Design of a SMART Knowledge Management System

Final Master's Project Thesis

Master's Degree on Multimedia Applications

Professional Itinerary

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Quote

"*Those who cannot remember the past are doomed to repeat it.*"
George Santayana, Philosopher.

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I would like to express my gratitude to my manager, Irma Martin, for her patient guide and help when I got stuck with the project. Thanks for encouraging me in every moment to get the job as complete and detailed as possible and for giving me a lot of good advices and practices. Also, I would like to express my gratitude to the whole PMO team for the opportunity to be in a cohesive team with great professionals. And especially to Jose Aires and Americo Toro, who always had provided me their sincere feedback. Thank you!

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Abstract

The process of gathering, documenting and analysing the lessons learned and best practices found out during a project, is a key challenging area in Project Management Offices (PMOs). Both, best practices and lessons learned increase the knowledge of the organization and teams, and facilitate new project managers to learn from previous experiences and prevent to fall into the same routines and pitfalls. However, collect, store, disseminate and apply this knowledge, it is not a trivial tasks. Many companies have tried to build wide databases, or create blogs o wikis to set up a collaborative environment, but finally they have given up. This project presents a knowledge management process together with an IT solution, which aim is to support the process. The solution built is a customized tool for a specific company, so, we have analysed their needs and as is processes of the company, to finally, come up with a built-in solution.

To conclude, this project aimed to understand the state of the art of knowledge management and how it can be applied on my company. It has served as a road path to understand what are the needs and what we can do to improve how the company is managing their knowledge assets.

Resumen

El proceso de capturar, documentar y analizar lecciones aprendidas y buenas prácticas identificadas durante la ejecución de proyectos, es un reto para muchas oficinas de gestión de proyectos (OGP). Ambas, buenas prácticas y lecciones aprendidas incrementan la sabiduría de la organización y los diferentes equipos que la forman, facilitan a nuevos gestores de proyectos aprender de experiencias anteriores así como prevenir recaer en las mismas rutinas o errores. Sin embargo, recoger, guardar, diseminar y aplicar este conocimiento adquirido no es una tarea trivial. Muchas compañías han intentado construir grandes bases de datos, o bien, crear blogs y wikis para fomentar un ambiente colaborativo, pero finalmente han abandonado. Este proyecto presenta un proceso de gestión del conocimiento así como una solución IT para soportar el proceso. La solución construida es una herramienta personalizada para una compañía específica, por lo tanto, hemos analizado sus necesidades y sus actuales procesos para finalmente crear una solución integrada y personalizada.

Este proyecto ha tenido como objetivo entender el estado del arte de la gestión de conocimiento y como esta se puede aplicar a la compañía donde trabajo. Ha servido también como estudio de las necesidades y de que debería hacer la compañía para mejorar la gestión de sus recursos de conocimiento adquirido.

Keywords

Lessons Learned, Best Practices, knowledge management, Organizational Learning, Competitive Intelligence, Successful factors, web application, Project Management tool

Notations & Conventions

Chapters: Arial 20 Bold

Title 1: Arial 13 Bold

Subtitle: Arial 10 Bold and Italic

Body: Arial 10

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Chapter 1: Introduction

1.1. Motivation

Since I am working as a PMO analyst in a well-known multinational, I would like to merge my work and studies to resolve a challenging situation that face many Project Management Offices (PMOs), when they try to have an effective Lessons Learned process.

In my organization, I have observed many times that project managers are hired for a project but when it finishes, they left the company giving away the acquired knowledge. Other times, we have projects that rollout in different markets or sectors across the Globe but there is no communication between the project teams, repeating the same mistakes and not leveraging the best practices.

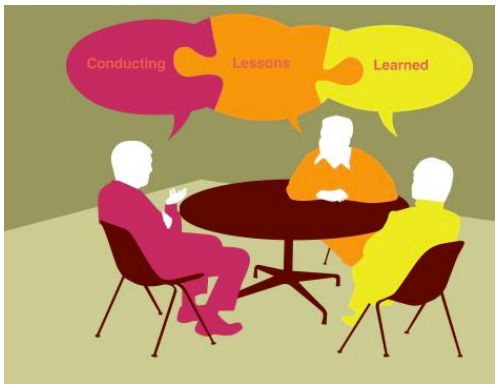


Figure 1 - Conducting Lessons Learned. Image posted in www.managingamericans.com by Lisa Woods on July 30, 2013

The aim to have a smart knowledge management application, which allows to collect, share, analyse and apply lessons learned and best practices, is to bring productivity and efficiency to the organization, continuously improving how projects are deliver. The objective of this project is to design an end-to-end application, which collect lessons learned, analyse them and transform to recommendations that can bring benefits like:

- Ensure knowledge target the right people timely and with the right information.
- Avoid reworking, decrease costs and can help to minimize delays in implementation.
- Help stakeholders to take better decisions based on experience and objective data.
- Help to reduce the knowledge gap caused due turnover of personnel or distance.
- Increase customer satisfaction (projects delivered on time, within budget)

Therefore, with this project I want to understand the state of the art of knowledge management systems and develop an application that drives efficiency and value though the digitalization of the Lessons Learned process.

1.2. Description

The process of gathering, documenting and analysing the lessons learned and best practices found out during a project, is a key challenging area in Project Management Offices (PMOs). A lesson is knowledge acquired through experience, which may be positive and we would like to reinforce it, called Best Practices. Or the experience may be negative, then called Lessons Learned (LL), which we would avoid repeating it. Both, best practices and lessons learned increase the knowledge of the organization and teams, and facilitate new project managers to learn from previous experiences and prevent to fall into the same routines and pitfalls.

Although there are many tools and processes for capturing Lessons Learned, most of them are based on databases or static content (wikis, SharePoint, excel files, etc). Because of that, finally, many organizations drop out the processes because several reasons like (Nick Milton, 2010):

- Static content and databases require a proactive approach from the user, who usually, is overwhelmed by the project.
- Categories are not clear, well defined or well filled in, making difficult to filter information.
- There are irrelevant, duplicate, old or incomplete information in the database.
- There are not a well define framework, with clear ownership and processes.
- Lack of performance indicators and metrics to drive changes within the organization and see the value of lessons learned process.

All of these points will be an important aspect to consider for this project to build a valuable tool and not falling in the same trap. This project consists on the conceptualization and design of a Lessons Learned Management System not just a database. A system, which will have the following features in scope:

- **Collect and Store:** Gather Lessons Learned from all project team in a simple way, allowing the project manager to configure a questionnaire from a template or a draft and send it to the project team. The answers of the project team will be stored and the system will ensure that the metadata is consistently completed and right.

- **Verify applicability and quality:** To ensure data correction the system will validate the data inserted and also, will engage users to rate lessons learned, hence, the most useful will have more visibility and will be a candidate to be transformed to a needed action.
  Furthermore, we will need to set up a framework around the validation process to ensure the success of the project and a valuable content. Our aim is to transform Lessons Learned to actions/recommendations that can improve the efficiency and productivity of the organization. We will need to engage different people and take into account change management needs in order to ensure the stakeholders engagement to the tool and processes.

- **Disseminate:** The stored lessons learned can be shared by email or extracted as a pdf or excel file (***pull strategy*** for engaged users). In addition, the system will regularly communicate the new updates and changes to keep everyone up-to-date (***push strategy*** for non-motivated users). Giving to the user the option to select a topic of interest, for instance: "As a portfolio manager, I want to receive one per month the latest lessons learned and best practices about Governance". The system will be proactive, and brings the correct visibility for each user to benefit all levels within the organization.

- **Data analytics:** Finally, we will take profit of the data centralization to provide visual reports, which will help out users to take decisions. Giving visibility and reports of the gathered lessons learned and tracking them to become actions. The aim is to reduce unnecessary waste, rework and improve the way that we deliver projects. For instance, the system will show in which market we have many issues related with the transition to support, allowing directors to plan and execute a strategy to prevent painful Project Hypercare. Or, for example, see what the best practices within a delivery team are and reinforce or leverage them to other markets.

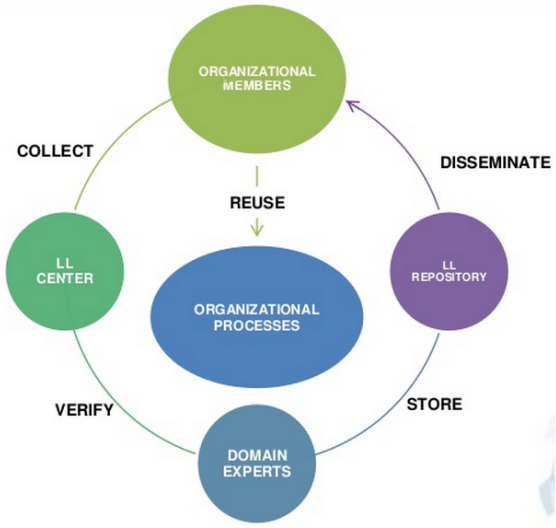


Figure 2 - A generic lessons learned process (Weber et al., 2001, p.21)

The users will be mainly sitting in an office with a desktop computer or a laptop, because of that, I chose to build a web application. Users haven't got much time and they need to see the value of their work. Therefore, one of the biggest challenges in this project will be assess how to engage users to introduce data. However, we think that if navigation and access is easy and the quality of the information is high making possible to reuse it, the chance of stakeholder's engagement will be high even without using gamification techniques.

There are several roles in the application and they will need different approaches. We need to engage **Project Team** to contribute uploading their lessons and recommendations. **Project Managers** and **Delivery Leads** need to extract information, an easy data visualization and action tracking though user dashboards will be very important to give value and drive change to the organization. Finally, there will

be another type of role, which is the **Data Controllers**, these team owns the application (support, trainings…) and ensure data quality. It will be represented by the PMO Governance Team.

Since I am part of a Graduate Program in my company, and I had to present a project of a process improvement as a Program closure. I chose the process of lessons learned, which allows me to work on the framework and simultaneously on the technology to support it. However, it has not been an easy project, because lessons are tacit knowledge. It is difficult to ensure quality and reuse the knowledge because it depends in part of the personal interpretation.

1.3. General Objectives

The Objective of the project is to conceptualize and design a SMART knowledge management system, which allows to collect, share, analyze and apply lessons learned and best practices. The aim of the knowledge management system is to bring productivity and efficiency to the organization, to improve service quality, and deliverable consistency by reusing and capitalizing on intellectual and knowledge-based assets.

The objectives are divided in three categories: Product, User and Project.

- Product refers to the knowledge management tool designed.
- User refers to the customer expectations.
- Project refers to the objectives I would like to achieve with this project.

Project Objectives (*Section 3.1*) are the short term objectives to meet within the scope of this project. While long term objectives (*Section 3.2*) are objectives out of the scope of this project but objectives to take into account if we want to develop the product. Long term objectives were presented in the company presentation in order to get a buy-in from the audience. Finally, we will see the success criteria for this project and metrics considered (*Section 3.3*).

3.1 Project Objectives

Product objectives:

- Collect, store and organize knowledge acquired deploying projects.
- Allow users to retrieve information from past experiences in a right format and easily.
- Engage users to upload their experiences and lessons learned during project implementation.

Customer/user objectives:

- Understand how knowledge management can help to leverage, improve and refine organizational competencies and knowledge assets obtained executing their projects.
- Obtain a clear assessment of user requirements and infrastructure needs to implement a knowledge management system in the company.

Project Objectives:

- Design all the screens of the tool and information architecture.
    - Metric: Gather the acceptance of the wireframe deliverables.
- Create an interactive mock up to test the tool and process.
    - Metric: Obtain the user acceptance test.
- Document the planning, execution and closure of the project.
    - Metric: All required deliverables to document the project (PACs + Memory)

Personal objectives:

- Apply the knowledge acquired in the Master's Degree in subjects as *Disseny d'interficies interactives*, *Producció multimèdia* and *Gestió Avançada de Projectes* to solve a problem statement through the design and development of an application.
- Improve my English communication skills through project presentation to a diverse audience and writing the final project assignment in English.
- Explore my capacity to plan, manage and control a multimedia project.
- Learn about Knowledge Management system and understand the sate of the art.

3.2 Long Term Objectives

Product objectives:

- Achieve broad usage of the process and solution using user engagement techniques.
    - Metric: Web analytics (Number of user registered, number of lessons, visits and visitants to the site, etc.).
- Achieve high level of user satisfaction of the tool and process.
    - Metric: Launch a survey to measure user satisfaction, look and feel score and gather user anecdotes.
- Improve timeliness and quality of information.
    - Metric: Number of contributions (lessons), quality audit of a sample, and number of lessons applied in the must win battles.

Customer Objectives:

- Increase productivity and streamline processes
    - Metric: Measure time and steps before and after the knowledge management initiative.
- Time and money saved by implementing and applying best practices
    - Metric: Measure of efficiency and productivity, measure project outcomes before and after initiative, gather outcomes from lessons applied in the must win battles.

3.3 Project Success Criteria

The project success will be measured by the four key areas of project management:

Scope**:** I delivered what I committed: Project memory, product mock up, other deliverables (Project Charter, Requirement Specification…) and company and university project presentations.

- Metric: Obtain a mark for all the PACs and deliverables from UOC.

Time**:** I delivered the whole project successfully on time.

- Metric: All the assignments and presentations done timely.

