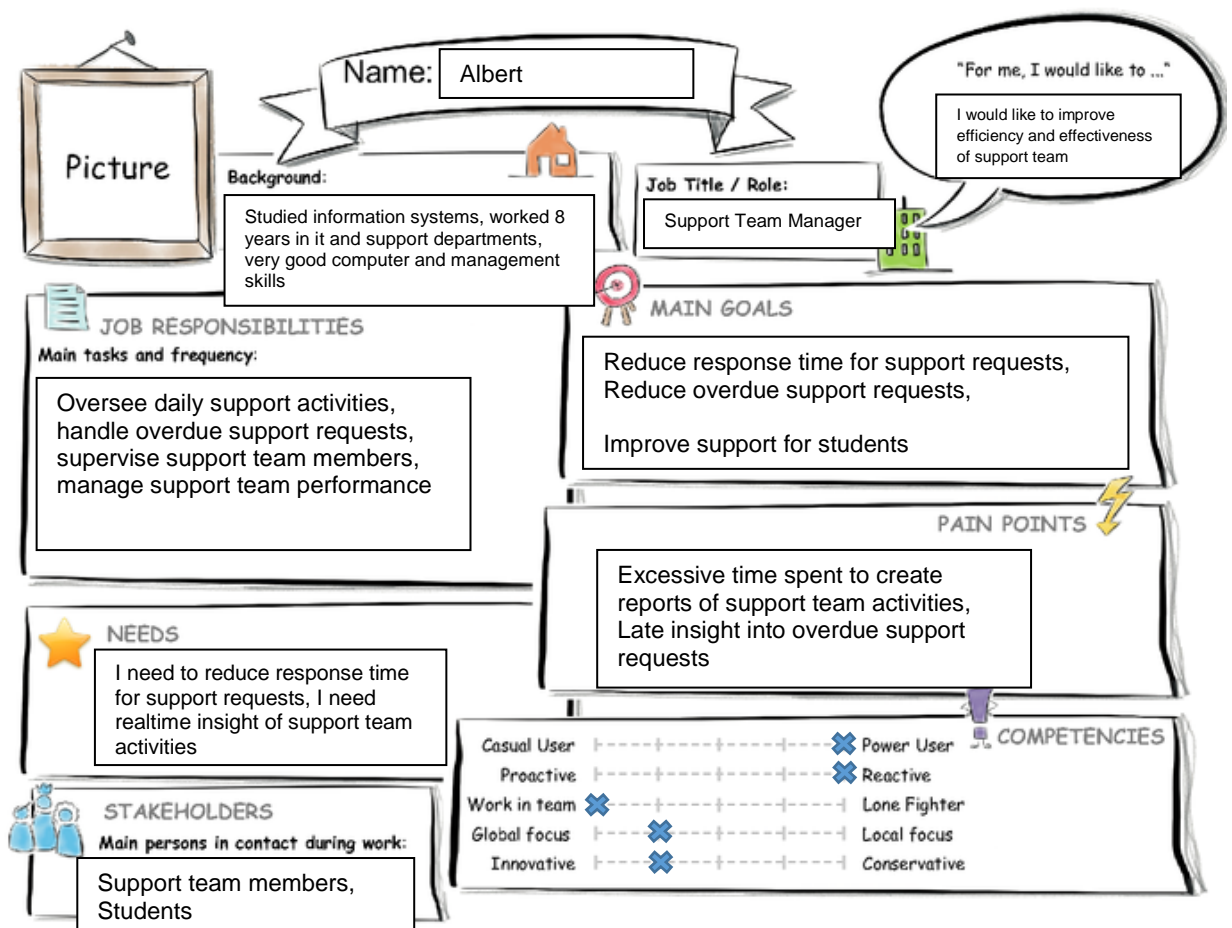


Figure 3 Support Team Manager Persona (Bob Caswell, 2015)

4 Interviews

4.1.1 Student Interviews

Julia Müller

Q1: Could you please give us brief information about yourself?

A1: I'm a Bachelor student in Business Administrations. Since this is my first semester, I'm very new to the university.

Q2: Are there any difficulties that you are facing during your studies which you need to get support for?

A2: Yes, I need support for mostly technical stuff. Like installing new software or accessing online sources for my lectures.

Q3: How do you get support?

A3: Mostly I try to get help from fellow students, but since we all started new this semester, it is hard to find real solutions together. We need help from someone who is experienced on our issues. I used the support mail group several times.

Q4: Is the existing support mail group sufficient for you? In which ways do you think it could be improved?

A4: I sent several questions to get help. At the end, they helped me but it took too long and I couldn't submit my paper on time due to late support. A real system would be more sufficient. In that way, I can see the status of my request and if anyone started working on it.

Q5: What other features do you think a support system should have?

A5: Maybe a page like "frequently asked questions". So that we can find answers to the questions which were asked before and it will take less time to solve our issues.

Mateo González

Q1: Could you please give us brief information about yourself?

A1: I'm an Erasmus student coming from Spain. I study Statistics.

Q2: Are there any difficulties that you are facing during your studies which you need to get support for?

A2: Even though we had orientation sessions, which gave us information about school and our studies, sometimes I still have questions regarding administrative subjects, because I'm not familiar with German education system.

Q3: How do you get support?

A3: I go to the student office and ask them. Sometimes they can provide help to me but sometimes they suggest me to contact someone else.

Q4: Is the existing support mail group sufficient for you? In which ways do you think it could be improved?

A4: I heard about it, but I didn't use it so far. Actually I don't know in which areas they provide support and if my questions would be relevant to ask them. Instead of a mailing group, an online system would be better, I guess. Maybe some information about the system, showing what for we can use it, would make it easier.

Q5: What other features do you think a support system should have?

A5: It would be very helpful if we could chat with support team.

Jasmin Neumann

Q1: Could you please give us brief information about yourself?

A1: I'm 30 years old and study Master of Computer Science. It's my last semester, I started working on my Master thesis.

Q2: Are there any difficulties that you are facing during your studies which you need to get support for?

A2: At the beginning of my Master program, the most difficult part was for me to complete assignments for my lectures. Most of them required some practice on new databases, applications or frameworks which I had no experience before.

Q3: How do you get support?

A3: I searched a lot in internet, tried to find online tutorials. Sometimes I asked students who were studying in later semesters. But all these ways costed me too much time and effort. Sometimes I couldn't find right solutions to complete my assignments in a better way.

Q4: Is the existing support mail group sufficient for you? In which ways do you think it could be improved?

A4: I use it but I can't say it's a life saver. First of all, it takes time to get an answer and since I can't see if someone is working on my issue, I can't count on it and stop searching other sources for support.

Q5: What other features do you think a support system should have?

A5: Different category types. For example, if I submit an issue, I should choose to which category it is related to and based on the chosen category, related support person should help me. This might cause to save time.

4.1.2 Support Team Member Interviews

Andreas Höfer

Q1: Could you please give us brief information about yourself?

A1: I'm 26 years old and have a Bachelor's degree in Computer Science. I'm working part-time in the support team for the university.

Q2: What are the major difficulties that you are facing during your work?

A2: The biggest pain point is to decide with which issue to start. Without reading every new email, I cannot know what the issue is related to or if it is an urgent case.

Q3: How do you share the issues with the other team members?

A3: We set some rules based on the words in the subject of the mails. Regarding these words, mails are forwarded to specific members who are experienced on those subjects. The rest of the mails, we read and decide individually.

Q4: Would it be easier for you to work with a ticketing system? Which features would you like to have in this system?

A4: Sure it would help a lot. First of all I would like to see open issues as a list. When I start working on a specific one, my colleagues should be informed that I'm working on it, so that I don't need to inform them separately and they don't work on the same issue.

Helena Wassermann

Q1: Could you please give us brief information about yourself?

A1: I'm a member of support team since 2 years and responsible for administrative subjects.

Q2: What are the major difficulties that you are facing during your work?

A2: For me the major challenge is to provide support on time. Most of the times, the students ask questions about official documents that they need or applications which they need to complete in a specific period of time and I need to help them before they are too late.

Q3: How do you share the issues with the other team members?

A3: It is mostly manual work. Even though we have some rules set in our mail program, we need to read them and decide if it is related to our own area.

Q4: Would it be easier for you to work with a ticketing system? Which features would you like to have in this system?

A4: It would definitely help a lot. We can sort open tickets based on their priority and category.

Sven Günther

Q1: Could you please give us brief information about yourself?

A1: I work in the support team since the beginning of this year and responsible for authorization subjects.

Q2: What are the major difficulties that you are facing during your work?

A2: I receive same or very similar questions several times and providing the same solution repeatedly.

Q3: How do you share the issues with the other team members?

A3: We share them manually. It requires a big communication traffic.

Q4: Would it be easier for you to work with a ticketing system? Which features would you like to have in this system?

A4: Yes and If this ticketing system would have a separate page where we can provide ready solutions, it would make my work a lot easier. The students can first search on this page and if they cannot find answers, they can ask us anytime.

4.1.3 Support Team Manager Interviews

Michael Schneider

Q1: As a support team manager, what are the difficulties you are facing during your work processes?

A1: One of my major responsibilities, as a support team manager, is to reduce response time of support requests. To achieve this goal, I need to follow my team's performance very closely. But I'm spending excessive time to create performance reports manually.

Q2: Based on your experiences, which features for your role are mostly needed in a support ticketing system?

A2: Analytics are definitely needed. I need reports and graphics to display each team member's performance. Filtering the results by ratings would be also helpful.

Sophia Schumacher

Q1: As a support team manager, what are the difficulties you are facing during your work processes?

A1: Overdue tickets are the biggest pain point of my work. Most of the negative feedback that we receive from students are related to overdue support.

Q2: Based on your experiences, which features for your role are mostly needed in a support ticketing system?

A2: I would like to have a list of open tickets which are overdue and have the possibility to assign them to team members.

Peter Weber

Q1: As a support team manager, what are the difficulties you are facing during your work processes?

A1: My performance is related to my team's performance. This means I need to have an insight of their workload and also of the tickets which are waiting since for a while.

Q2: Based on your experiences, which features for your role are mostly needed in a support ticketing system?

A2: Reporting is the most important feature I need for my job. I need analytics to have an overview of my team activities.

5 UX User stories

Initially, based on the requirements analysis interviews with different roles, who are the possible users of support ticketing system, a draft list of user stories has been created. After brainstorming activities, the list has been finalized as follows. Each user story is classified as “must have”, “nice to have” or “out of scope”.

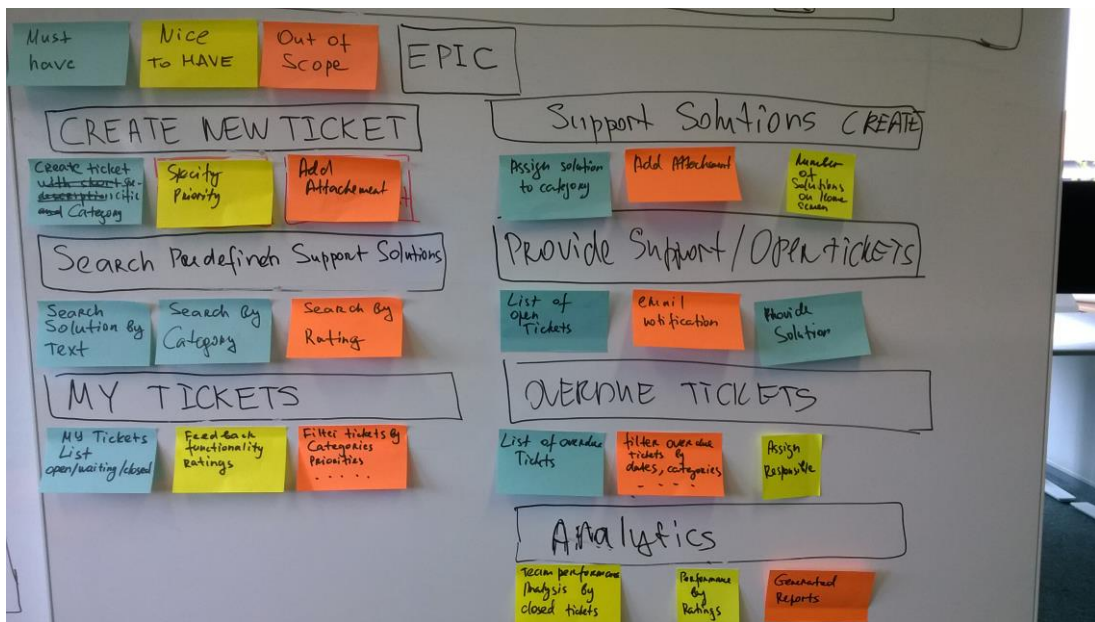


Figure 4 User stories draft version

Epic : Search predefined support solution		
US1	MUST HAVE	As a student, I want to have a list of support solutions.
US2	MUST HAVE	As a student, I want to search for support solutions by their categories.
US3	OUT OF SCOPE	As a student, I want to search for support solutions by their ratings.
US4	NICE TO HAVE	As a student, I want to see the number of the predefined support solutions on my home screen.
Epic : Create new ticket		
US5	MUST HAVE	As a student, I want to create a new ticket with specific category.
US6	OUT OF SCOPE	As a student, I want to create a new ticket with attachments.
US7	NICE TO HAVE	As a student, I want to create a new ticket with a specific priority.
Epic : List my tickets		

US8	MUST HAVE	As a student, I want to see my tickets as a list.
US9	OUT OF SCOPE	As a student, I want to filter my tickets by their categories, priorities, support team member.
US10	MUST HAVE	As a student, I want to edit my existing ticket.
US11	MUST HAVE	As a student, I want to delete my existing ticket.
US12	OUT OF SCOPE	As a student, I want to receive an email notification when a response sent for my ticket.
US13	MUST HAVE	As a student, I want to confirm the solution provided and close the ticket.
US14	NICE TO HAVE	As a student, I want to give feedback and rating about the provided support for my ticket.
US15	NICE TO HAVE	As a student, I want to see the number of the tickets, for which solution is provided, on my home screen.
Epic : Create solution categories		
US16	MUST HAVE	As a support team member, I want to create support solution categories
US17	MUST HAVE	As a support team member, I want to edit support solution categories
US18	MUST HAVE	As a support team member, I want to delete support solution categories
US19	NICE TO HAVE	As a support team member, I want to see the number of the available categories on my home screen.
Epic : Create predefined support solution		
US20	MUST HAVE	As a support team member, I want to create predefined support solutions
US21	MUST HAVE	As a support team member, I want to edit predefined support solutions
US22	MUST HAVE	As a support team member, I want to delete predefined support solutions
US23	NICE TO HAVE	As a support team member, I want to categorise predefined support solutions.
US24	OUT OF SCOPE	As a support team member, I want to add images, attachments to the predefined support solutions.
US25	NICE TO HAVE	As a support team member, I want to see the number of the predefined support solutions on my home screen.
Epic : Provide Support Solution		
US26	MUST HAVE	As a support team member, I want to see a list of open tickets.
US27	OUT OF SCOPE	As a support team member, I want to work only with specific categories.
US28	OUT OF SCOPE	As a support team member, I want to receive an email notification when a ticket with a category specified for my account is created.
US29	MUST HAVE	As a support team member, I want to have the possibility to ask questions to the ticket owner via ticket.
US30	MUST HAVE	As a support team member, I want to resolve tickets.
US31	NICE TO HAVE	As a support team member, I want to see the number of open tickets on my home screen.
Epic : List overdue tickets		
US32	MUST HAVE	As a support team manager, I want to have a list of overdue tickets.
US33	OUT OF SCOPE	As a support team manager, I want to filter overdue tickets by their creation dates, categories and priorities.