Cost: There is no budget for this project.

Quality**:** Ensure the quality of the deliverables and the assessment.

- Metric: Obtain a high mark on the final rating by UOC.

1.4. Methodology

When I started to set out the project I thought to use an Agile methodology to learn how to manage a project using the Scrum framework. However, when I started to plan the project, I changed to a linear approach of waterfall for several reasons:

- I wanted to really focus on the user's requirements and design, which I think, are key to achieve user expectations and engagement. Knowledge management is much more that an information management approach or a stand-alone technology. Knowledge Management is a business process, which also entered in the scope of these months of work.
- By other hand, I don't have the required technical skills to implement the tool, knowledge about PHP and MySQL, which are needed to build the application. The idea of having a deep design and process, learn how to develop the tool and implement it was not at all realistic. Although, the first work plan optimistically I added a construct and test phase.
- With two of the "iron triangle" vertex fixed (cost and time), I thought a waterfall approach would be more secure.

For these reasons, finally I follow the waterfall approach shown in Figure 3.

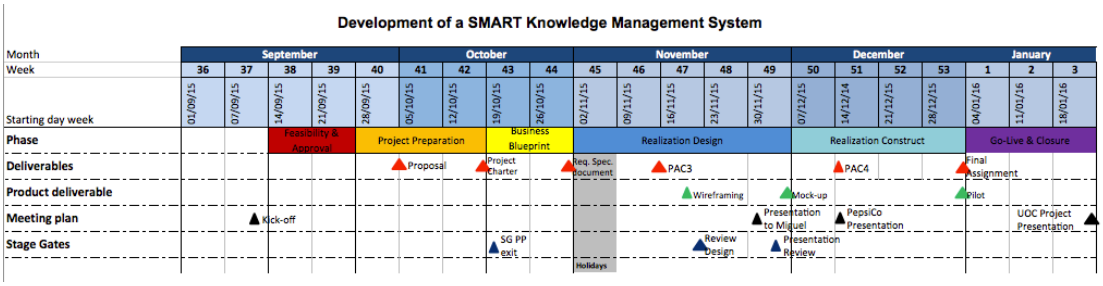


Figure 3 - High level work plan v3 (by December 2015)

The project had almost 4 months of duration, from the 15th of September, when the course started until 4th of January, when the final project assignment has to be delivered. I divided the timeline in seven main phases:

- **Feasibility and approval:** During this phase I work on brainstorming and study the feasibility and complexity of the ideas that came up. I aligned with the company and the university the different ideas and chose one. The output of this phase was the proposal assignment (PAC 1).

- **Project Preparation:** Main activities of this phase were documenting and assess the state of the art of the knowledge management systems and techniques. Also, defining the project scope and work plan. The output was the finalized and approved project charter. See Annex B.

- **Business Blueprint:** The main activity of this phase was to gather the requirements specifications for the development of the website. The requirements were taken through interviews with different users: project managers, customer representative as well as the

recommendations found on the project preparation phase. The output of this phase was the PAC 3, which contains the requirement specification list.

- **Realization Design:** During this phase I planned the structure of the website through a navigation map. In addition, I sketched the design of the main screens using a wireframing tool and request approval of the customer. Once wireframes were approved, I developed a high definition screen to test the look and feel. The mockup based on the high definition screens enabled to test the user interaction and receive the customer feedback. The timing of this phase was tight and I had some days off planned ahead. Because of that, there was a **risk** of delay in this phase identified in the preparation phase. I accepted the risk and from the beginning I inform about the possible cancellation of the testing phase to my consultant. The output of this phase was the mockup finalized. As we will see later, finally we had a delay of 3 weeks.

- **Realization Construct:** The aim of this phase was to get a basic prototype of the application with at least one of the main functionalities to deliver (Identify, share or extract information). In this phase was planned, also a training in PHP and MySQL. However as in the previous phase, time was too tight and a risk of cancelation of this activity was high. During the execution of the project simpler solutions were lay out in order to obtain a view of the tool outcomes.

- **Go-Live and Support:** This phase was set for presentation rehearsal and preparation due to a misunderstanding. Finally, there wasn't any activity during this phase, hence, presentation was delivered January 4th.

1.5. Project Plan

As we have seen in the previous section, a linear approach of waterfall with clear phases was chosen. Within these phases we determined the activities to develop and the effort needed to complete them.

In the table below, you could see a summarized view of the work plan based on Figure 3, which offer a simplified view structured in four most relevant categories:

- **Deliverables:** Deliverables related with the phase plus the mandatory deliverables to be hand over to the university consultant.
- **Product deliverable:** There are two main deliverables the mockup of the system and a small prototype coded using HTML5, CSS, PHP and MySQL.
- **Meeting plan:** Planned key meetings, it includes the project presentation in the company, the presentation to the lead of my department as well as the presentation in the university (UOC).
- **Stage Gates:** The stage gated will be held bi-weekly during the 1:1 with my mentor in the company. She represents the customer in the project, and we will use the meeting to follow up the project development and give feedback about the product delivered.

Please, review Project Charter in Annex B to see a detailed Gantt chart with start and end date for each activity and dependences between activities. As I said in the previous section the timing was tight due to there is not a team to do the work, everything is done by my own. I don't have the chance to dedicate 8h per day since I am fulltime employee (40h/week), I am taking another subject in the UOC (8h/week) and English lessons in the EOI (5h/week). Even so, I was very motivated about the topic selected and merging the Master's Degree final project with the Company Internship Program project made easier to advance on the project.

Table 1 - Key Milestones by phase and deviations

Tasks	Estimated Duration	Start Date baseline	End Date baseline	Actual Start Date	Reason of the delay or comment
Phase 1 – F&A	**2 week**	**14/09/15**	**28/09/15**	2 weeks	Feasibility and approval
PAC 1: Proposal	4 days	28/09/15	01/10/15	28/09/15	
Phase 2 - PP	**3 weeks**	**28/09/15**	**19/10/15**	3 weeks	State of the art and research
PAC 2: Plan	3 days	09/10/15	12/10/15	09/10/15	
Project Charter	3 days	13/10/15	16/10/15	13/10/15	Longer than expected.
Stage Gate PP	1 day	20/10/15	20/10/15	20/10/15	
Phase 3 - BB	**2 weeks**	**19/10/15**	**02/11/15**	4 weeks	Underestimated + holidays
Analysis process	5 days	21/10/15	26/10/15	21/10/15	End date moved to 11/11/15
PAC 3: Requirements	3 days	13/10/15	16/11/15	13/11/15	
Stage Gate BB	1 day				
Phase 4 - RD	**3 weeks**	**02/11/15**	**28/11/15**	4 weeks	Started 2 weeks late. Scope increased with Proof of Concept, one week of delay more added.
Navigation map &	6 days	30/10/15	05/11/15	17/11/15	Activity planned on baseline during holiday period by

wireframming					mistake.
Develop Mock-up	7 days	06/11/15	16/11/15	25/11/15	Underestimated
Presentation on the company	1 day	03/12/15	03/12/15	15/12/15	Delayed due to attendee's agenda clashes
PAC 4: Design	3 days	11/12/15	14/12/15	14/12/15	
Stage Gate RD	1 day				
Phase 5 – PC	**2 weeks**	**21/12/15**	**04/12/15**	**2 weeks**	**Project Closure tasks**
PAC 5: Final Memory	10 days	21/12/15	04/01/16	21/12/15	
Presentation	5 days	-	-	28/12/15	In baseline I misunderstood target date. Finally prepared in parallel with memory.

The **deviations** were caused by different factor like:

- Unknown topic caused wrong estimation of Business Blueprint and Design phase, once I get deeper on the topic I realized that the project was more complex than expected. Time anc cost where limited, then I should modify the scope of the project. Cancelling some activities and going deeper on other to keep quality.

- Split on the objectives of the merged projects (Company Internship Program Project and Master's Degree Final Project) made more difficult to meet goals. While in the Company I should put the focus on improving the process, for this project I must focus on the tool to support the new process. The process and requirements were more complex than estimated and some features of the tool were redesigned many times due to the process was not closed.

- The decision to realize a Proof of Concept to understand better what kind of data is needed and how people is acting. It was not on scope and it was added during the project execution.

- Rework due to Justinmind[1] trial version expired and I was not able to share the file. Also, limitation on the free account of Moqups[2] forces me to delete some screens once done, keeping a .jpg copy.

- Other risks and activities external to the project but that impacted it, mainly related with my job.

[1] www.justinmind.com
[2] www.moqups.com

1.6. Budget

The Master's Degree project has been developed without budget. However, I find interesting and useful to estimate costs and needed resources to build the Knowledge Management System. The data used in the following tables is an average of standard costs.

Based on the work done, I have estimated that the development of the pilot will last 5,5 months. There is no need to have the human resources during all the period, due to the first month can be carried by the project manager, who will need to plan and align stakeholders. For the construct and test stages, we will need two web developer and one web designed, it will last 4 months including the hypercare and transition to support. The last two weeks are for the project closure activities.

Therefore, we can compute and approximation of human and material resources as it is shown in the following tables:

Table 2 - Human Resources estimation

Concept	Annual salary	Description	Total
Project Manager	30000 €	All period 5,5 months	13.750 €
Senior web developer	23200 €	4 months	7.730 €
Junior web developer (Intern)	14400 €	4 months	4.800 €
Web designer	18000 €	4 months	7.500 €
		TOTAL	**33.780 €**

**Note: Prices based on payscale.com[2] resource.*

Table 3 - Material resources estimation

Concept	Annual cost	Description	Total
Pack Professional of: + domain + + MySQL database 1GB with backup + + Windows server 2012 R2[3] + 24/7 support	150 €	+ 21% VAT	181.50 €
		TOTAL	**181.50 €**

**Note: Prices based on aruba.it[4] public prices.*

So, we conclude that the development of the knowledge Management system will cost around **37.396 €** including a 10% of contingency.

[2] http://www.payscale.com/research/ES/Job=Web_Developer/Salary

[3] Windows server 2012 R2

[4] https://www.aruba.it/home.aspx

1.7. Document Structure

This document is organized in seven chapters.

- Chapter 1 has presented the project preparation and the methodology used to conceptualize and design the knowledge management system proposed.

- Chapter 2 explains the state of the art of the knowledge management and its relation with technology. We will see web 2.0 techniques and existing tools available in the market.

- Chapter 3 contains a deep analysis of what are the problem statement and roles impacted. We will start suggesting the direction to follow.

- Then, in Chapter 4 we will see the requirement specifications obtained during the interview to two project managers and the customer representative, as well as the system requirements.

- In Chapter 5 we will review the architecture of the web application, the navigation and the structure of information. In addition, we will see the results of the proof of concept realized in order to understand the data.

- Chapter 6 applies the knowledge and decisions taken on previous chapters, in order to design the application's screens.

- Finally, the last chapter presents the conclusions of the thesis and future work to be done.

Chapter 2: Overview of Knowledge Management

2.1. State of the art

We are in the age of the information, when companies understand the information they have it becomes knowledge, which allow companies to be more efficient and competitive. Therefore, all companies face common challenge: learning and understanding what is happening inside and outside their business so they can be as competitive as possible. Many researches in project management have highlighted the relevance of lessons learned to continuous improvement of processes and improve efficiency doing projects (Williams, 2008; Jugdev 2012)

Knowledge, as per the Business dictionary[1], is the faculty resulted from interpreted information: data, experience and individual interpretation. Hence, knowledge is a combination of objective and subjective data. The sum of this individual knowledge within an organization makes the organizational knowledge, which can help organizations to work more effectively and make better decisions. The management of the organizational knowledge is called Knowledge Management, which is essentially about giving the right knowledge to the right person at the right time.

It is important at this point to differentiate between the units of information that we will use throughout this project. **Data** is the smallest and more objective value of information, it is something specific a number or a value. **Information** become from the analysis of the data, it can be categorized, calculated and contextualized. Information can help us to make good decisions based on the analyzed data. Finally, at the top of the pyramid, we have knowledge. **Knowledge** is the interpretation of the information; this interpretation has a subjective part based on our own experiences.

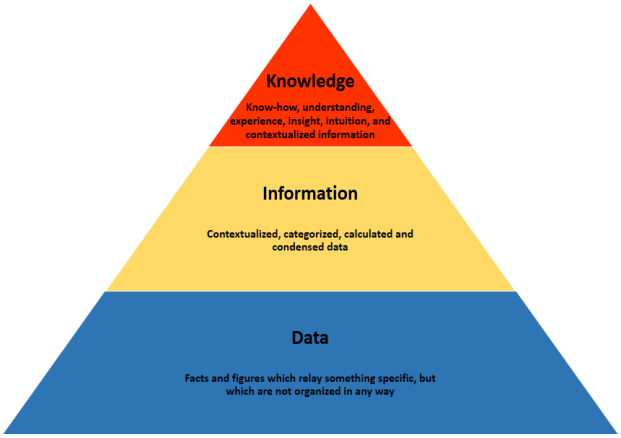


Figure 4 - Competitor Intelligence Pyramid (Frost, A. 2013; www.knowledge-management-tools.net/images/Knowledge_pyramid).

Knowledge Management systems aim to work with all of them (data, information and knowledge). We will need to store project knowledge, but we should be able to categorize it in specific values of data, which can be analyzed to extract patterns and information. The information extracted will give to the organization a bigger picture of what is happening, knowledge of what we can do to be more efficient.