US34	NICE TO HAVE	I want to assign responsible
US35	OUT OF SCOPE	Notification should be send to repnsible
US36	NICE TO HAVE	As a support team manager, I want to see the number of the overdue tickets on my home screen.
Epic : Analytics		
US37	NICE TO HAVE	As a support team manager, I want to have analytics phs which display team performance by number of open tickets and team members.
US38	NICE TO HAVE	As a support team manager, I want to have analytics which display team performance by number of raitings and team members.
US39	OUT OF SCOPE	As a support team manager, I want to have reports which will be generated based on the fields I choose.

6 Experience map

6.1.1 Student

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 creating a new ticket in the support system, he waits for a response. After several minutes, he receives a response which describes how to get access to the portal.

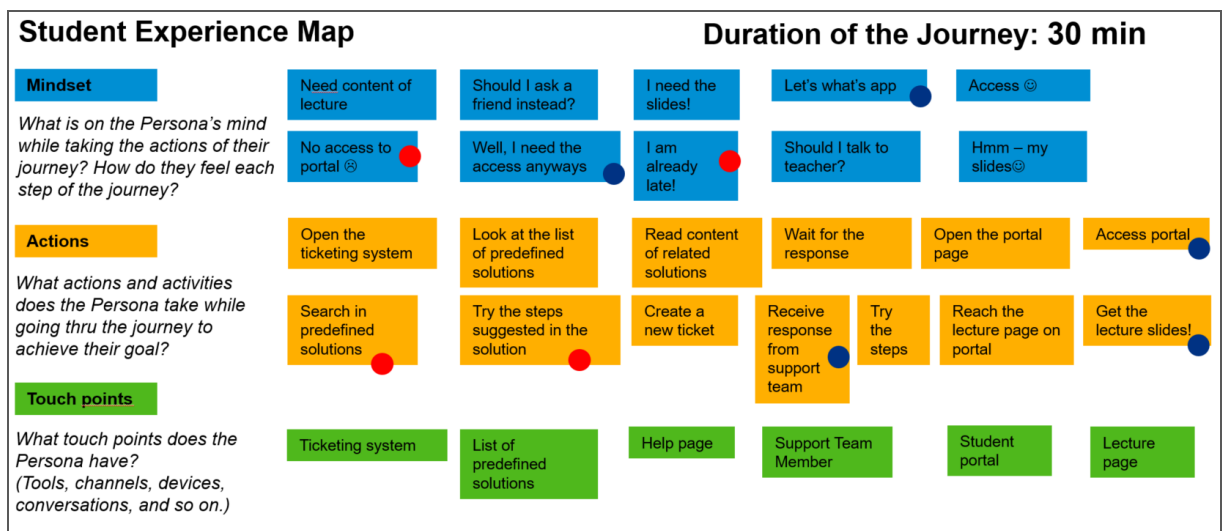


Figure 5 Student Experience Journey (Bob Caswell, 2015)

6.1.2 Support Team Member

Support team member logs in to the support ticketing system and displays the list of open tickets. In some cases he needs extra information from the requester, so he sends the ticket back to the requester with his question 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.

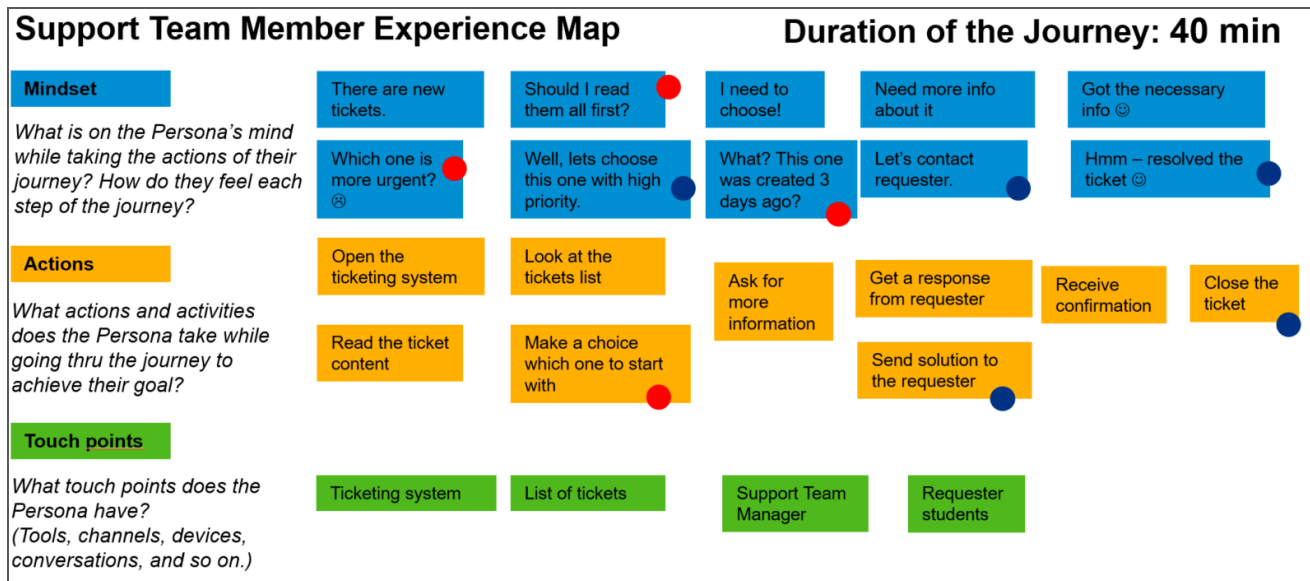


Figure 6 Support Team Member Experience Journey (Bob Caswell, 2015)

6.1.3 Support Team Manager

Support team manager logs in to the support ticketing system. He displays the list of overdue tickets and assigns them to the available support team members. To view performance results of the team he displays the analytics.

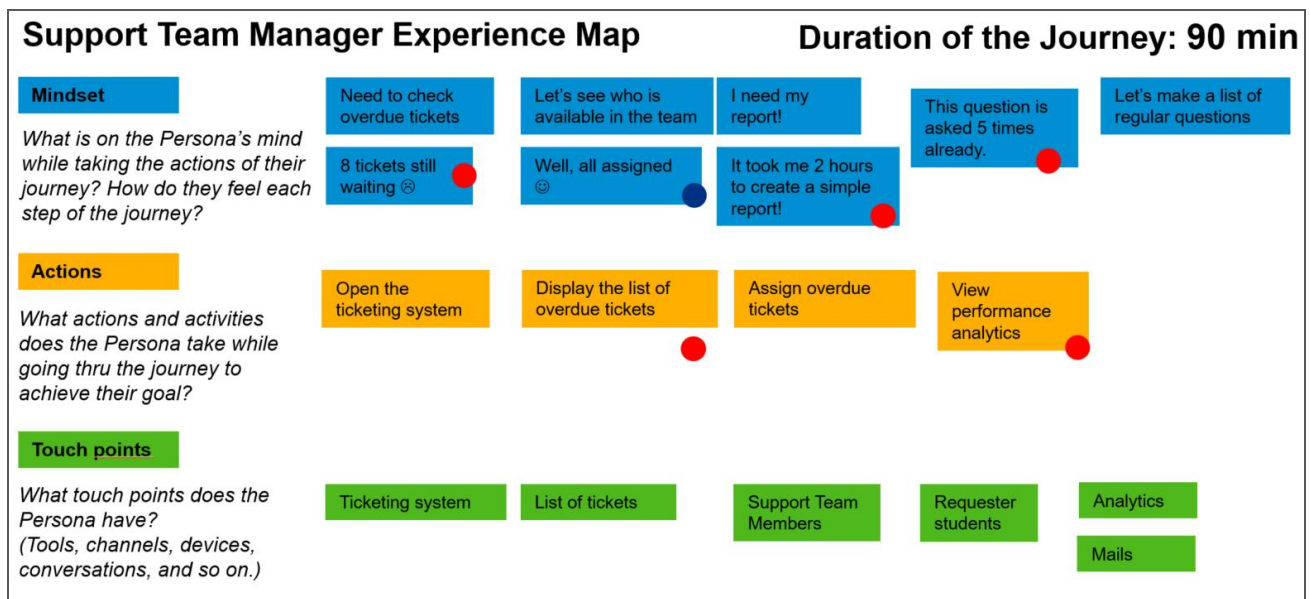


Figure 7 Support Team Manager Experience Journey (Bob Caswell, 2015)

7 Low-fi and High-fi prototypes

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.

7.1 Low-fi prototypes

Initial step to create prototypes was creating draft versions as low-fi prototypes on the board.

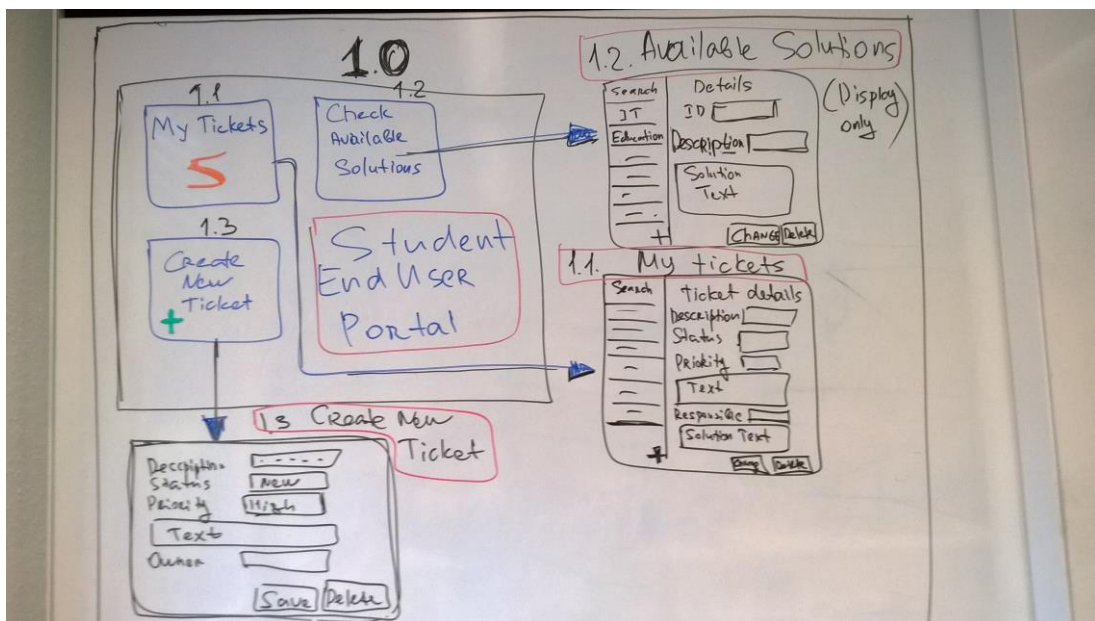


Figure 8 Student low-fi prototype

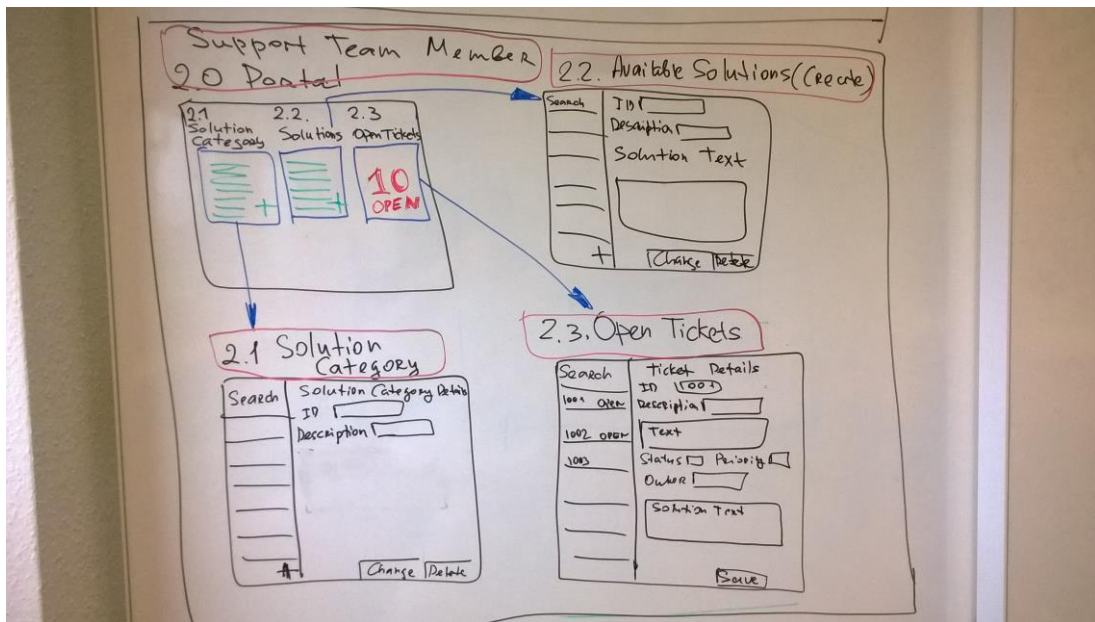


Figure 9 Support Team Member low-fi prototype

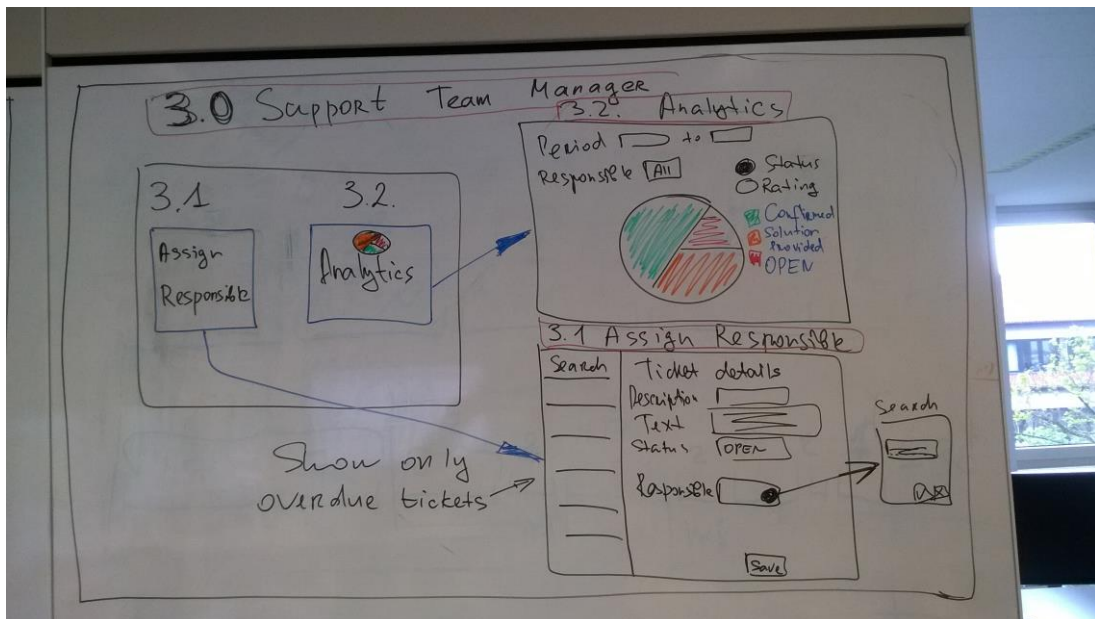


Figure 10 Support Team Manager low-fi prototype

7.2 High-fi prototypes

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.