In addition, there is not only a one type of knowledge in organizations. We have explicit and tacit knowledge. While explicit knowledge is a formal and codified knowledge: trainings, guidelines, documentation, quick reference cards, etc., which are easy to share and store. Tacit knowledge is intuitive knowledge and know-how, which is more subjective and more difficult to handle by IT tools. Lessons learned are an example of tacit knowledge.

2.2. Knowledge Management and Web 2.0

The field of knowledge management started many years ago, however recent years attention to this topic has increased. While there is many variations on how firms manage their knowledge assets from a knowledge-centered organization as the US Navy (Department of the Navy, 2001) to a specific tools for a specific knowledge collection (Morrissey, 2005). Nowadays, we have better information and technical tools to make easier leveraging the stored knowledge and spread it out. We can find many applications from web 2.0 which can help us out to exchange information easily between virtual teams spread across the globe.

We have opportunities to socialize the lessons gathered through e-mails, live chats, social networks or VOIP calls. However, these services are difficult to systematize to ensure lessons are consistently stored. Blogs, Wikis or document repository tools allow us storing, socializing and retrieving the data, but again, the control mechanism that we can apply to guarantee the reuse of lessons is low. Finally, we have opportunities transmitting lessons learned through new web 2.0 tools that allow us to build and share videos, serious games or storytelling applications. But the effort needed to build the resource is high, record a good video, prepare trainings and courses using serious games take time and need experts. These techniques are more effective for explicit knowledge, when we have identified which process we need to reinforce or train. (Silveira, 2014)

The Figure 5 extracted from the study of Maucirio Silveira (2014) summarizes everything we have exposed in the previous sections. In the first column we can see the available techniques, but as we have said Lessons Learned Process cannot work only by implementing a tool, we need to improve processes and change the organization's culture to ensure success. The third and fourth columns show the benefits of each of the features. Finally, the last two columns show the overall objectives and drivers of a knowledge Management project.

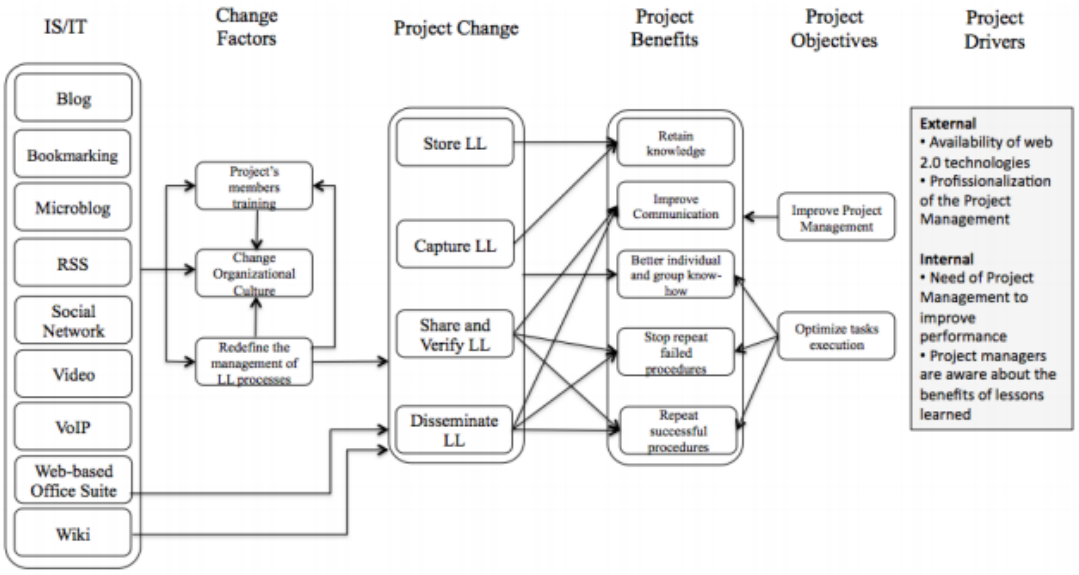


Figure 5 - Overview of project requirements, benefits and implications. (Silveira, 2014)

2.3. Comparative of existing tools

In order to understand the market and competitors we have compared four different existing tools to manage lessons learned and knowledge. All of them will serve as inputs for the design of our knowledge management application and all of them use web 2.0 services to encourage users to collaborate and share knowledge.

Table 4 - Comparative table of four existing tools

Tool name and Logo	Features	Missing features	Pricing	Link
Helpjuice *Propierty Helpjuice*	✓ Cloud Knowledge Base (ensure security) ✓ Intelligent Search ✓ Customizable ✓ Analytics ✓ Users rewards	X Lessons validation X Comments	Free trial Business ($199) Scale ($249) Enterprise (>$249, contact)	https://helpjuice.com/
Lessons Learned Database *Propierty Secufor Solutions*	✓ Cloud Database (Capture & Share) ✓ Search ✓ Reports ✓ Categories ✓ Mobile ✓ Lessons validation	X Users rewards X Roles are not customizable (doesn't match)	$800 one-time payment	http://unbouncepages.com/capterra-knowledge-management/
Tallium *Propierty Tallyfox*	✓ Fast search ✓ Categorization ✓ Filterable/customizable content dashboards ✓ Customizable ✓ User Rewards ✓ Open to integration with other applications ✓ Mobile	X Analytics and reporting	Not available	https://www.tallyfox.com/product
Lessons Learned Server *Propierty Tallyfox*	✓ Cloud Database ✓ Powerful Search ✓ Project = Space ✓ WYSISWG editing ✓ Categorization ✓ Comments	X Analytics and reporting X Dashboards	Depend of number of users. 100 users (850$) 200 users ($1450) More contact. One-time payment	www.lessonslearnedserver.com

Chapter 3: Analysis

3.1. Introduction

In the first part of the assignment we have review the basics of Knowledge Management and different methods and tools. In this second part of the assignment, we will design our own tool according with the needs of the Company where I'm working. Due to privacy and data protection I will refer to it using general terms like the company, organization and the customer.

3.1.1. Company description

The company, which has been evaluated for this project, is one of the biggest multinationals of beverage and food industry. The company's products are distributed across more than 200 countries under 22 different brands, which generate more than $1 billion in annual retail sales each.

This project starts within the Europe Business + Information Solutions (BIS) department due to the need to be more efficient and fast delivering solutions and to avoid committing the same mistakes again and again. The BIS department supports 700 applications, nearly 200 infrastructure components and carries around 200 projects each year. Therefore, we can consider the BIS department as project-oriented area, where learning from past experiences can improve project's success.

3.2. As Is

There is already a process of lessons learned defined within the company. The process established that lessons learned are gathering during the project lifecycle and reviewed at the project closure. During the first phases of the project, project manager search on an offline database and pick the most relevant lessons to share them with his/her team. During project realization lessons are identified and stored in an offline spread sheet owned by the project manager. Finally, before closing the project, the project manager organize a post-implementation review meeting to discuss key challenges, lessons learned and best practices within the team. After the meeting, the project manager consolidates all the feedback and agreement in an executive One Pager.

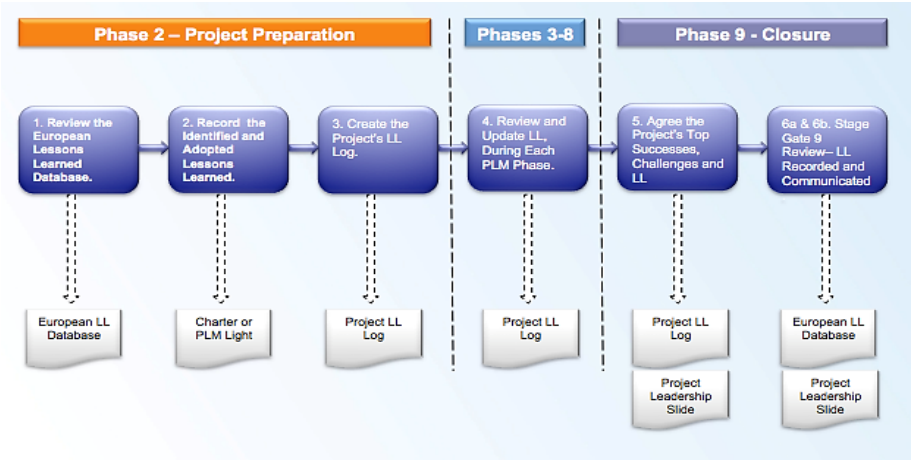


Figure 6 - As Is Lesson Learned Process

Theoretically, the process is well defined and ownership is clear. However, each project team follows different approaches. There are project managers that request lessons learned through email, others within meetings, others wait until the project closure to gather the lessons learned. That variability of approaches made lessons quality low. There are not clear examples of how lessons have to be written and took, therefore, many lessons could not stand-alone. One of requests from some stakeholders was to have clear examples, nonetheless without influence on the users.

The main opportunity and the reason to do this project is because a lack of a centralized tool to support the process. Currently, an Excel spread sheet is used to store lessons learned. The source is shared in a public workspace where people can download the Excel spreadsheet containing all lessons and filter by several parameters. Lessons gathered and summarized by the project manager during the post-implementation review meeting are uploaded to the project's workspace. The PMO Governance Analyst takes them and copy into the Excel Data Base. Easily one project can gather between 60 – 90 lessons, which are stored in a static and offline Data Base. No one is reviewing, checking and analyzing them, so, the lesson lifecycle ends on the Excel. As a result of that complex and non-valuable process, the engagement and knowledge acquired is being lost.

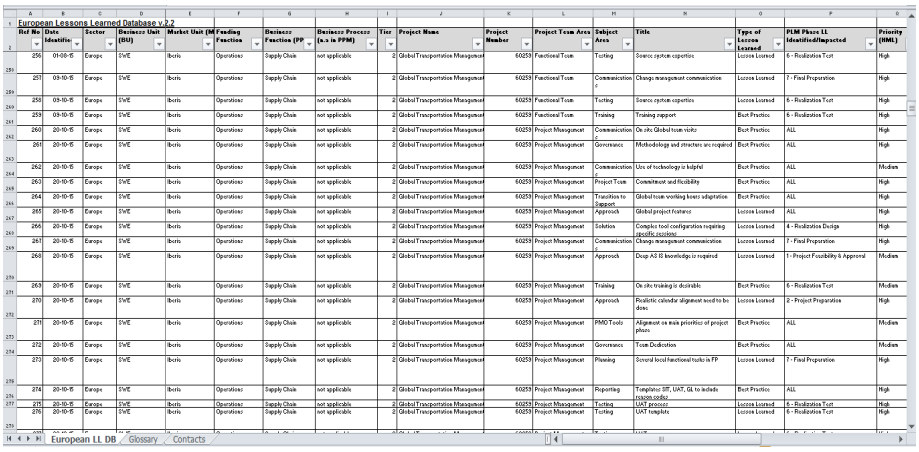


Figure 7 - View of the current tool used to gather and share lessons

3.3. SWOT Analysis

We realized a SWOT analysis of the current process in order to assess the strengths, weaknesses, opportunities and threats of the process and understand the project's starting point.

Figure 8 - SWOT Analysis of the current state

3.3.1 Strengths

The Company has a process of Lessons Learned, which is training during the on-boarding to new Project Managers. The process clearly defined ownership and steps to gather lessons during the whole project lifecycle. In many markets and many project managers are holding Post-Implementation Review meetings and documenting the lessons learned and best practices identified.

3.3.2 Weaknesses

Although the process is defined and trained, the engagement of project managers and teams are being lost because lessons have no effect. Lessons Lifecycle ends in an Excel spreadsheet where they are stored. The content on the database is not checked causing low quality content, difficult to understand by itself, not reusable or repeated. In addition, the process is delegated to project managers, expecting a reactive approach from them. We need to add a value to lessons, ensure the lifecycle is finalized and quality is enough good to encourage people to adhere their selves to the process and start sharing and reusing lessons.

3.3.3 Opportunities

There is an opportunity to improve how the Company is storing and disseminating the lessons. A new process has been designed and there is a need of a tool to support it. A new tool can provide insights of how the process is being adopted, will help project managers to gather and analyze lessons and provide insights on the challenges and opportunities to keep continuously improving.

3.3.4 Threats

The major threat is the engagement of people, from the team members until the senior management leaders. The tool and the process require human interpretation at some steps, and human actions to ensure lessons are causing a change in our culture and way to do projects.

3.4. To Be

We have seen how the current process is. However, as we have commented previously as part of my Graduate Program I should propose an improvement of a process. As we have seen with the SWOT Analysis, the company already has a process of Lessons Learned. However, lessons lifecycle is not complete and the distribution is not working properly due to the tool used. Therefore, we will start improving our Lessons Learned process, ensuring these weaknesses are solved.

The completion of the lessons lifecycle through the lessons analysis and reuse will be mainly carry out of the system taking profit of annual stablished processes (i.e. Must Win Battles). Despite our tool should provide the insights to be able to start a continuous improvement cycle based on the lessons identified by the different project teams.