7.2.1 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.

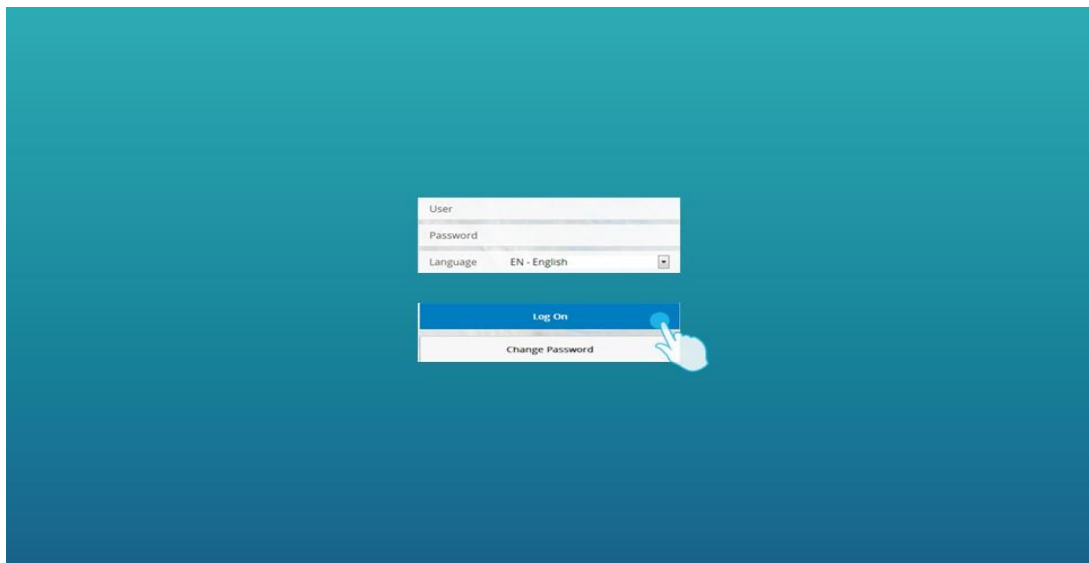


Figure 11 Fiori Launchpad Login screen

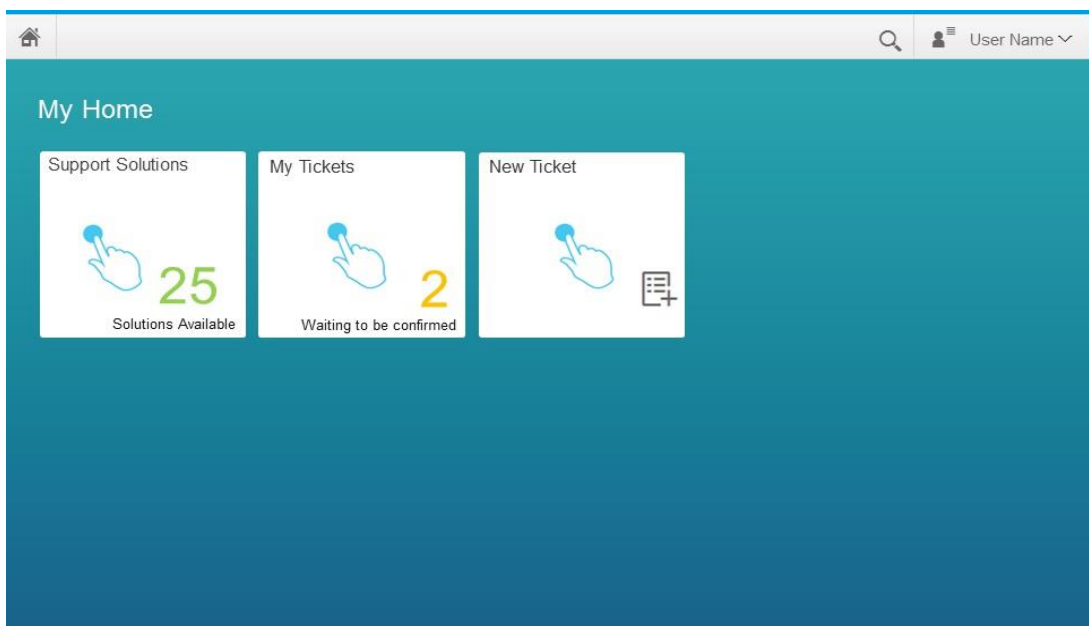


Figure 12 Fiori Launchpad Home screen for Student

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.

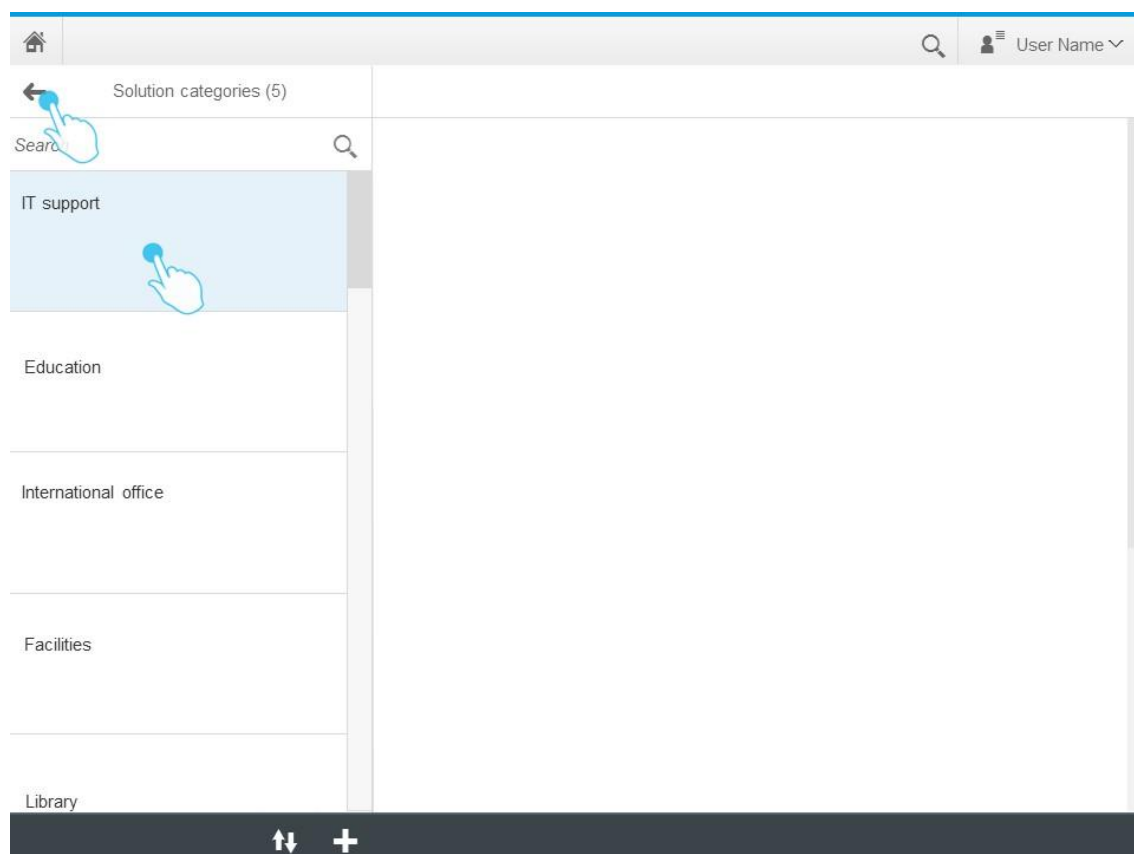


Figure 13 Predefined Support Solution Categories

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

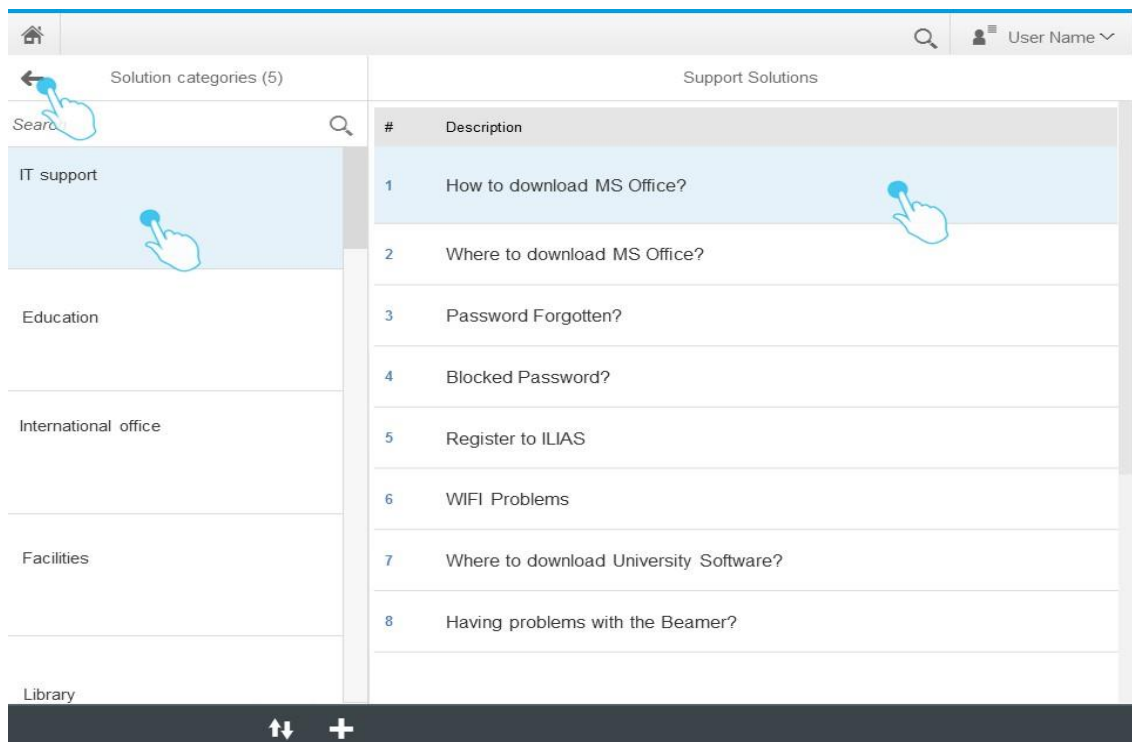


Figure 14 List of predefined Support Solution

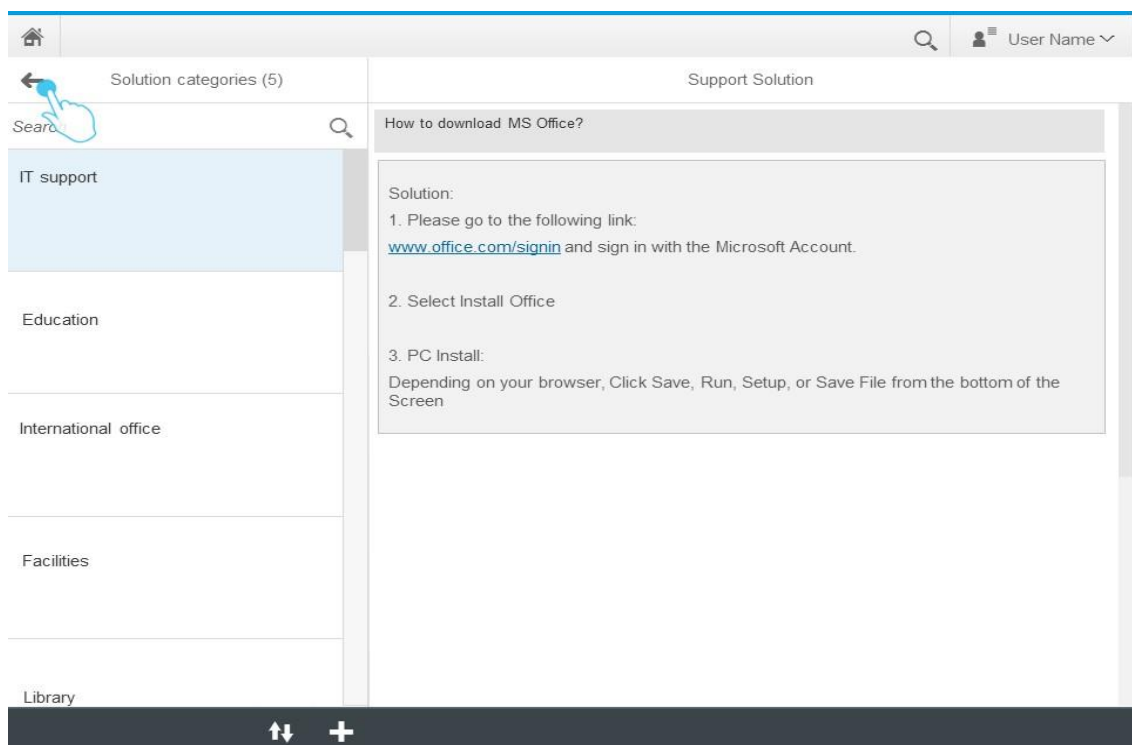


Figure 15 Predefined Support Solution

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.