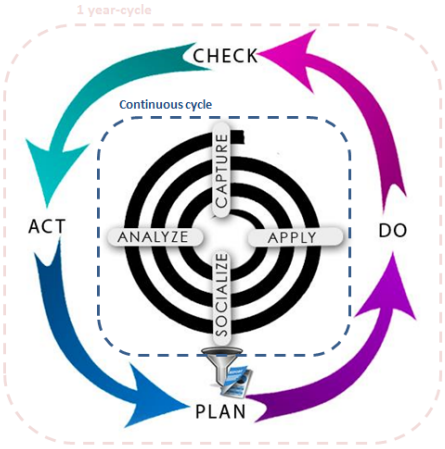


Figure 9 - Continuous Improvement process through lessons learned process outcomes

In the other hand, we need to improve the communication and storage of the information. A supportive tool to help on the collection and dissemination of the lessons will be highly required. Our tool will carry many benefits, but I would like to highlight the opportunity of having the information in real-time. We don't need to wait until the project has finished to review the lessons learned. Projects can feed other projects since early stages. For example, if projects are having troubles with servers' delivery, coming projects will be able to plan better when they need to order a server based on the lessons uploaded by other teams. Also, the tool can help project managers to easily obtain a top-down analysis of lessons identified and summarize the information at executive level.

Therefore, for this project in order to reduce scope we will focus on having those requirements:

- Easy collection and dissemination of lessons.
- Facilitation of lessons rate, review and summarize through top-down analysis.
- Analytic capabilities to provide the right reports (Correct lessons categorization)

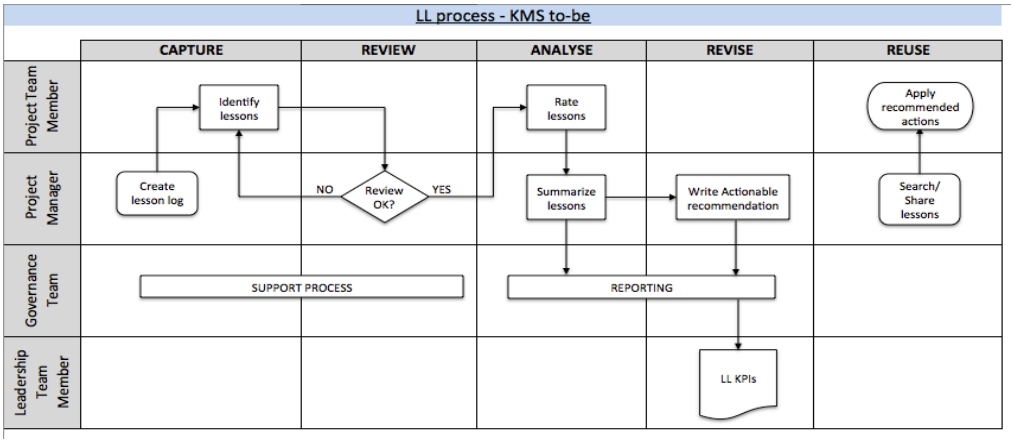


Figure 10 – System Workflow based on to-be requirements.

3.5. User's Characteristics

Below, on Table 5, you could observe the different user's profile. In the characteristics column we assess what are the needs and responsibilities of the role, hence, the expected frequency and how they will use the software application. In actions, summarizes if the user will introduce data (SET) or extract data (GET).

Table 5 – User's characteristics table

User Classes	Characteristics	ACTIONS
Project Manager 	He/she is the ultimate accountable for making sure that lessons are identified by the project team and introduced to the system. He/she does a first quality check of the data introduced. He/she summarizes all the lessons and share once the project has finalized. Project Manager role uses frequently the application and push notifications are sent as a reminder to engage them to review and add lessons.	SET & GET
Project Team 	They are accountable for taking part in the lesson identification and are responsible to introduce data in the system honestly and correctly. Also, they help to identify the most relevant lessons through voting. Project Team members enter ad-hoc when they want to register a lesson or the Project Manager has requested it.	SET
PMO Governance Team 	Owners of the process and tool. This team is accountable for supporting the lessons learning process. They make sure projects are identifying, storing and reusing lessons. This team, also, is responsible for reporting and data analysis to ensure lessons are adding value to the company. They enter frequently to the tool to check and extract data.	OWNER
Leadership Team 	The roles within this team are senior levels. Their role on the tool is just as observers. They get the reports and they can make better decisions.	GET

4. Requirement Specification

In this section we will review the requirement specifications gathered from a general perspective of key re functionalities, to a collection of technical requirements (security, language, response time), and finally to the user-centered requirements.

4.1. General System Requirements

- Online, global tool: All the information in a single source.
- Easy lessons entry, edition and review.
- Powerful search capabilities
- Recommendation based on user needs
- Capability to upload and see multimedia content.
- Data quality check through different steps.
- Proactive system (push notifications).
- Clear metrics and executive outcomes.
- Different views for each user type.
- Engagement mechanisms (users contribution roles and measures)

4.2. Technical Requirements

Table 6 - Technical requirement specifications

Requirement Subject	Element	Description
Ease of Use	Screens	Screens to be as intuitive as possible. Recognized conventions to be used eg hyperlinks in blue etc.
	Data input	System security to control screens or fields which can be updated. Screens to be as intuitive as possible. Recognized conventions to be used eg fields greyed out if input not allowed. Navigation should be possible backwards and forwards between screens without data loss.
	Reporting	Reports/screens showing data already in the public domain (eg on lessons) to be made as easily accessible as possible.
User Guides	End Users Guides	Documentation to explain how to use the system.
	System Administrators guides	Documentation to explain how to use the system and ensure system security.
	Technical Documentation	Documentation for handover to support the application.
Responsiveness	Screen Response	Simple screens to return data in < 10 seconds Complex screens to return data in < 30 seconds

	Reporting	On screen reports to be available in < 30 seconds. Warning message to be displayed if report time will be greater than this
Data Recovery	Data Recovery	Database to be backed up every 24 hours. Rollback required to reload any data lost by restoring the databases from backup.
	Component Backups	Back ups required of Web Server , databases and any other required components to ensure that the systems can be recovered within agreed business timelines.
Data Retention	Data Retention Age and amount	Low rated and visited lessons will be archived once per year.
User Security	Access	Network User authentication will be used to control access to any part of the application that allows data to be updated or gives visibility of sensitive information. Within the application, user security will be managed by the system Administrator to control the elements of data that can be updated by individual users.
	Access Time	Application to be available 24/7 to allow access to people working on different shifts.
Language	English	The language used in the application will be English.
Accessibility	Global accessiblity	The application has to be available across the company.

4.3. User's Stories

User's requirements have been consolidated in Users Stories. User stories are used in agile software methodologies as a product backlog to discuss user needs. They can be used to define User Test Cases. User stories must be short and simple descriptions of a feature required. They are written from the user perspective following the structure: As a <user class>, I want to <user goal> so that <reason/benefit>.

As a Project Manager…

- PM001 > … I want to **find** lessons of similar projects so that I can learn from previous experiences and plan better.

- PM002 > … I want to know who I can **contact** to know more so that I can contact him/her by email, phone or directly.

- PM003 > … I want to **extract** lessons found in different formats (.pdf, .xls) so that I can review and send them when starting the project.

- PM004 > … I want to **create** my **project** lessons learned **log** so that my team and I do not need to add for every lesson the same information.

- PM005 > … I want to **upload** lessons so that I share my project learning's and experience to improve other projects.

- PM006 > … I want to **edit** lessons, which I have wrote, so that I correct mistakes and/or add more information to clarify the lesson.

- PM007 > … I want to **request** my team to identify lessons so that I have all lessons identified centralized to be reviewed.

- PM008 > …I want to **request** my team to **rate** their lessons within a period so that I can prepare the post-implementation review meeting and have lessons ordered by relevance.

- PM009 > … I want to **read** lessons uploaded by my team and know who has uploaded the lesson so that I can review them and request clarification if needed.

- PM010 > … I want to **build** an executive summary so that I communicate the top successes, challenges, lessons learned and best practices easily.

As a Project Team Member…

- PT001 > … I want to **upload** a lesson so that I share my project learning's and experience to improve other projects.

- PT002 > … I want to **edit** lessons, which I have wrote, so that I correct mistakes and/or add more information to clarify the lesson.

- PT003 > … I want to **delete** lessons, which I have wrote, so that I can delete a wrong or duplicate entry.

- PT004 > … I want to **read** examples of well written lessons, so that I can understand how to write a lesson to be useful.

As a PMO Governance Team Member…

- GT001 > … I want to **view** lessons learned updated, so that I can check that the process is followed.

- GT002 > … I want to **delete** lessons learned updated, so that I can help cleaning up data.

- GT003 > … I want to see process and **system** performance **metrics**, so that I can determine the impact of the KMS on the organization and what is going on within the projects portfolio.

As a Leadership Member…

- LT001 > … I want to see **projects** performance **metrics**, so that I can understand what is happening and make decisions to improve.

4.3. User's rights

Depending on user role some options will be active or not. For example, only Project Managers can create Project log spaces or only owners of lessons can edit them.

	Project Team Member	Project Manager	PMO Team Member	Op. Exc. Team Leader
Create a Lesson	X	X	X	X
Search lessons	X	X	X	X
Rate lessons	X	X	X	
View lessons report	X	X	X	X
Create a project		X	X	
Create lessons summary		X	X	
View users report			X	X

Chapter 5: Design

5.1. General Architecture

The proposed solution is web based. A web is divided in the client side and the server side as we can see on Figure 11. From the client side a HTTP request is sent, it is solved by DNS and arrives to the server. The server process the request, if the request involves data, then, the server sent a query to the database. The server validates forms and sends other pages (.html, .php) as well. The user authentication will request validation to an external database.

Therefore, we need the following languages to codify the application:

Table 7 - Coding Languages

CLIENT SIDE	SERVER SIDE
HTML	PHP
JS	MySQL
CSS	

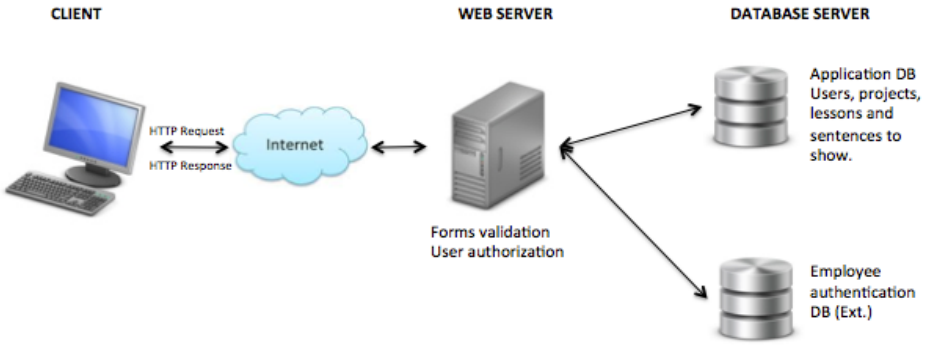


Figure 11 - High Level Architecture Diagram

The three main elements on the database will be conceptually: the users, projects and lessons. One user can be in several projects and insert several lessons for each project. One project, definitely, consists in several lessons introduced by different users assigned to a project(s).

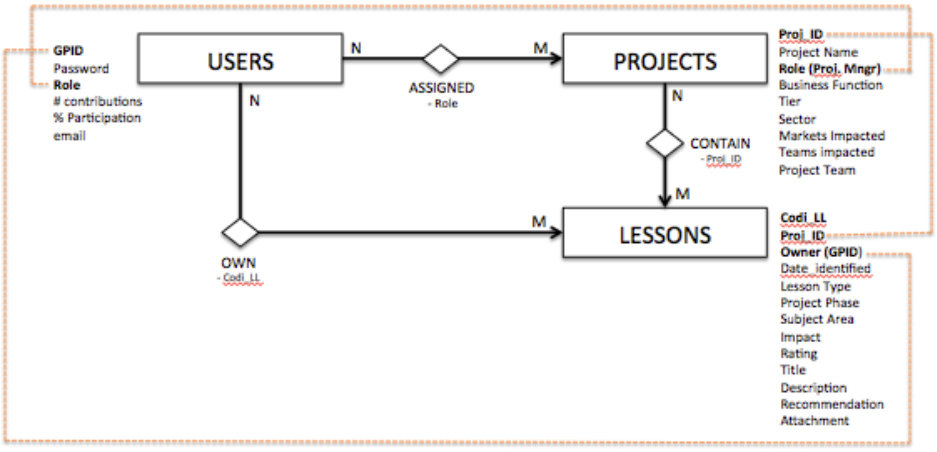


Figure 12 - Database structure

5.2. Navigation Map

The navigation map changed during the conceptualization of the project. While we were getting deeper on the user's needs and requirements, we realized that instead of show a user dashboard it would be more useful to facilitate the key actions on the home page. As the interviewed users express their preference to have a powerful searcher, than see information that may interest them or not. Also, we get deeper on some of the main screens having more levels on the navigation map.