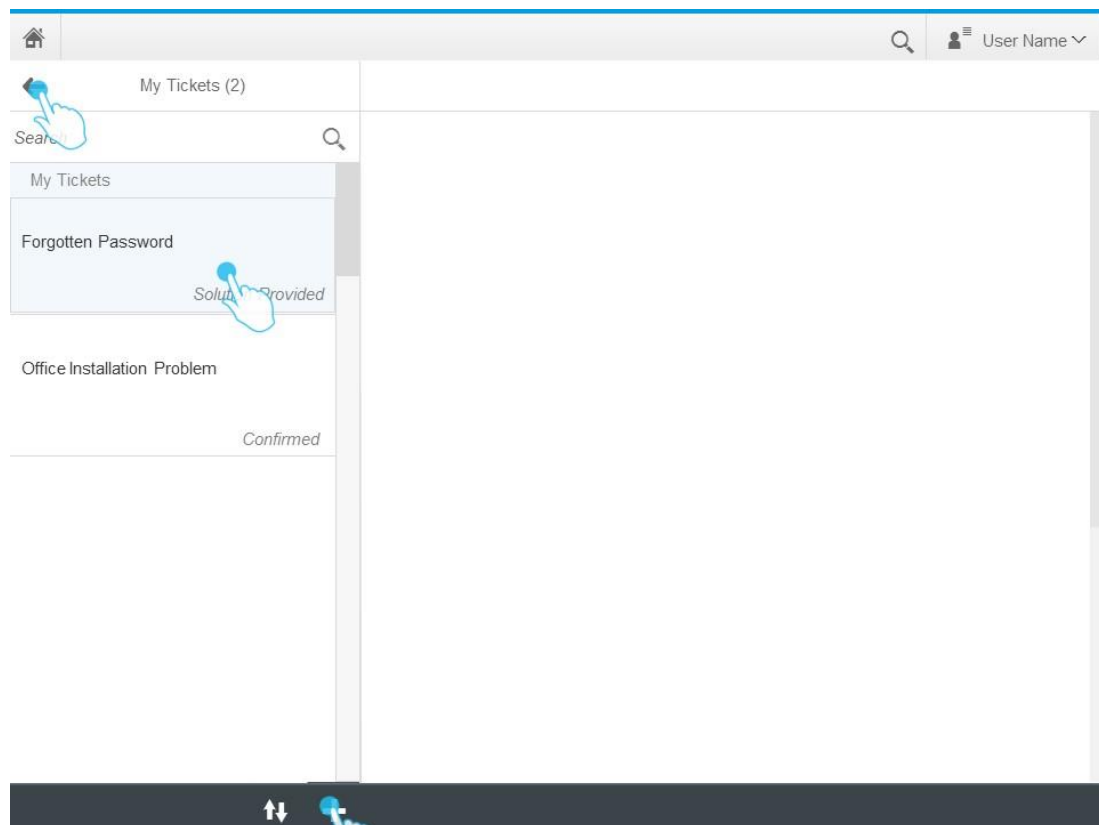


Figure 16 List of My Tickets

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 displays a web application interface for managing tickets. The top navigation bar includes a home icon, a search icon, and a user profile icon labeled 'User Name'. The sidebar on the left, titled 'My Tickets (2)', contains a search bar and a list of tickets: 'My Tickets', 'Forgotten Password' (marked 'Solution Provided'), and 'Office Installation Problem' (marked 'Confirmed'). The main panel, titled 'Ticket Details', shows the details for the 'Forgotten Password' ticket. The fields are as follows:

*Description:	Forgotten Password
*Priority:	High
Status:	Solution Provided
*Category:	IT
*Detail Description:	<p>Hello IT,</p> <p>I do not remember my Password. Could you please support me with a new password.</p> <p>Thank you and Regards</p>
Solution:	<p>Dear Student,</p> <p>If you forgot your password you can request a new one, at campus net.</p> <p>https://campus.hochschule-heidelberg.de/</p> <p>Please find more information in the FAQ Section</p> <p>Best Regards,</p> <p>IT</p>

At the bottom of the main panel, there are two buttons: 'Confirm' and 'Reject'. The 'Confirm' button is highlighted with a blue cursor icon.

Figure 17 Ticket Details

Feedback

After a ticket is confirmed by the student, a feed back questionnaire will be displayed on the right pane. The rating given by the student for the provided support will be saved for analytics which will be provided to support team manager.

My Tickets (2)

Forgotten Password

Office Installation Problem

Confirmed

Search

My Tickets

Forgotten Password

Solution Provided

Office Installation Problem

Confirmed

Ticket Details - Feedback

Overall Service

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

1 2 3 4 5

Comments:

Send Cancel

Figure 18 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 top navigation bar includes a home icon, a search icon, and a user profile dropdown labeled 'User Name'. The main content area is split into two 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 is a list of tickets: 'My Tickets', 'Forgotten Password' (with a 'Solution Provided' status), and 'Office Installation Problem' (with a 'Confirmed' status). The right panel, titled 'New Ticket', contains a 'Create New Ticket' form. The form has the following fields:

- *Description: A text input field containing 'Block Password'.
- *Priority: A dropdown menu set to 'High'.
- Status: A dropdown menu set to 'New'.
- *Category: A dropdown menu set to 'IT'.
- *Issue Detail Description: 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 vertical scrollbar on the left, a plus icon, and two buttons: 'Create' and 'Cancel'.

Figure 19 Create New Ticket

7.2.2 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.

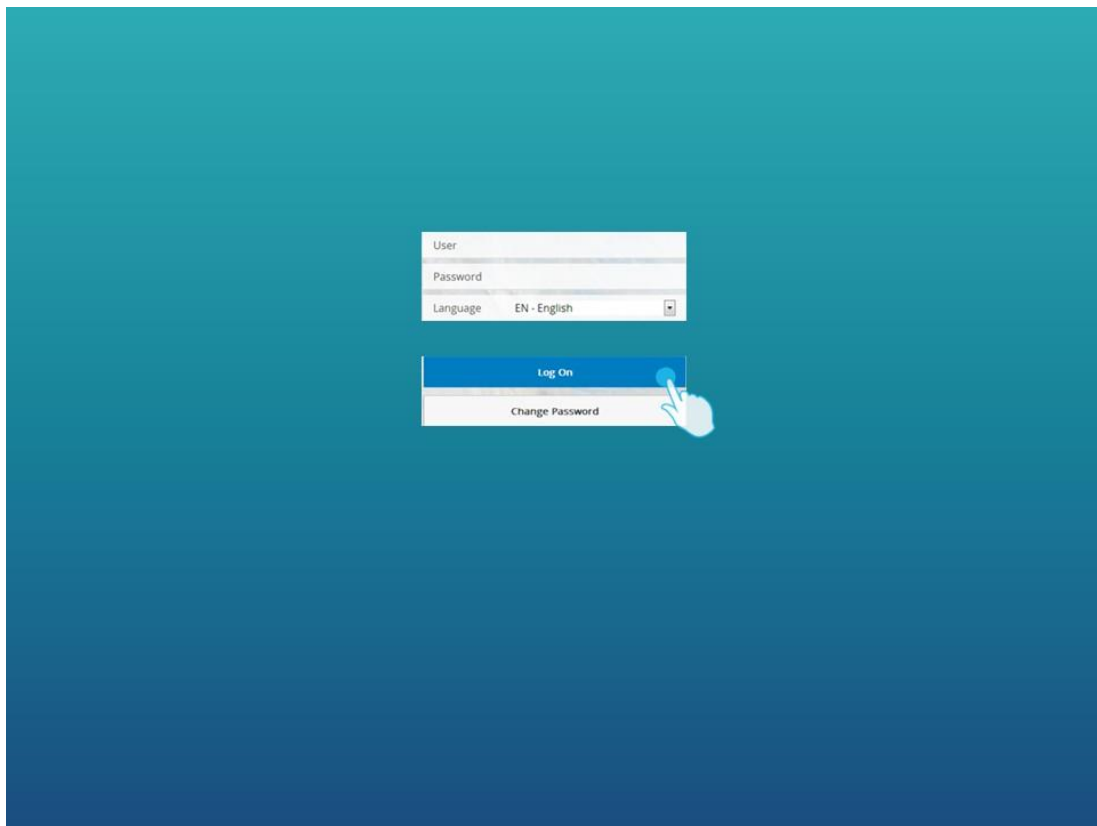


Figure 20 Fiori Launchpad Login screen

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.

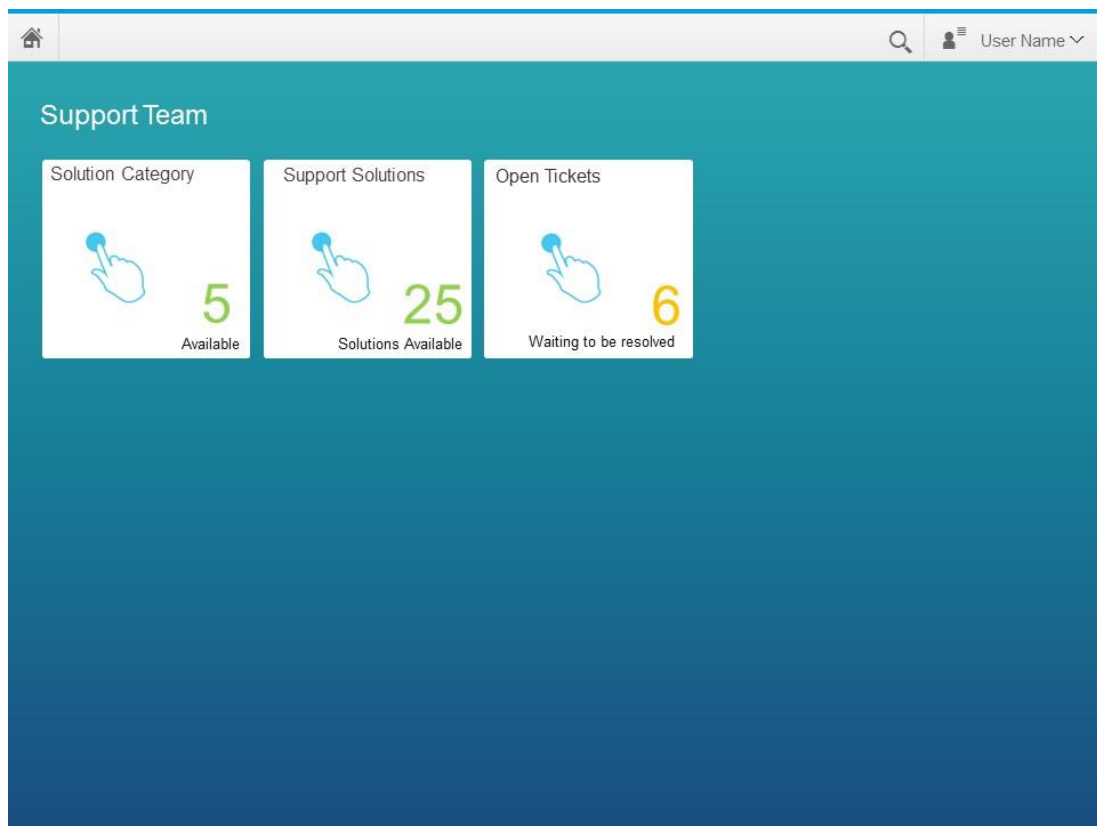


Figure 21 Fiori Launchpad Home screen for Support Team Member

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.

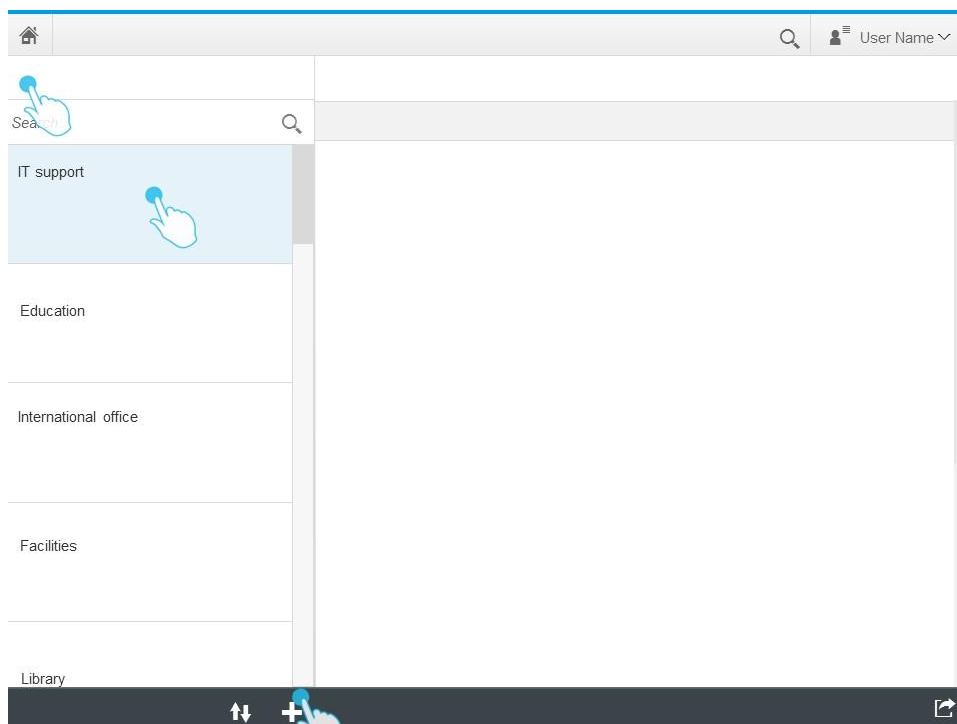


Figure 22 Solution Category Maintenance

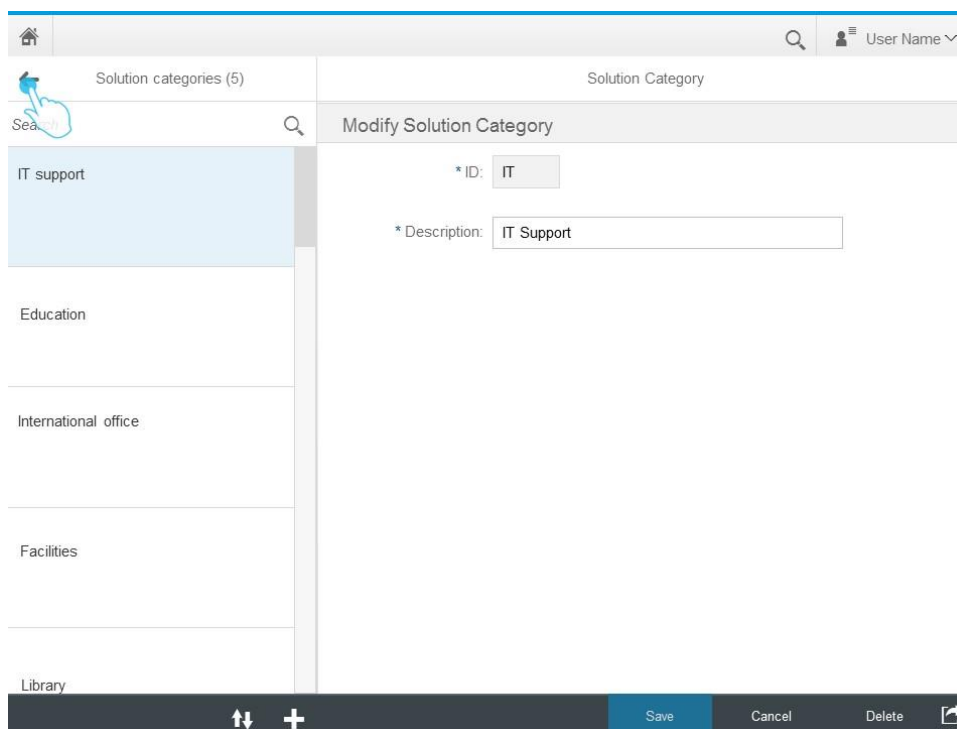
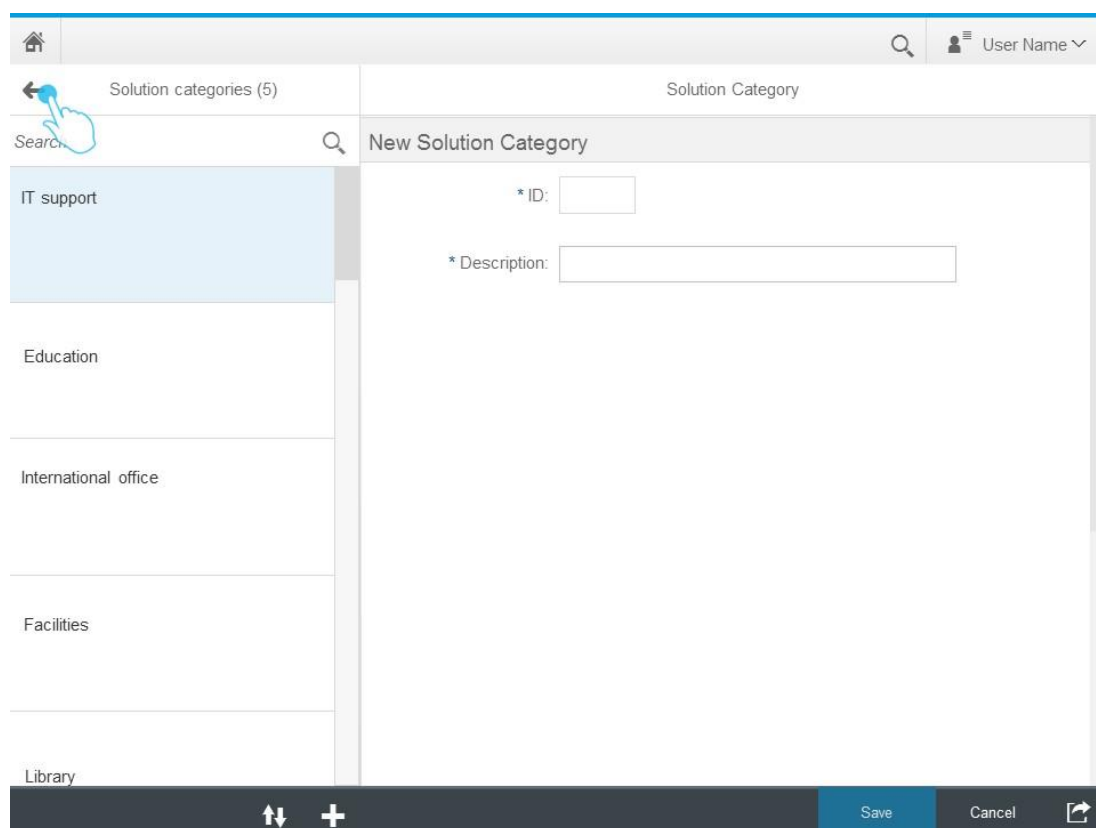


Figure 23 Solution Category Details

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 required 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 24 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.

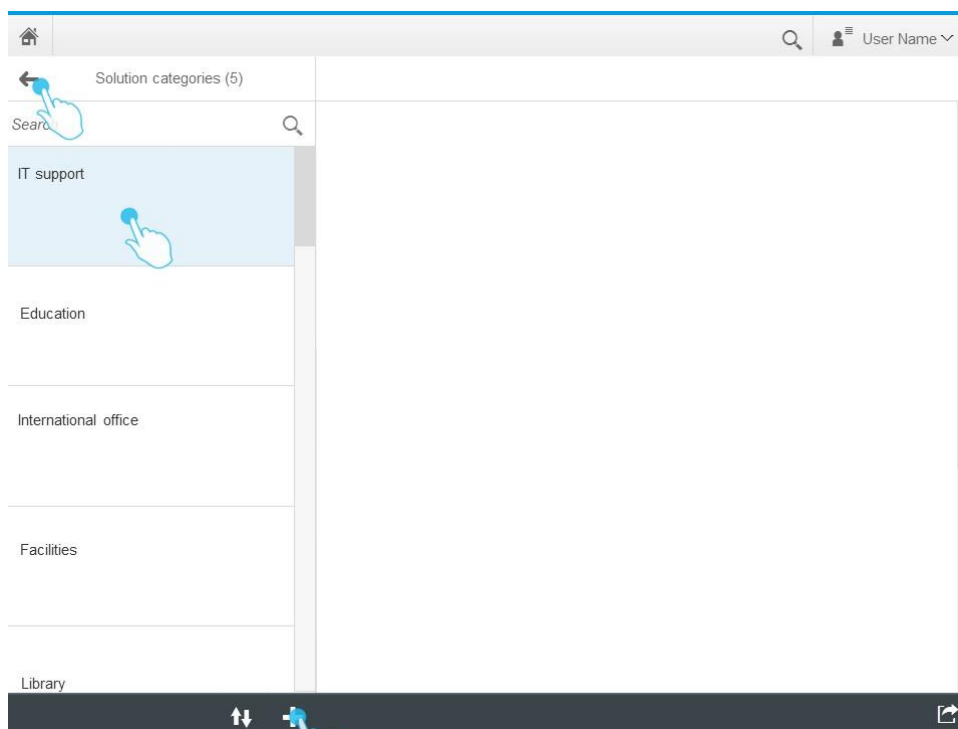


Figure 25 Predefined Support Solution Maintenance Category List

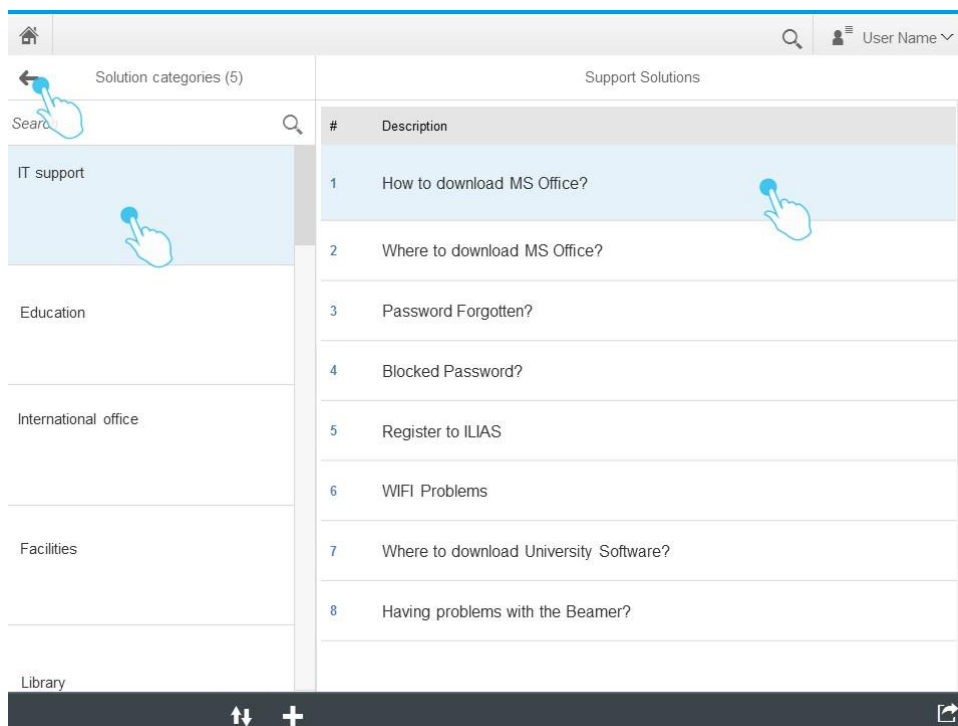


Figure 26 Predefined Support Solutions Maintenance Solution List

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.

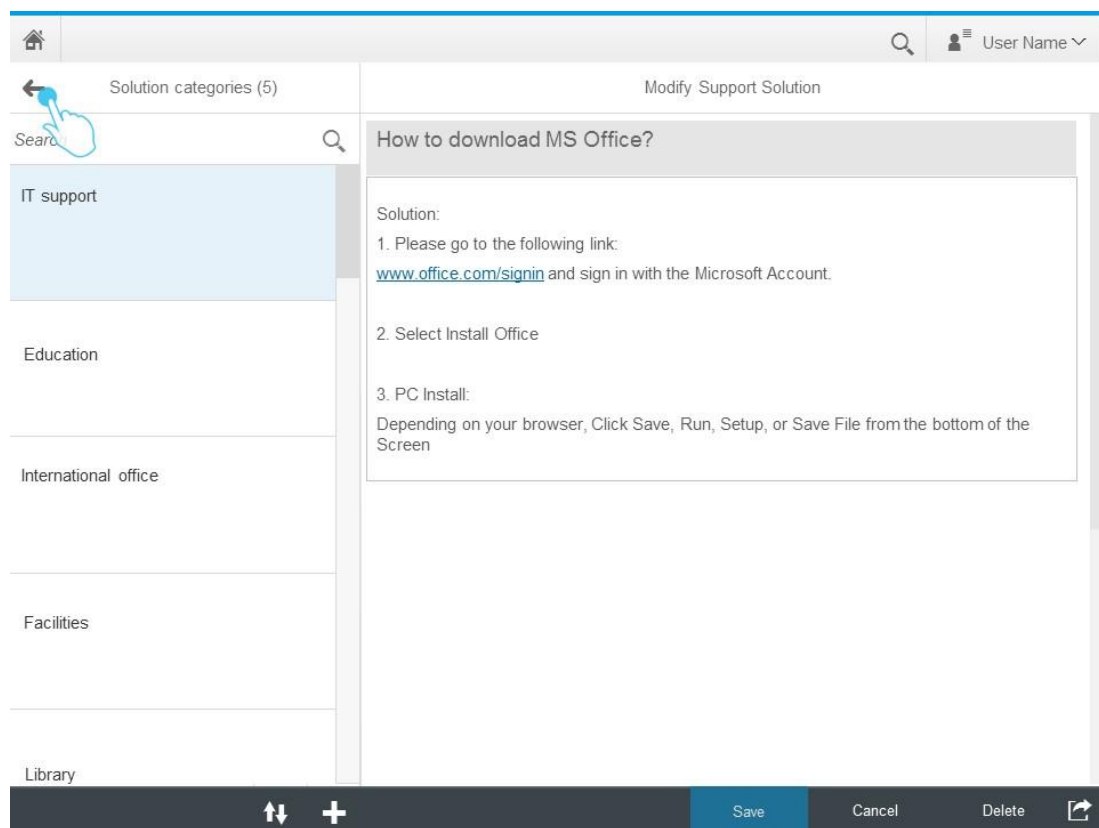


Figure 27 Predefined Support Solutions

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 28 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 29 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 Ticket Details' 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 currently empty. At the bottom of the right pane, there are 'Send' and 'Cancel' buttons.

Tickets (6)	Ticket
My Tickets	
Forgotten Password <i>Open</i>	Description: Forgotten Password Priority: High Status: Open Category: IT Detail Description: Hello IT, I do not remember my Password. Could you please support me with a new password. Thank you and Regards Solution: Dear Student, Your password was expired, for that reason you was not able to connect even when you reset your password.
Office Installation Problem <i>Open</i>	
Email not Working <i>Open</i>	
No information in my Profile <i>Open</i>	
No access to ILIAS	

Figure 30 Open Ticket Details

7.2.3 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.

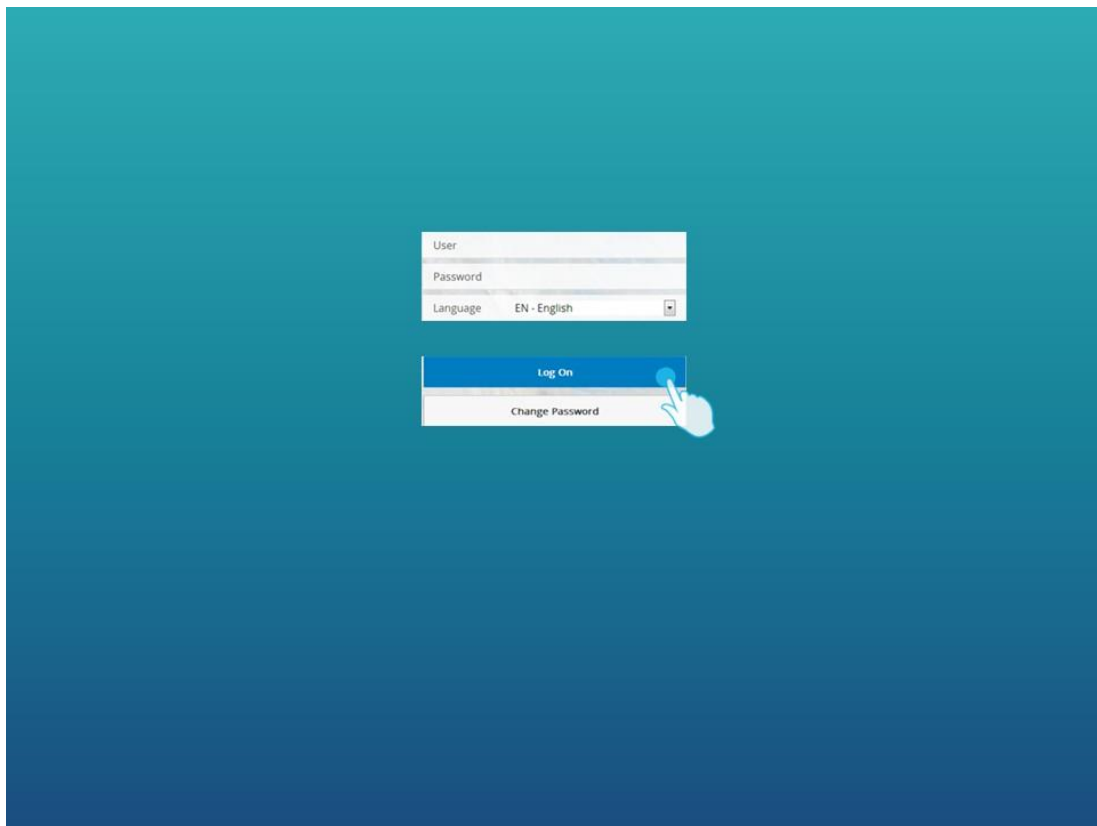


Figure 31 Fiori Launchpad Login screen

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.