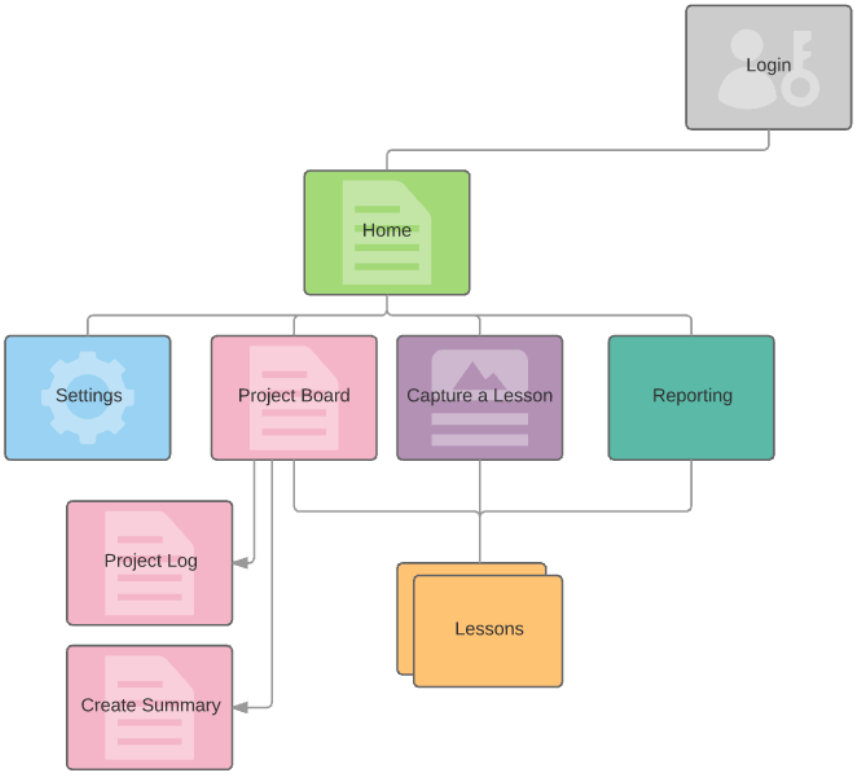


Figure 13 - Navigation Map

User should log into the application through their company identification and password. It is assumed that the user is already registered in the company's application manager, and we only need to check that the introduced user and password match.

The main page is the **Home**; from here the user can start searching content, assess their project to get recommendations, capture a lesson or navigate through the page menu.

In order to keep a simple tool it will contain 4 main actions accessible from a horizontal menu in the all pages:

- **Settings**: Allow to edit user profile and see user contributions. Furthermore, the user can choose periodicity of push notifications (Newsletter) and interests, for instance, "I would receive lessons about technology projects". Finally, user can see their contributions of knowledge.

- **Project Board:** This page allows creating or seeing a project board. A project board is a space with all the project metadata and lessons introduced by project. The project board page has two objectives:
    - Consolidate project information in a single view. While when we search we can obtain the latest information from different projects, from the project board the user can easily filter the information by project. Also, it will facilitate the rating process.
    - Reduce the repetition of data entry. The PM must create the project board at the beginning of the project to allow project team to create lessons.

  From the project board, Project Manager users have access to create a new project log or summarize the lessons gathered on one of their projects.

- **Capture a Lesson:** This page allows users to create a lesson. They should fill in a form with some questions. Each question contains an explanation/description when the mouse is located over the empty field. The form allows attaching presentations, recorded videos and audios.

- **Reporting**: This page will allow users to view online or download the reports in different formats (.xls, pdf). Having all the reports in the same page allow us to build a scalable page and be able to increase reporting in a future if needed.

Finally, we have a small entity: **Lessons**. For each lesson introduce we will have a page where we can see the information introduced, we can download/share the content attached and edit/delete the content if we are the lesson owner. Also, other similar lessons that may interest the user are shown on the bottom of the page.

5.3. Proof of Concept

In order to evaluate the application workflow we decided to implement a proof of concept of the process shown in Figure 10. The proof of concept aims to help us to understand what it is the best approach to engage people and get the type and quality of answers that we would like to be shared. In addition, the analysis of the data can provide us some insights of what is the information we can use on the reports and taxonomy to follow.

In order to realize this proof of concept, we decided to follow the approach explained in Figure 14. Leveraging a Survey Builder tool available in the company. The scope for the proof of concept was two Global projects of the technology area, which finalized in December. Find in the link below the survey, please, access using Internet Explorer.

https://SurveyBuilder/Survey_Form.cfm?id=106644

The survey contains the following characteristics:

- ✓ Request not only lessons learned and best practices, also, ask for opportunities and threats.
- ✓ Users must provide at least two best practices and two lessons learned.
- ✓ Examples are shown for every request to guide participants.

However, the proof of concept did not work as expected. December was a busy month for everyone in the company closing the year. We get only 5 responses, which represent around 10% of possible participation. The answers were not qualitative, although, the examples provided. Answers and a global report of lessons (consolidated using lessons of other sectors) are attached in the Annex B as an evidence.

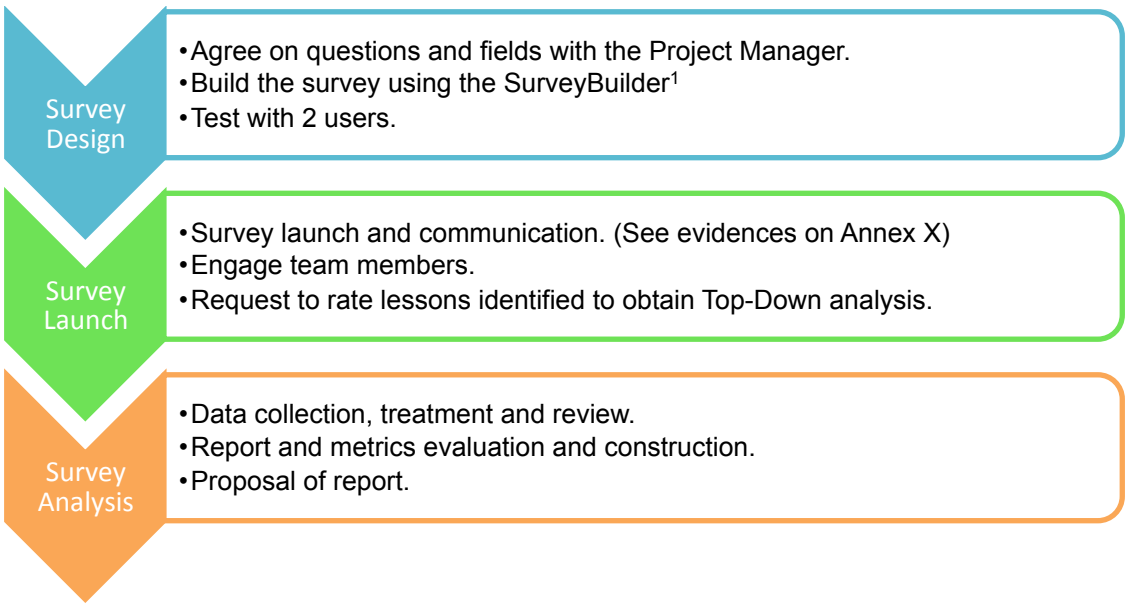


Figure 14 - Proof of Concept plan

Chapter 6: Prototype

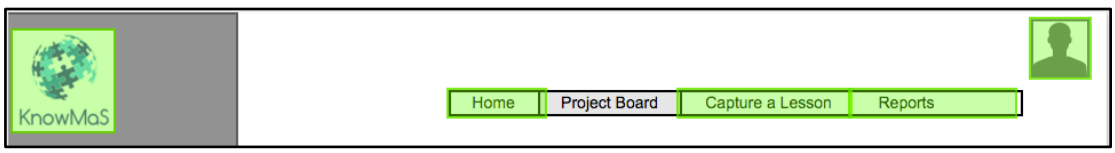
6.1. Introduction

The prototype at low fidelity (Lo-Fi), has been done with Moqups. Due to the limitation of the free account, which only allows 300 stencils per project, some of the wireframes shown in this document are not available in the final mock-up presented. Only key pages have been left in order to understand navigation principles and page design:

Table 8 - Relation of wireframes in the document and online at mockups.com

Wireframes available in this document	Wireframes in Mockups.com
Login Page	✓
Home page option 1	✗
Home page option 2	✗
Home page option 3	✓
Project board (PM view)	✓
Project board (Regular user view)	✗
Create a Project Summary	✓
Reports page	✓ (simplified)
Capture a Lesson	✓
Lesson Page	✓ (simplified)
User Settings Page	✓
Newsletter	✗

The navigation can be done using the top horizontal menu or through page actions that connect different pages. **Note** that the user settings page is accessible through the user picture.



Use the following link to access to the wireframes in mockup.com:
https://moqups.com/martalworks@gmail.com/UTE1hR0t

6.2. Lo-Fi Screens

6.2.1. Login page

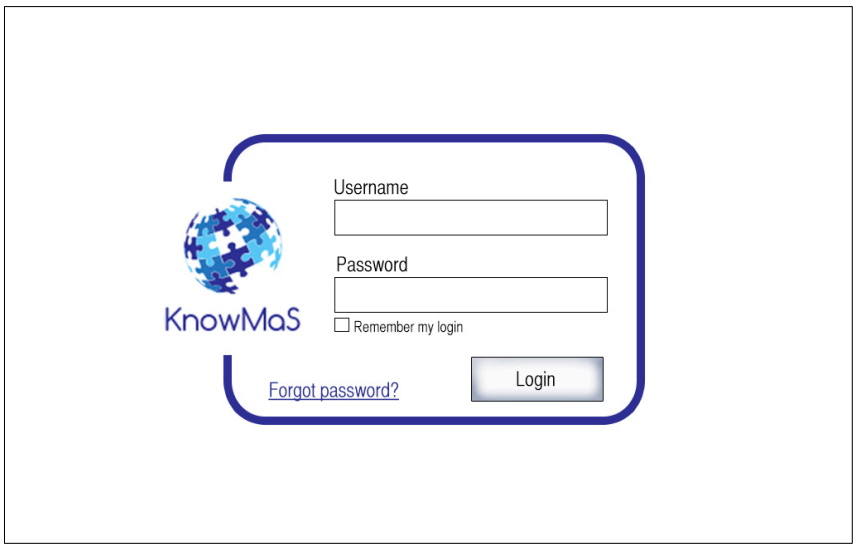


Figure 15 . Login Page

- **Functional Design:**

User should log into the application through their company identification and password, allowing to the user to remember this information to enter automatically. If the information entered is incorrect, the system will show an error and will let the user to enter again the information. The user information will block at the third wrong intend of entry as per the Company policy.

The user have available the option "Forgot password?", which will guide the user through the password recovery steps in the Company's application manager. It is assumed that the user is already registered in the Company's application manager, and we only need to check that the introduced user and password match.

- **Technical Design:**

The screen contains:

Table 9 - DOM elements in Login page

Type	Name	Description
Text Box 1	UserName	Check user name entry, it must be an integer of 8 numbers.
Text Box 2	Password	Check that the password matches with the stored user password. The text box must show '*' instead the characters entered to ensure privacy and security.
Check Box 1	Remember my Login	If the user checks this box the information will be stored and used every time user comes back to the page avoiding to re-entering the information each time.
Link	Forgot Password?	Blank link (open the linked page into a new tab) to Forgot Password instructions page.
Button 1	Login	Send data to validation (Client side validation and server side authorization.

6.2.2. Home page

The Home page is the first page that the user sees, because of that this page should:

- Engage and retain users
- Be impacting
- Give the users what they expect to obtain/do quick

Three different proposals were presented to the client to choose and receive their feedback. All of them have the top part of the page in common, which is formed by:

- Application logo (Image .png)
- Horizontal Menu
- Slider of famous quotes about Knowledge Management (5 sentences picked randomly from a database of sentences every 15 days)

Option 1

- **Functional Design:**

The first approach was to build a simple landing page, where the user can see latest updates of lessons and recommended actions. The users can set in Settings Page what they would like to see on the Dashboard, choose their interests and it will be shown all the latest uploaded by user interests. For example, a user working in the PMO team can set their profile to only see lessons learned and best practices related with PMO tools and methodology.

The user can access to any item clicking over it to see more detail or see the attachments. Furthermore, the first row allow to the user to sort and filter the content.

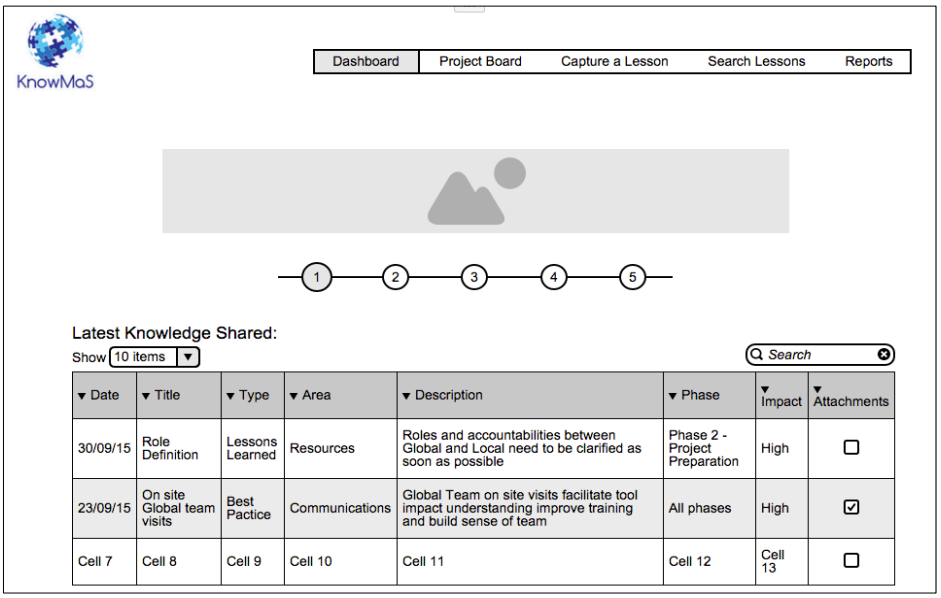


Figure 16 - Home page wireframe option 1

- **Technical Design:**

It could be implemented using a jQuery plugging: DataTables using Javascript, HTML and MySQL.