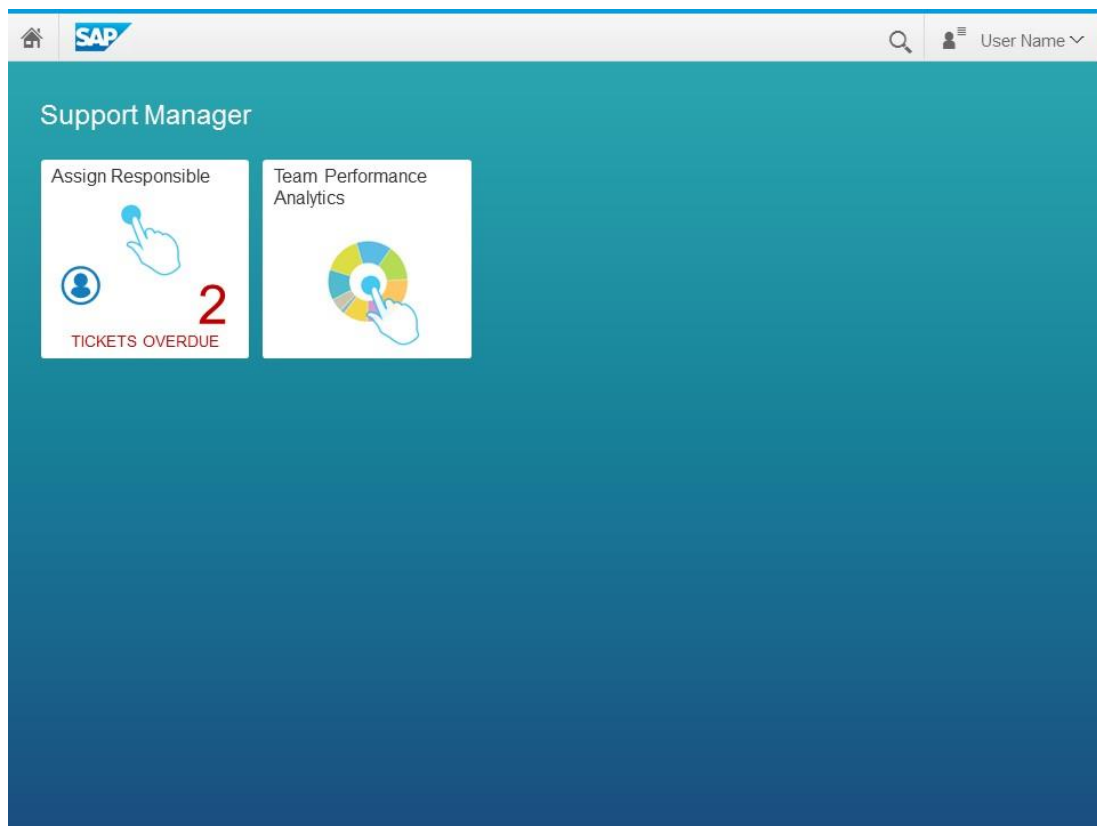


Figure 32 Fiori Launchpad Home screen for Support Team Manager

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.

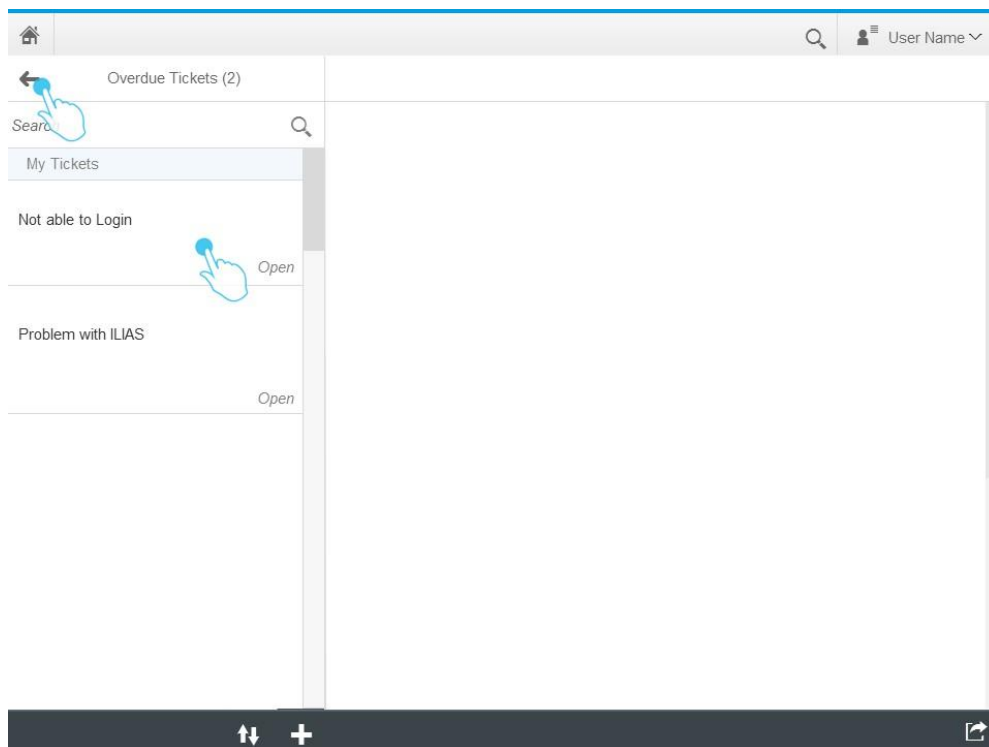


Figure 33 Overdue Tickets List

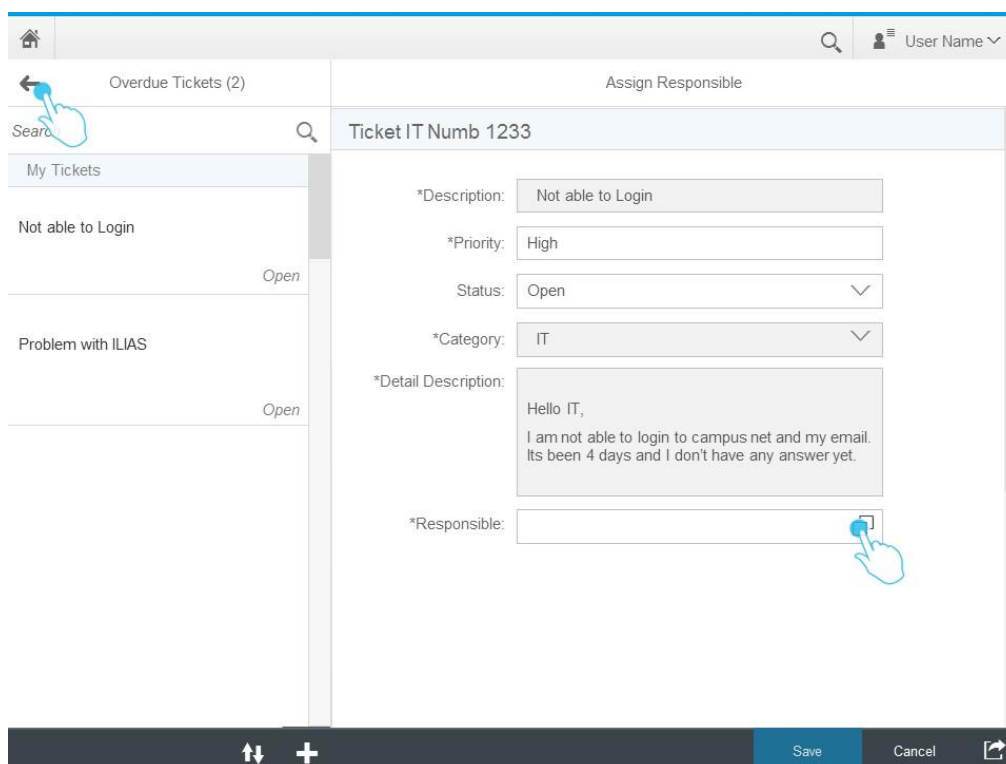


Figure 34 Overdue Ticket Details

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

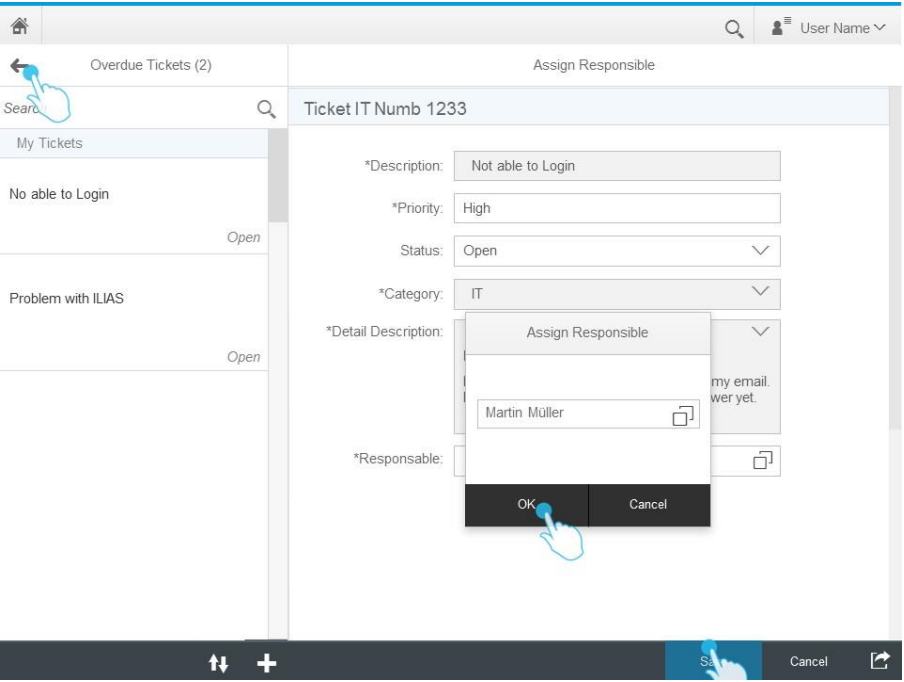


Figure 35 Overdue Ticket Responsible Selection

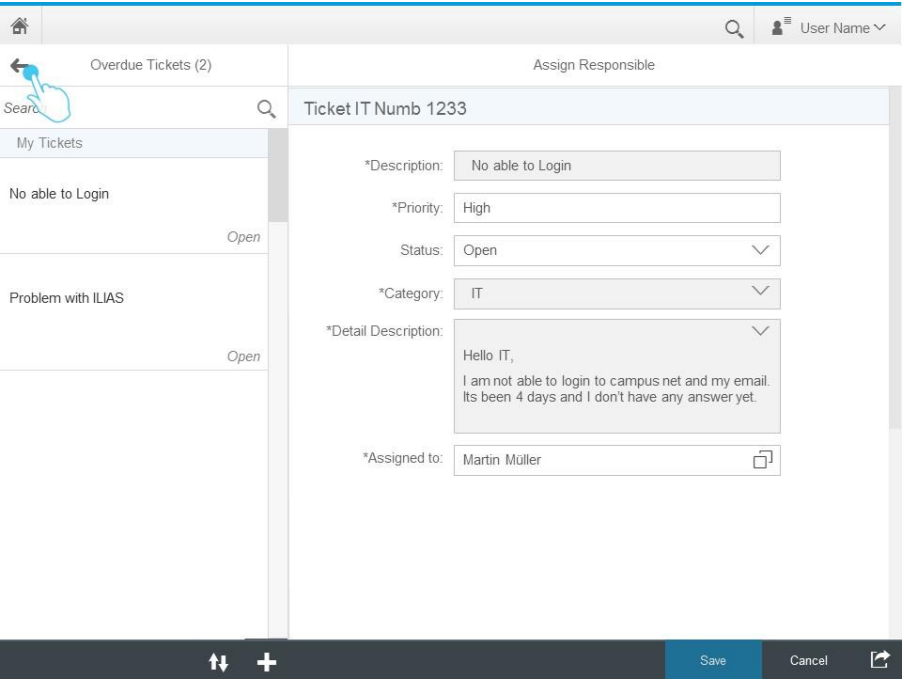


Figure 36 Overdue Ticket Assignment

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.