Option 2

- **Functional Design:**

In this proposal we added a space for news and updates. The idea behind this decision, it is to show the changes produced by the lessons learned and best practices captured. Showing the result of lessons application through news about new processes, trainings, methodologies or other related topics can engage users. The news will be written and publish by the PMO office and can contain videos, images and links to other sources. For instance, if we detect that there are many issues about financials, we can set up a course about financial processes and publish a new about that. Therefore, the news & updates section give value to the lessons gathered, closing the lessons lifecycle.

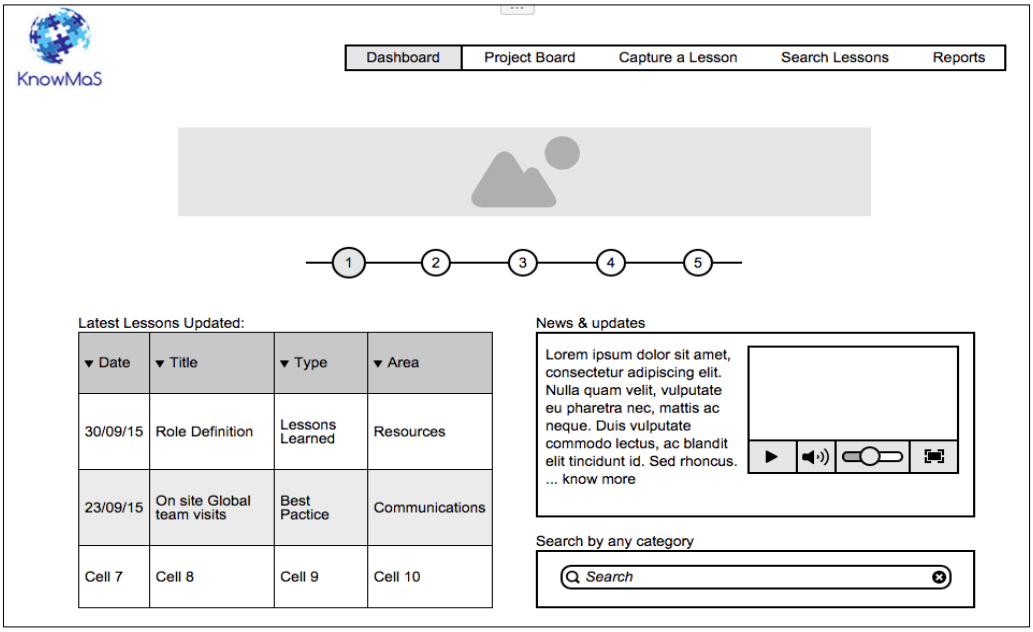


Figure 17 - Home page wireframe option 2

- **Technical Design:**

As the previous design it could be coded using the Datatable puglin, HTML5, Javascript and MySQL. However, we will need to implement a WYSISWG editor page to allow the PMO team to publish easily news and updates, so, cost and effort will increase respect to the option 1.

Option 3

- **Functional Design:**

This option gives in a glance the key actions that any user can need:

- Search (using 2 methods: Filter by parameters or search by any word o sentence)
- Consult (Assess by a short questionnaire if the project will be successful and provide recommendation to mitigate possible risks based on previous experiences registered).
- Capture (Identify and share a lesson learned or best practice).

In this flow, instead to show results directly like in Option 1 we invite the user to do an action to offer the results depending on what they are looking for.

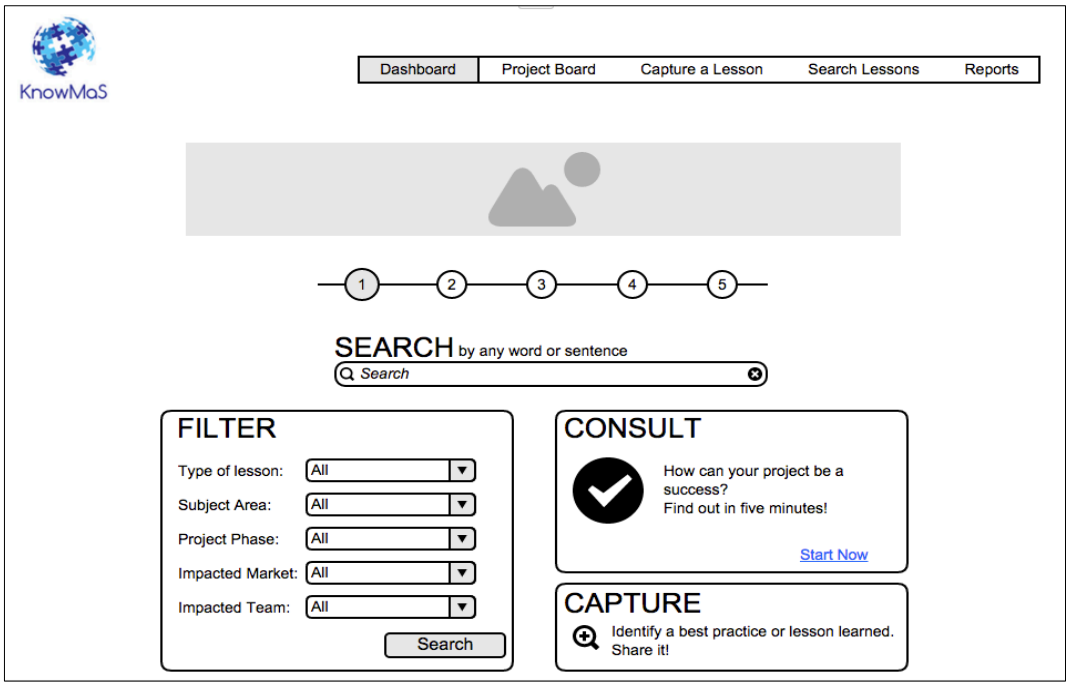


Figure 18 – Home page wireframe option 3

- **Technical Design:**

For this option we will need to implement a search box to find by any field on the database. Also, a search by dropdown filters selection that sends a query to the database and returns the results in a new page. Consult is activated by a link to a questionnaire page, where each question in one page. Capture brings the user to the "Capture a lesson" page.

As a summary, see on Table 9 a high level comparison between the options presented.

Table 10 - Comparison table of the proposed home page designs.

	Probability of meeting user expectations	**Technical complexity**	**Cost**
Option 1	Medium	Low	Low
Option 2	Medium	High	High
Option 3	High	Medium	Medium

The client chose option 3.

Once we get the feedback from the client, we did a Hi-Fi screen of option 3.

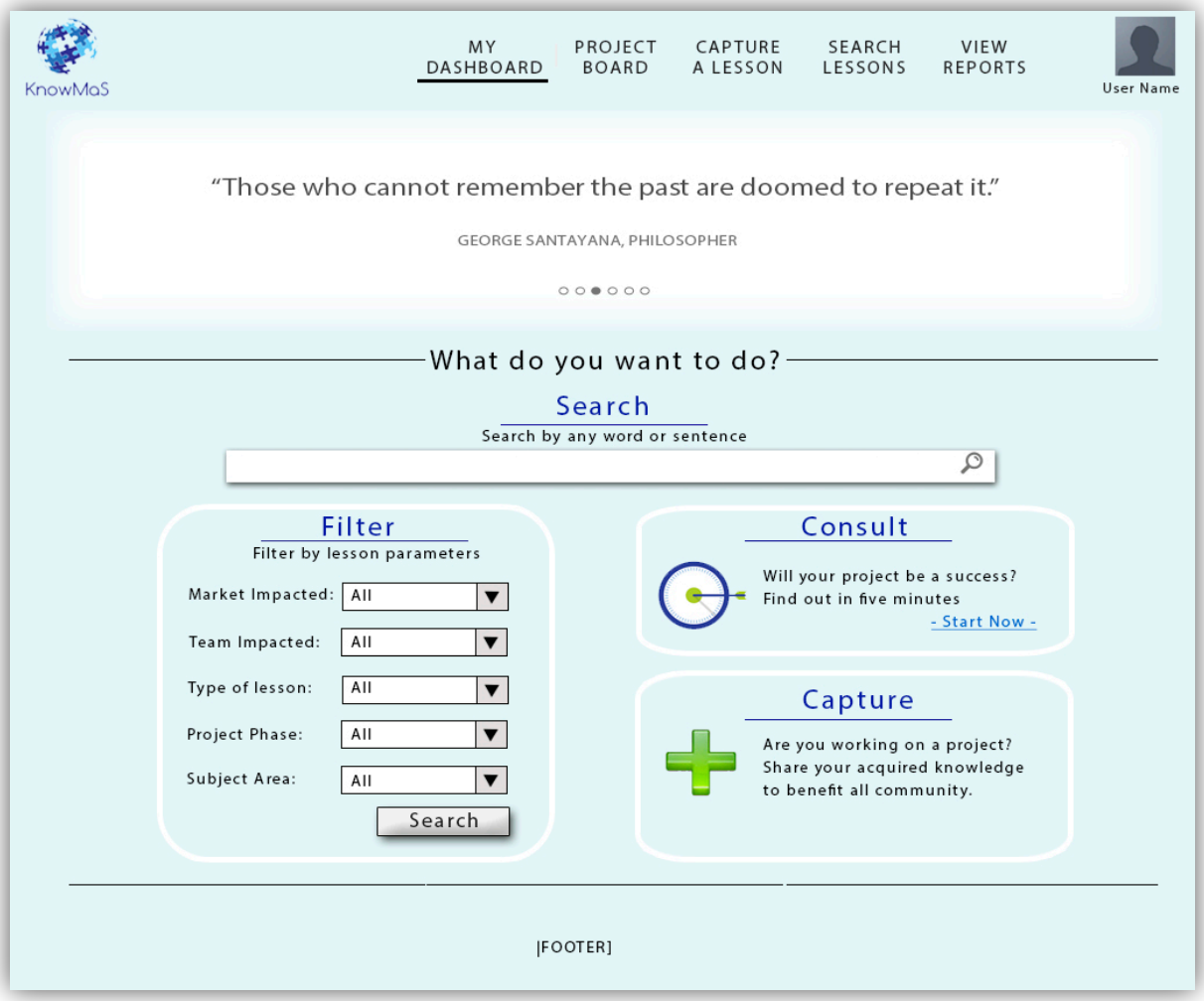


Figure 19 - Hi-Fi Home page

If the user selects the "Consult" option, a questionnaire will open in a new tab. The questionnaire has 10 questions and 5 possible answers with different weights. At the end, the questioner will return a list of the recommendations/lessons which can be more useful for the project manager.

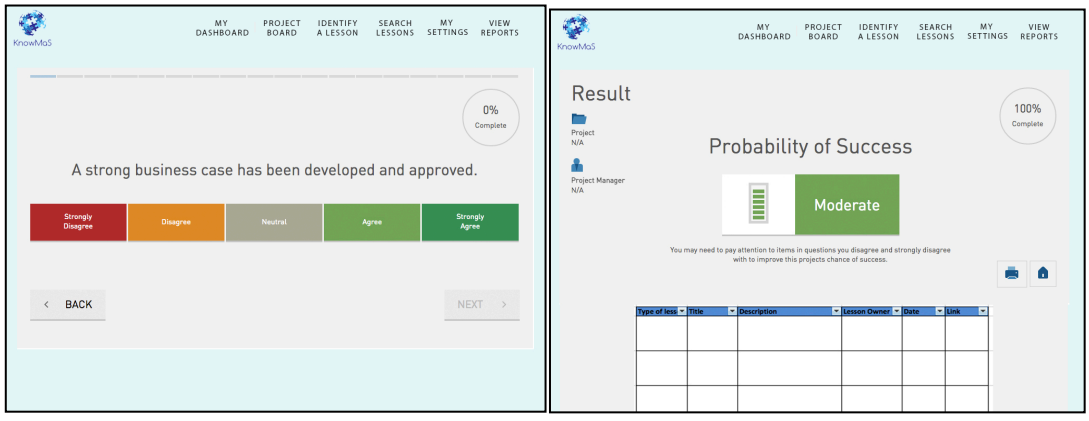


Figure 20 - Consult feature example of question (left) and outcome (right)

6.2.3. Project Board

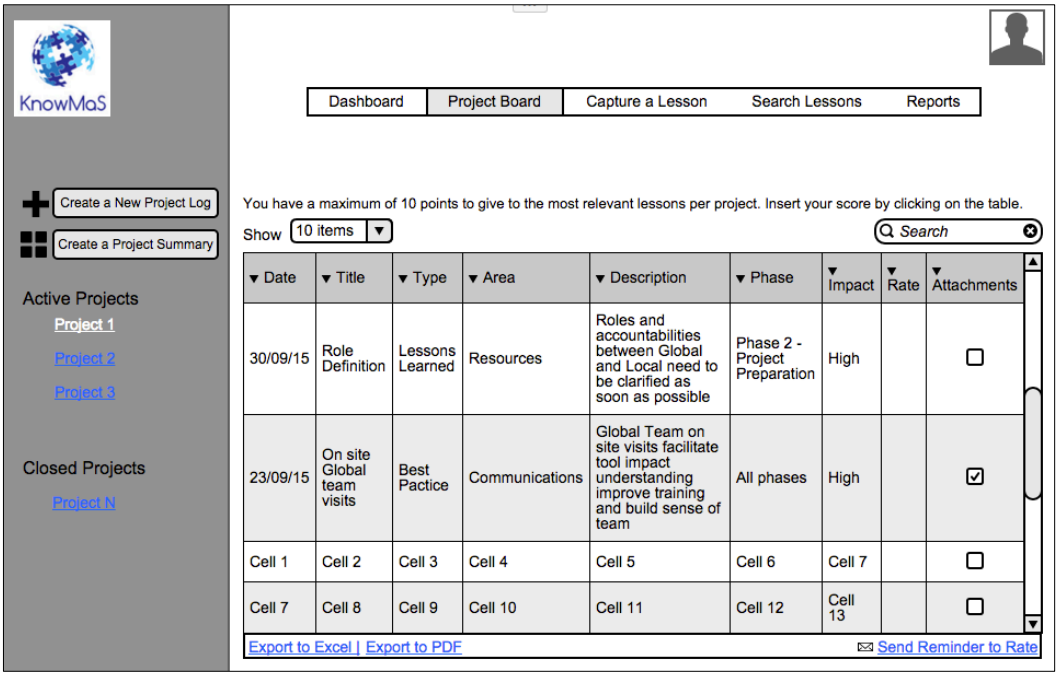


Figure 21 - Project Board wireframe (PM view)

- **Functional Design:**

From this page the user can navigate through the projects where he/she is involved, and see all the lessons registered.

The lessons can be exported to an excel file or pdf to be shared or used in the Post-review meeting (PM003). The user can rate lessons entered, having 10 points to hand out between all lesson identified (PM008 and PT005). The user can click on the "Title" to go to the lesson, where more information is shown. (Refer to 3.1.5. Lesson page)

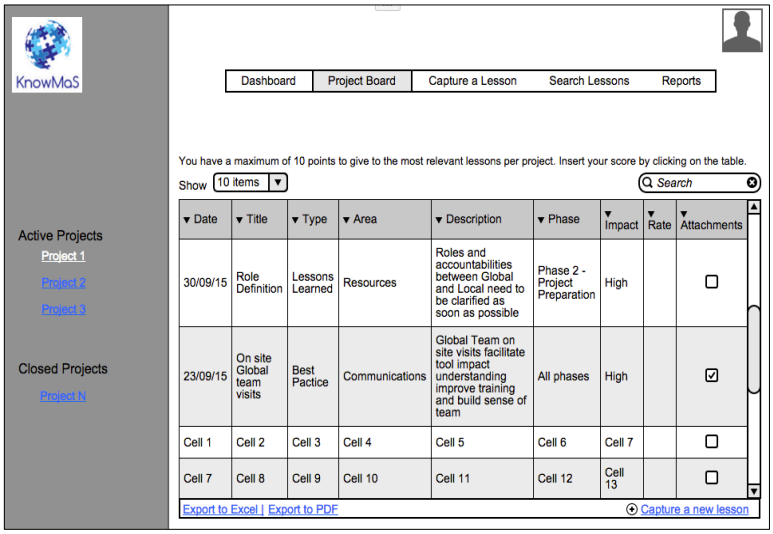


Figure 22 - Project Board wireframe (General user view)

If the user has a role of Project Manager, then the buttons on the top left menu are visible and the user can "Create a New Project" log (New Project) or "Create a Project Summary" (Summary of all the lessons registered). Also the user has the possibility to send a reminder to the project team to rate the lessons uploaded.

- **Technical Design:**

The structure of this page is integrated by a top menu, which allows website navigation, and left menu, which allows project navigation. The user click over the project name, executing a query requesting all the lessons uploaded for this project. The results are shown on the canvas, allowing the user to select the number of items to show, filter or search them.

The user can rate clicking on the empty rate cell, a formula will discount the values inserted. There aren't any constrain, the user can rate 10 points to only one lesson or distribute them through several lessons.

6.2.3.1. Project Log

This screen is out of the scope of this part of project. Ideally, this page could be prepared to gather the project information from an HP tool, which is used to manage all projects called PPM. If the integration is possible it will made the process simpler. If not, we will implement a similar approach that we are using to capture lessons, requesting project information to the user though a questionnaire. Project information refers, for instance, functional area, market where it has been implemented, teams involved, steering committee names, project manager name, etc. Therefore, it is pending to align with the HP vendor the possibility of system integration to obtain all project data with just one click.

6.2.3.2. Create a Project Lesson's Summary

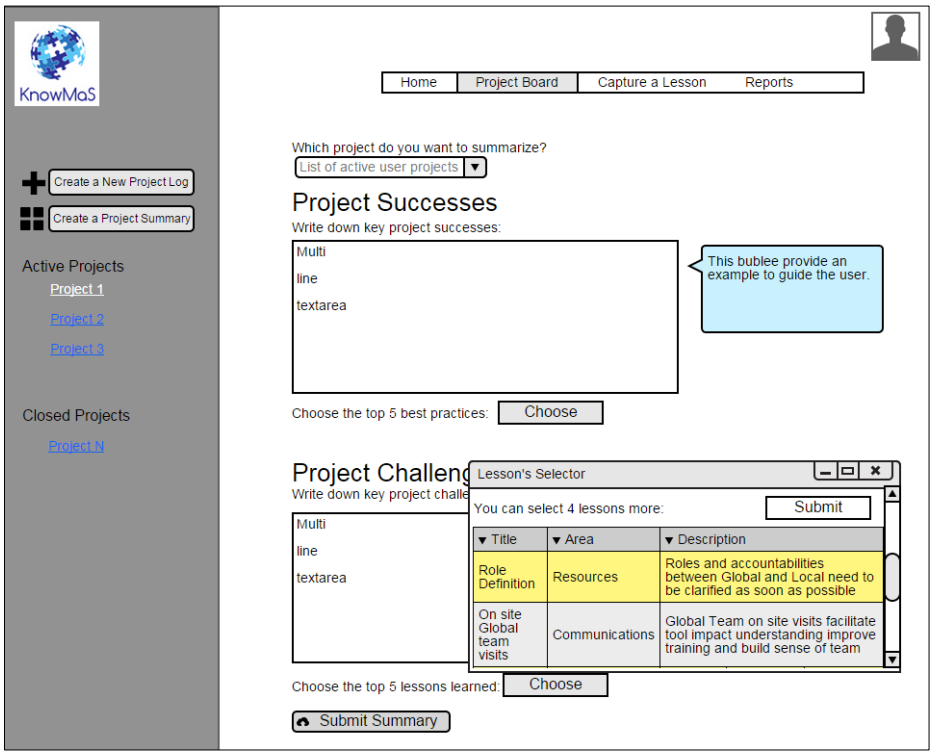


Figure 23 - Create a Project Lesson's Summary action page

In order to create a standard executive summary the project manager should follow the following steps:

1) Choose project to summarize. The dropdown only show user's active project.
2) Write in a few lines the project successes.
3) Choose a maximum of 5 best practices identified during the project.
   By clicking on the "Choose" button will open a pop-up window with all best practices uploaded to the selected project ordered from the highest to lowest score. Multiples rows can be selected, finally, the user clicks submit button in the top floating menu to store the 5 selected items.
4) Repeat step 2 and 3 for lessons learned and project challenges.
5) Press Submit Summary, the user will be redirected to the report view.

6.2.4. Reports page

The previous report will be available from the Report Page. All type of users can access to Project summarized lessons. They can find a summary searching by project number or project name. Once the report is uploaded the user can download or send it by email. Also, can access to the project manager name. Within the report there are links to the Best Practices and Lessons Learned chosen to create the report, hence, the user can access to lessons details and recommendations.

Always following the system requirements and user experience recommendations. The page will show a uploading in progress icon while the report is searched and upload.

At the bottom, there are access to the Data Analytics Report, which is the Project Portfolio view at executive level to understand how do we can improve our project delivery and the web analytics Reports. Those reports are only available for specific users, as shown in the User's rights section.

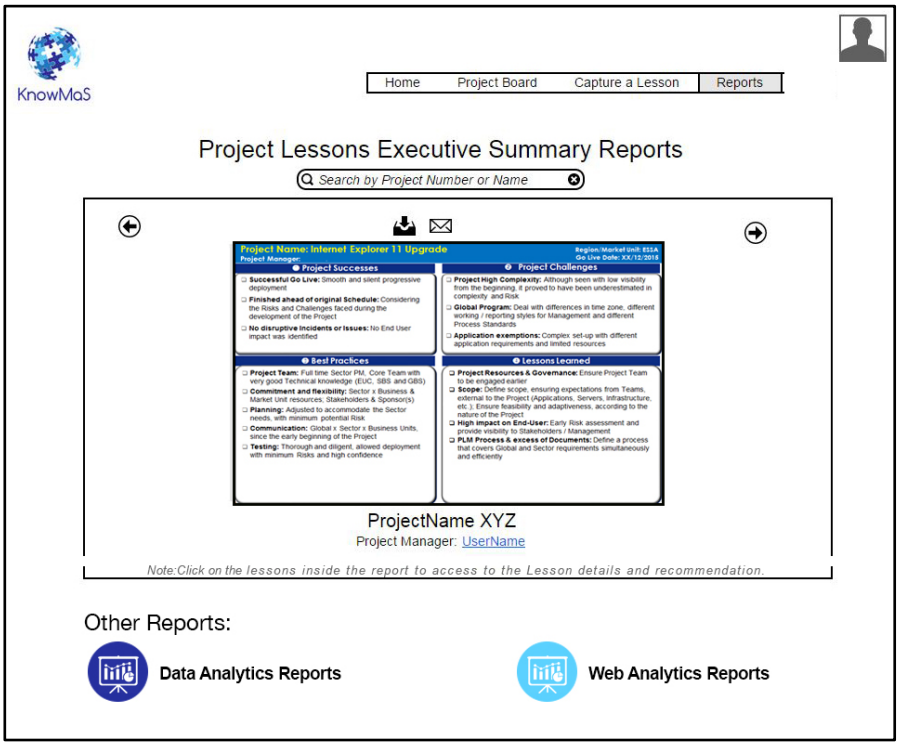


Figure 24 - View Report page

6.2.5. Capture a lesson

- **Functional Design:**

This page allows the user to introduce the lessons learned and best practices acquired during the project realization in five minutes. One thing requested by the users is to have a guide and examples of good lessons learned. In the right panel some examples or explanation will be shown. Explanations will change depending where the focus is. For example, if the user is in Subject Area dropdown, explanation of the options will be displayed. While if the user is in the second Text Box an example of an impartial lesson will be shown with some recommendations of how to write a applicable lesson.

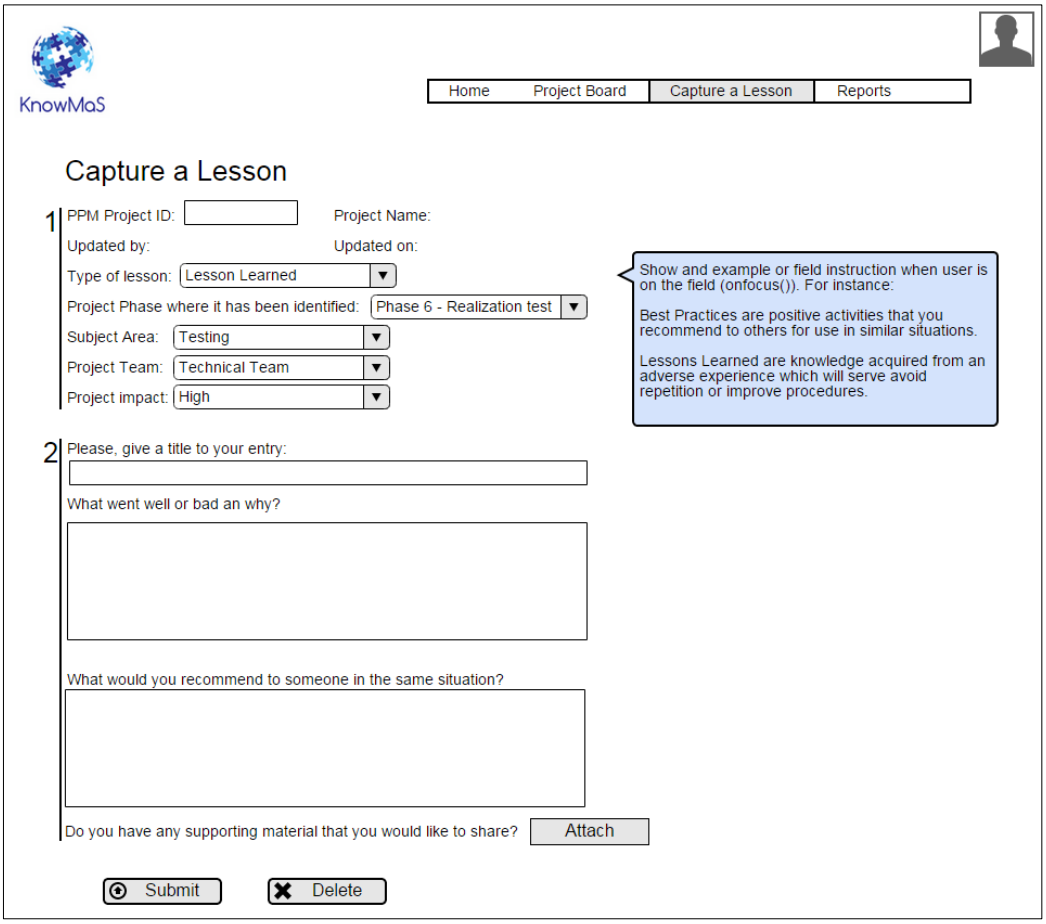


Figure 25- Capture a Lesson page

- **Technical Design:**

PPM Project ID field must validate that it is a valid project identifier. The project manager using the Project Board page must create a project to have a valid project ID.