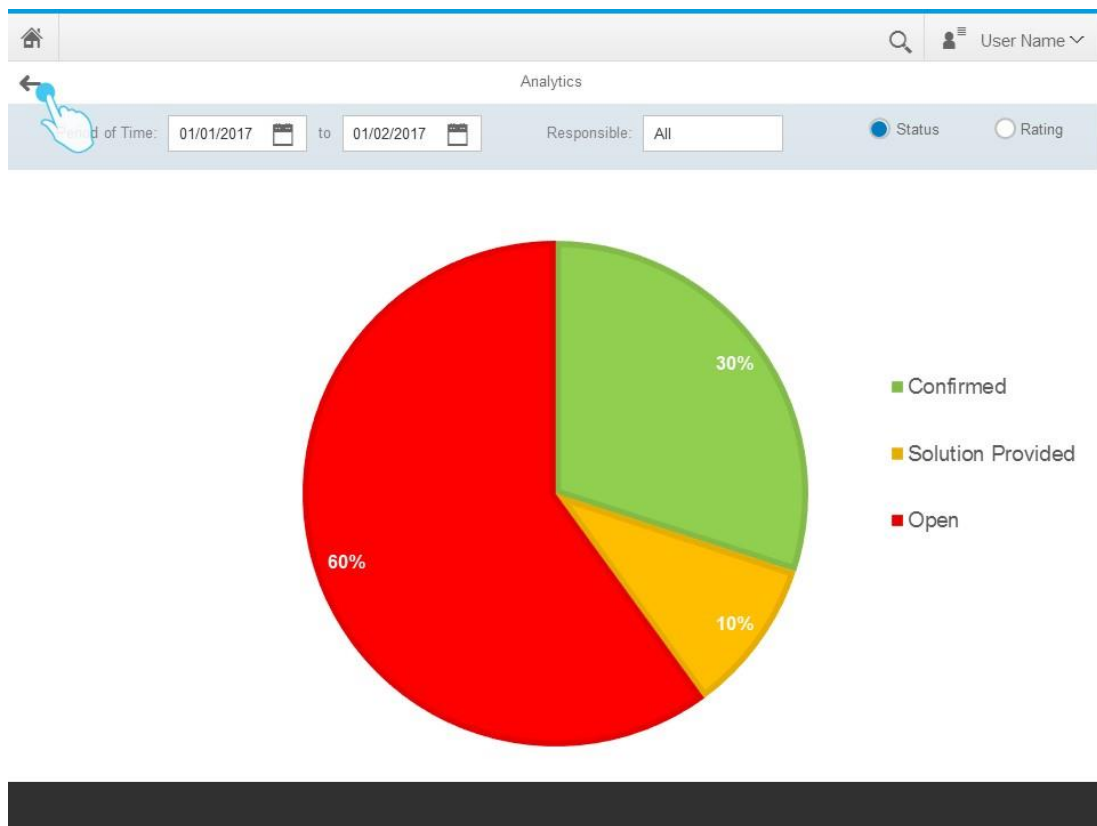


Figure 37 Team Performance Analytics

7.3 BUILD.ME Prototype Tool Study

Three different prototypes have been created with Build.me tool.

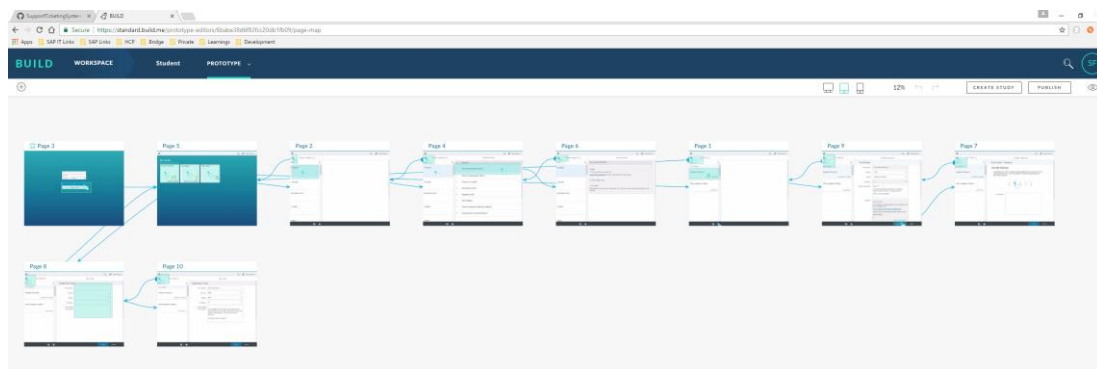


Figure 38 Student Prototype flow

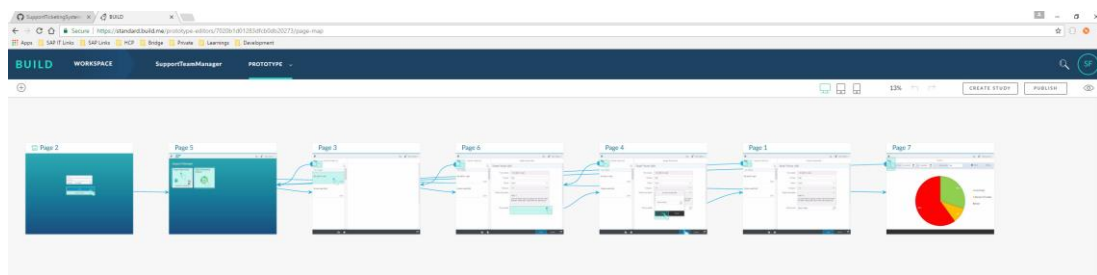


Figure 39 Team member Prototype flow

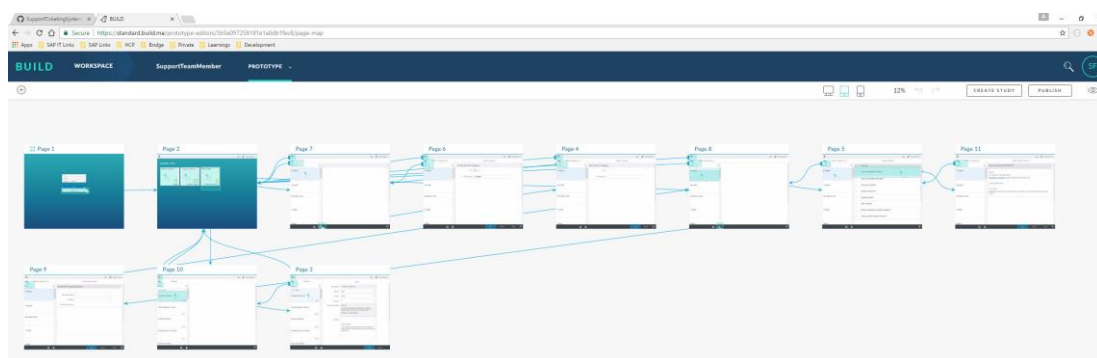


Figure 40 Team Manager Prototype flow

Research studies were made after these three prototypes were published.

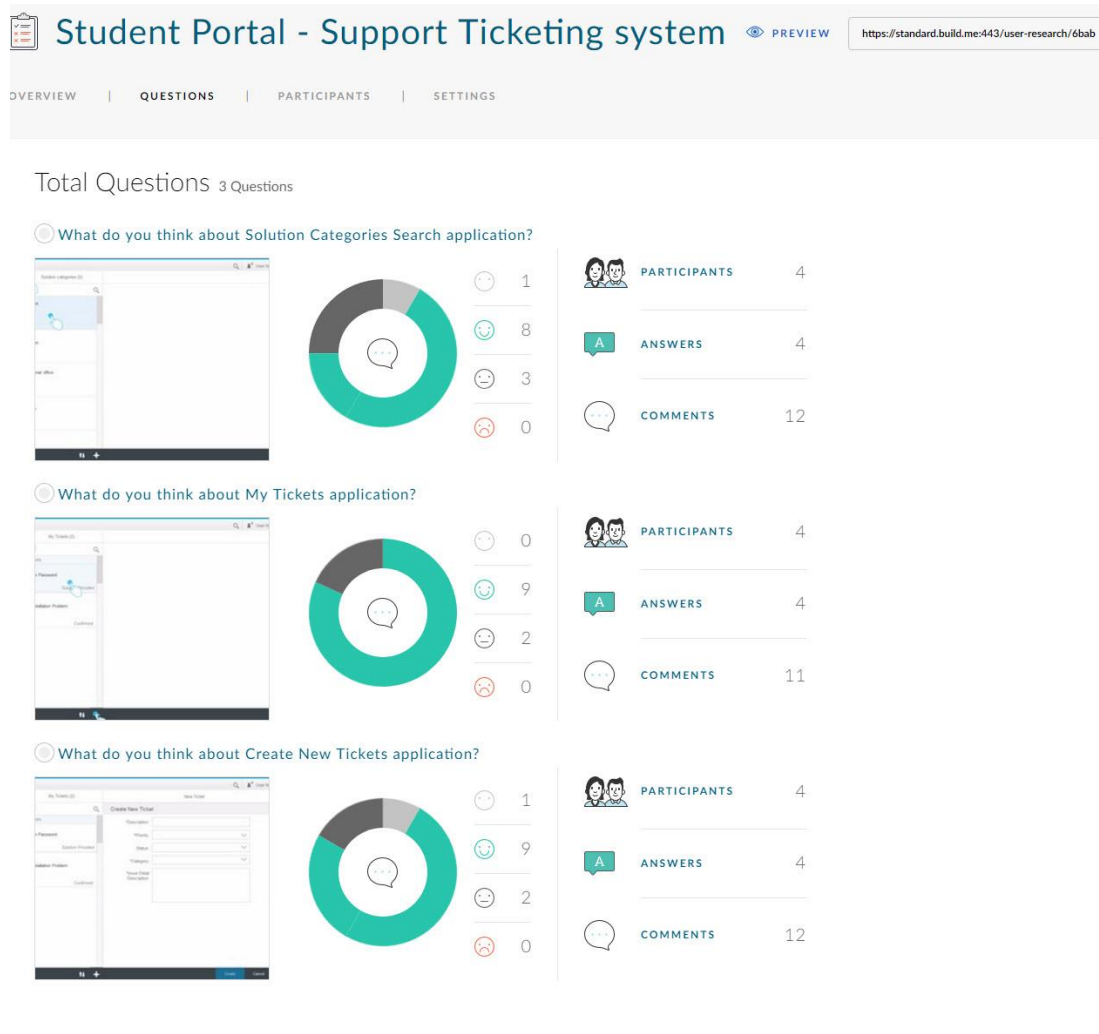


Figure 41 Student Prototype study evaluation

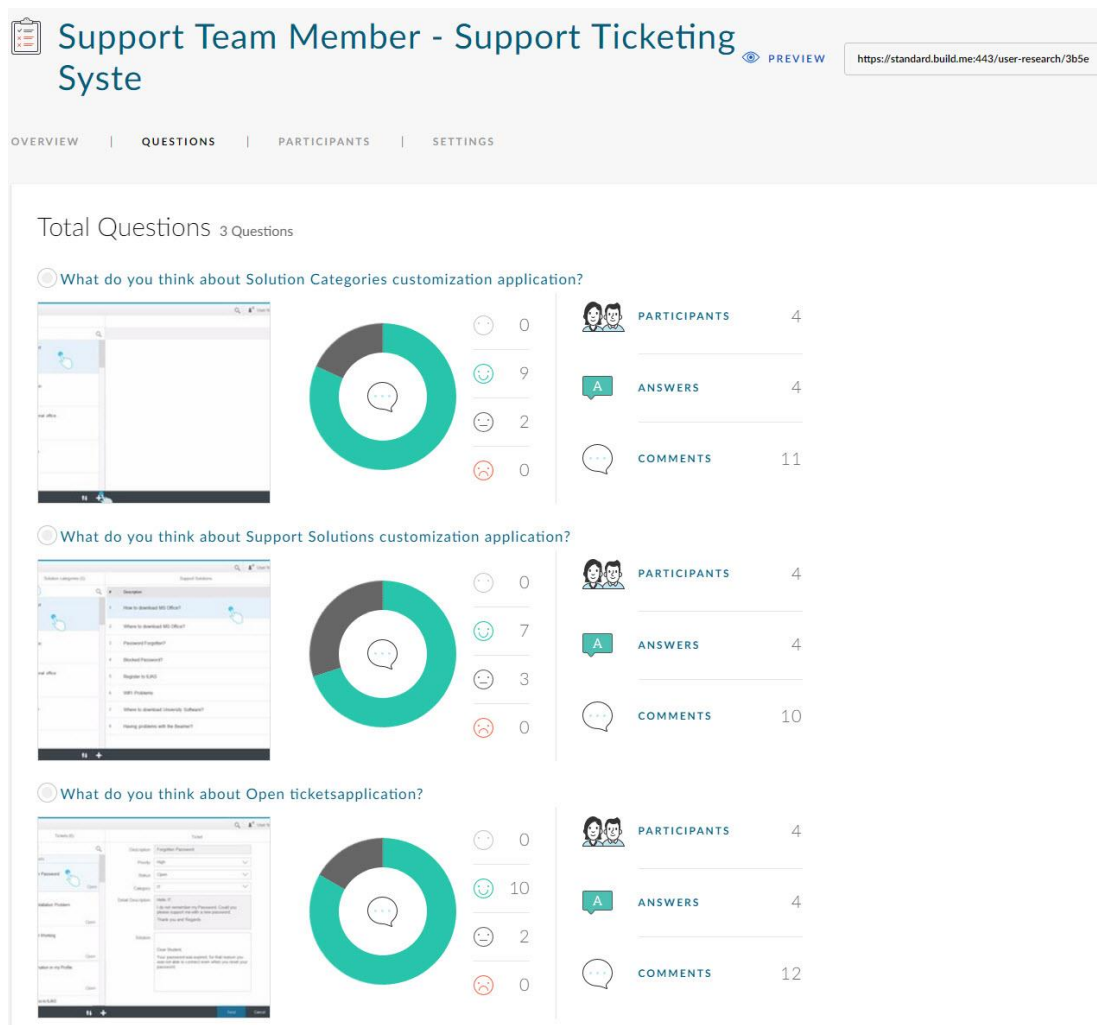


Figure 42 Team member Prototype study evaluation

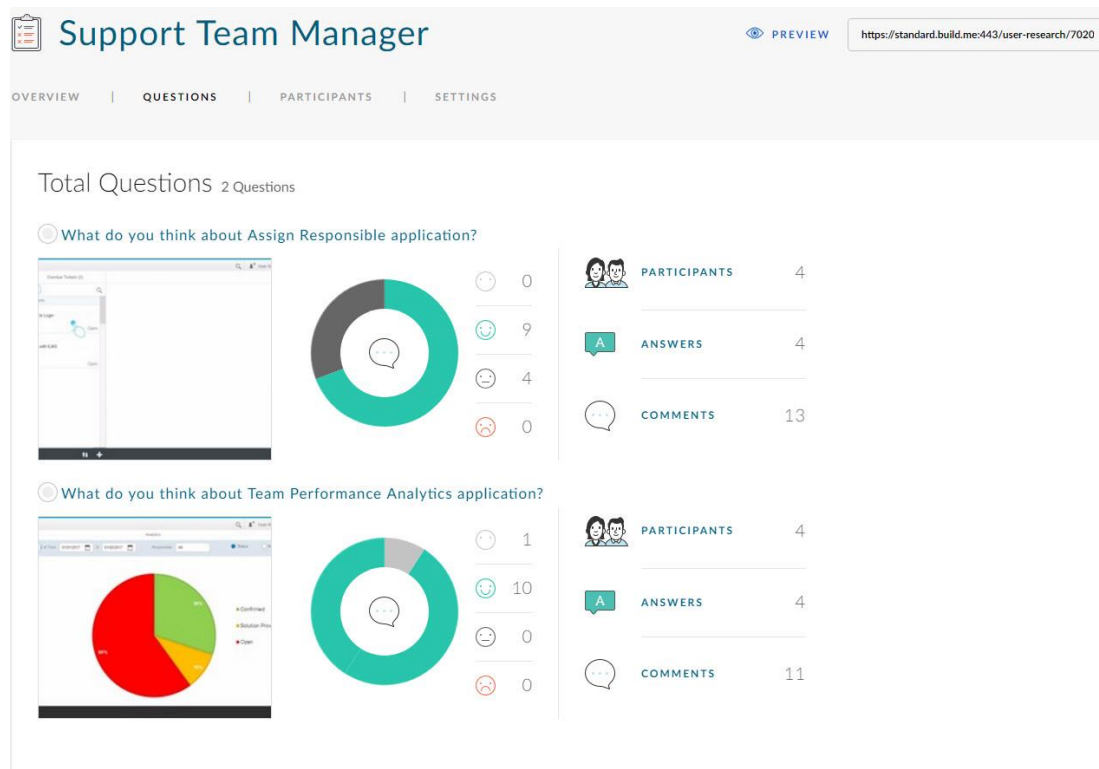


Figure 43 Team manager Prototype study evaluation

Based on the results of the study, it has been concluded that the created user interface design is sufficient for the support ticketing system.

8 Software Architecture

8.1 Solution Overview

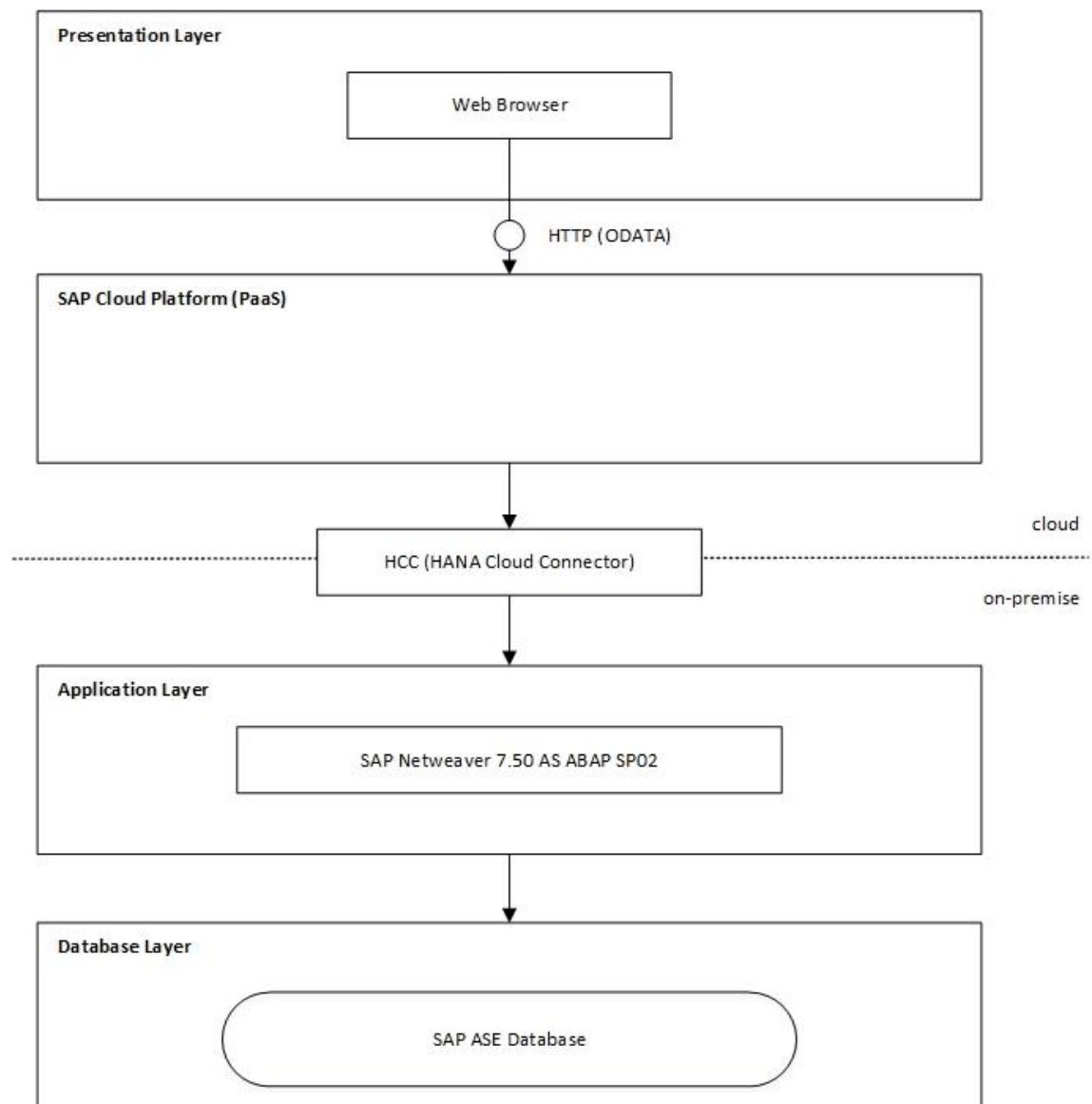


Figure 44 Solution architecture

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.

8.2 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

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 45 Frontend Roles and Authorizations illustrates this role-based authorization concept implemented in the SAP Cloud Platform. (SAP, 2017d)

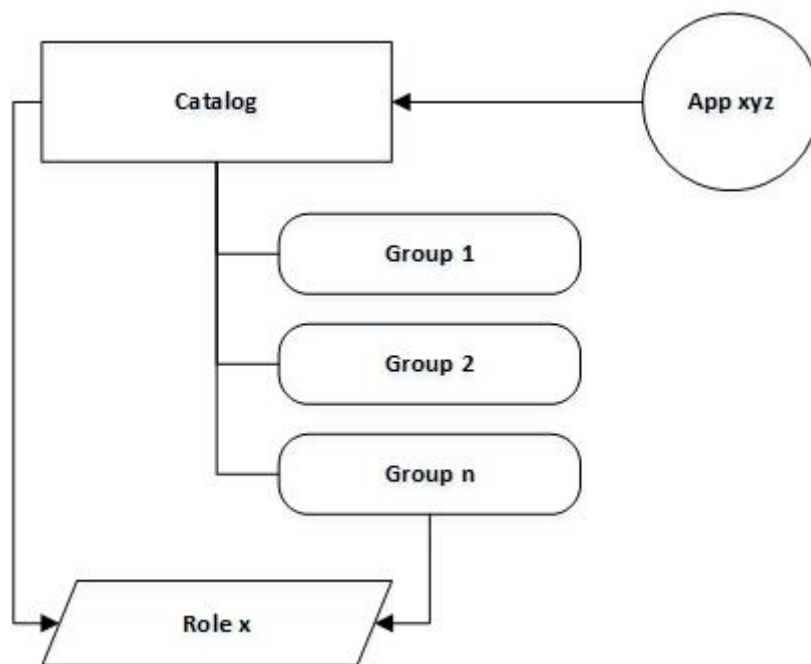


Figure 45 Frontend Roles and Authorizations

8.3 Database diagram (ERM)

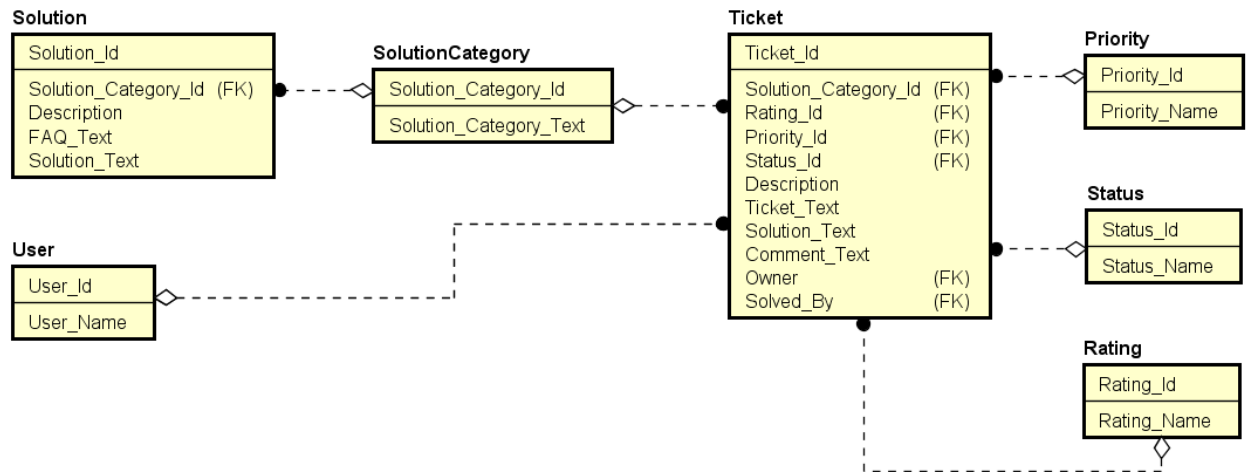


Figure 46 ERM Support Ticketing System

The figure 46 ERM Support Ticketing System 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.

9 User-Story to Task Mapping

Table 7 User-story to Task Mapping

US#	Classification	User Story Description	Responsible	Due Date
Epic : Search predefined support solution				
US1	MUST HAVE	As a student, I want to have a list of support solutions.	Frontend Dev: Ilkay Ates	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US2	MUST HAVE	As a student, I want to search for support solutions by their categories.	Frontend Dev: Ilkay Ates	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US4	NICE TO HAVE	As a student, I want to see the number of the predefined support solutions on my home screen.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : Create new ticket				
US5	MUST HAVE	As a student, I want to create a new ticket with specific category.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US7	NICE TO HAVE	As a student, I want to create a new ticket with a specific priority.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : List my tickets				
US8	MUST HAVE	As a student, I want to see my tickets as a list.	Frontend Dev: Marcia Luna	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US10	MUST HAVE	As a student, I want to edit my existing ticket.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US11	MUST HAVE	As a student, I want to delete my existing ticket.	Frontend Dev: Marcia Luna	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US13	MUST HAVE	As a student, I want to confirm the solution provided and close the ticket.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US14	NICE TO HAVE	As a student, I want to give feedback and rating about the provided support for my ticket.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US15	NICE TO HAVE	As a student, I want to see the number of the tickets, for which solution is provided, on my home screen.	Frontend Dev: Marcia Luna	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : Create solution categories				
US16	MUST HAVE	As a support team member, I want to	Frontend Dev: Shamil Fayzullin	11.05.2017

		create support solution categories	OData API: Shamil Fayzullin	01.05.2017
US17	MUST HAVE	As a support team member, I want to edit support solution categories	Frontend Dev: Shamil Fayzullin	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US18	MUST HAVE	As a support team member, I want to delete support solution categories	Frontend Dev: Shamil Fayzullin	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US19	NICE TO HAVE	As a support team member, I want to see the number of the available categories on my home screen.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : Create predefined support solution				
US20	MUST HAVE	As a support team member, I want to create predefined support solutions.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US21	MUST HAVE	As a support team member, I want to edit predefined support solutions.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US22	MUST HAVE	As a support team member, I want to delete predefined support solutions.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US23	NICE TO HAVE	As a support team member, I want to categorise predefined support solutions.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US25	NICE TO HAVE	As a support team member, I want to see the number of the predefined support solutions on my home screen.	Frontend Dev: Ilkay Ates	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : Provide Support Solution				
US26	MUST HAVE	As a support team member, I want to see a list of open tickets.	Frontend Dev: Marcus Ritter	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US29	MUST HAVE	As a support team member, I want to have the possibility to ask questions to the ticket owner via ticket.	Frontend Dev: Marcus Ritter	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US30	MUST HAVE	As a support team member, I want to resolve tickets.	Frontend Dev: Marcus Ritter	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US31	NICE TO HAVE	As a support team member, I want to see the number of open tickets on my home screen.	Frontend Dev: Marcus Ritter	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : List overdue tickets				

US32	MUST HAVE	As a support team manager, I want to have a list of overdue tickets.	Frontend Dev: Marcus Ritter	11.05.2017
			OData API: Shamil Fayzullin	01.05.2017
US34	NICE TO HAVE	I want to assign responsible	Frontend Dev: Marcus Ritter	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US36	NICE TO HAVE	As a support team manager, I want to see the number of the overdue tickets on my home screen.	Frontend Dev: Marcus Ritter	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
Epic : Analytics				
US37	NICE TO HAVE	As a support team manager, I want to have analytics phs which display team performance by number of open tickets and team members.	Frontend Dev: Shamil Fayzullin	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017
US38	NICE TO HAVE	As a support team manager, I want to have analytics which display team performance by number of raitings and team members.	Frontend Dev: Shamil Fayzullin	11.06.2017
			OData API: Shamil Fayzullin	01.06.2017

10 Group Workload

Table 8 Group Workload

Task#	Description	US#	Responsible	Time
1	Provide interviews		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	2 days
2	Vision		Marcia Luna, Shamil Fayzullin, Ilkay Ates, Marcus Ritter	1 day
3	Low-fi mockups		Shamil Fayzullin, Ilkay Ates, Marcia Luna, Marcus Ritter	1 day
4	Personas		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	2 days
5	High-fi mockups		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	5 days
6	Solution Architecture		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	4 days
7	Create prototypes in build.me		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	2 day
8	Experience map		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	1 day
9	User stories		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	2 days
10	Roles and authorizations		Ilkay Ates, Marcia Luna, Marcus Ritter, Shamil Fayzullin	1 day
11	Install Sap NetWeaver server		Shamil Fayzullin	1 day

12	Connect application server to SAP Cloud platform via HANA Cloud Connector		Shamil Fayzullin	0,5 day
13	Implement OData API	US1	Shamil Fayzullin	0,5 day
14	Implement user interface	US1	Ilkay Ates	3 days
15	Implement OData API	US2	Shamil Fayzullin	0,5 day
16	Implement user interface	US2	Ilkay Ates	3 days
17	Implement OData API	US8	Shamil Fayzullin	0,5 day
18	Implement user interface	US8	Marcia Luna	3 days
19	Implement OData API	US11	Shamil Fayzullin	0,5 day
20	Implement user interface	US11	Marcia Luna	3 days
21	Implement OData API	US16	Shamil Fayzullin	0,5 day
22	Implement user interface	US16	Shamil Fayzullin	1 day
23	Implement OData API	US17	Shamil Fayzullin	0,5 day
24	Implement user interface	US17	Shamil Fayzullin	1 day
25	Implement OData API	US18	Shamil Fayzullin	0,5 day
26	Implement user interface	US18	Shamil Fayzullin	1 day
27	Implement OData API	US26	Shamil Fayzullin	0,5 day
28	Implement user interface	US26	Marcus Ritter	3 days
29	Implement OData API	US32	Shamil Fayzullin	0,5 day
30	Implement user interface	US32	Marcus Ritter	3 days

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