Once the project ID has been validated some fields are auto-populated: Project Name, Updated by (User Name) and Update on (Date). The user must fill all the fields. There are 4 dropdowns which lessons characteristics and 3 text boxes, the first one limited to 42 characters and the other two to 3100 characters. Finally, the user can attach supporting material. The formats allowed are: .ppt, .xls, .docx, .pdf, .mp4, .jpeg.

Instructions will show/hide different layers of information depending on where is the focus using onfocus() function.

Table 11 - Dropdown values (Value between brakets are values to be agreed)

Type of Lesson	Project Phase	Subject Area	Project Team
Lesson Learned	All phases	Approach	Architecture Team
Best Practice	Phase 1 – F&A	Benefits	Business Analyst
(Opportunity)	Phase 2 – Proj. Prep.	Business Case	Business Stakeholder
(Threat)	Phase 3 – Proj. Blueprint	Change Request	Business Engagement
	Phase 4 – Design	Communications	External Stakeholder
	Phase 5 – Construct	3rd party	Functional Team
	Phase 6 – Test	Financials	Global Solutions
	Phase 7 – Go-Live Prep.	Governance	Technology Team
	Phase 8 – Hypercare	Planning	PMO
	Phase 9 – Closure	PMO Tools	Project Management
	Iteration	Post Go-Live	Sector Solutions
	Sprint	Procurement	Service Management
		Legal	Technical Team
		Project Management	All
		Risk Management	
		Scope	
		Stakeholders	
		Testing	
		Training	
		Transition to Support	

6.2.6. Lesson page

- **Functional Design:**

In this page we shown all the relevant information about a lesson stored. At the top we can see the lesson title and if it is a Best Practice or a Lesson Learned. Also there are two arrows to navigate to the previous lesson or the following one.

At left the user can see the following information:

- Project against lessons have been introduced.
- How has uploaded and when. Username contain a link to be able to send a mail to the lesson owner.
- Impacts, this information will be useful to understand how it is classified, in which reports will appear and which are the impacted teams that should evaluate if can implement an improvement.
- The user can navigate between two tabs. By default Recommendation tab is shown. In Recommendation we show the comment captured though the question: "What you would recommend to someone in the same situation?". The content tab shown the information captured from the question: "What went well or bad and why?"

At the right side the user can interact:

- Deleting or editing the lessons if he/she is the creator.
- Rating the lesson if it has been useful or not.
- Disseminating it by email or extracting the information to reuse it.
- Can see attachments, depending on the extension of the file it will show a presentation, video or just an audio.

Finally, at the bottom of the page similar lessons are shown based on previous navigation, similar to the Amazon look and feel to recommend products. We will show other lessons that maybe interesting for the user related with the topic that he is looking and their interests.

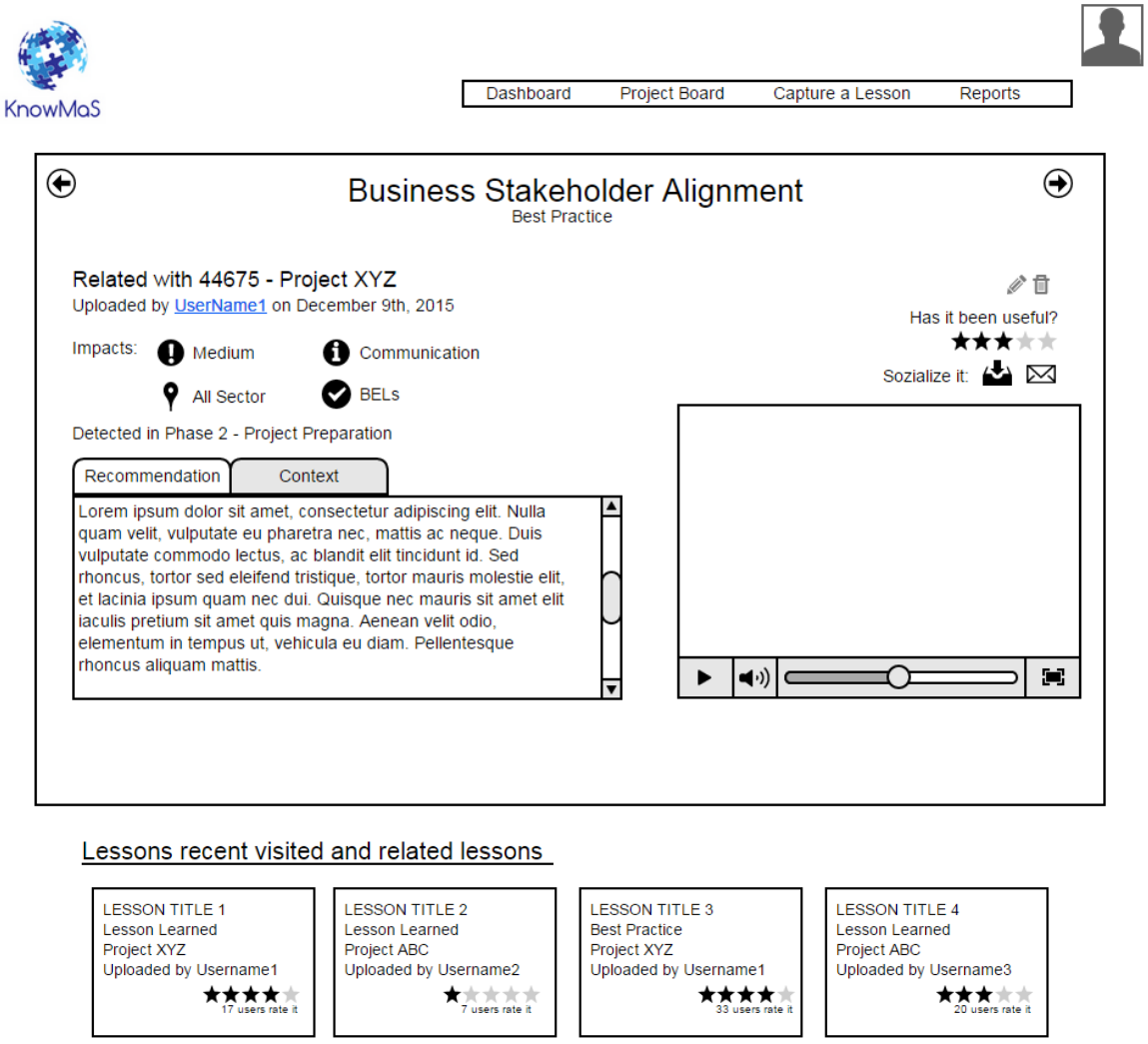


Figure 26 - Lesson Page

- **Technical Design:**

While the left side it is a retrieval of information from the database. The right side request interaction to the user, when users rate the utility of the lesson we must save the rating introduced. Also, the user can download, send it by email or see the supporting material.

We have more complexity on the bottom page, where we will need to determine the algorithm to show related lessons and the criteria to follow.

6.2.7. User Settings Page

- **Functional Design:**

Users can see their profile as well the profile of other users. Each user is able to edit some of their profile information and upload a new picture. Also, from the settings page the user can see their contribution on the community and a role associated. We decided to implement these gamification techniques to encourage users to contribute posting new lessons. In Table 11 there are the roles and criteria followed.

From this page users can modify their notification preferences and interests. By default notifications are set up weekly and "All" interest are selected.

- **Technical Design:**

In terms of technical elements, this page is composed of buttons, links and checkboxes. Highlight that while Interest section is a multiple choice selection, periodicity of notification only allow one selection. Checkboxes should be related to dropdowns, if a checkbox is selected then we will get the information in the dropdown. The page should validate that at least there is one selection in interests section.

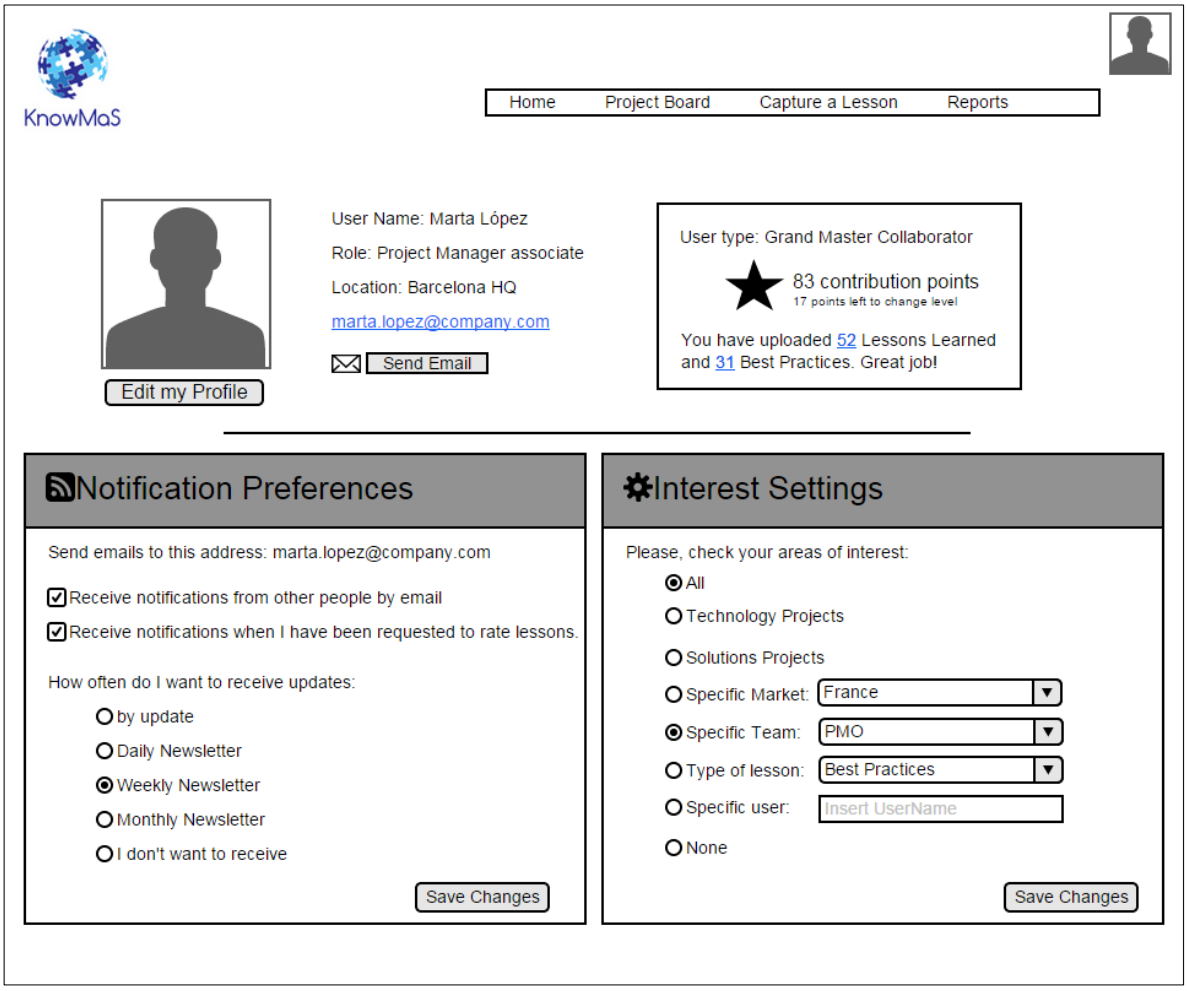


Figure 27 - User Settings page

Table 12 - Roles assigned as per number of lessons introduced

Role	Lessons Introduced
Knowledge Guru	1000 to unbounded
Knowledge Manager	781 - 1000
Savant	661 - 780
Grand Master collaborator	551 - 660
Master collaborator	451 - 550
Prodigy collaborator	361 - 450
Extraordinary knowledge	281 - 360
Wise man	211 - 280
Knowledge owner	151 - 210
Mentor	101 - 150
Consultant	61 - 100
Adviser	31 - 60
Contributor	11 – 30
New User	0-10

6.2.5.1. Newsletter

A Newsletter is generated and send automatically based on the new information updated. The newsletter is a push technique to remind and engage users. The first section of the newsletter highlight the lesson rated more useful, the intention is to provide visibility of quality lessons and reward users who provide qualitative recommendations.

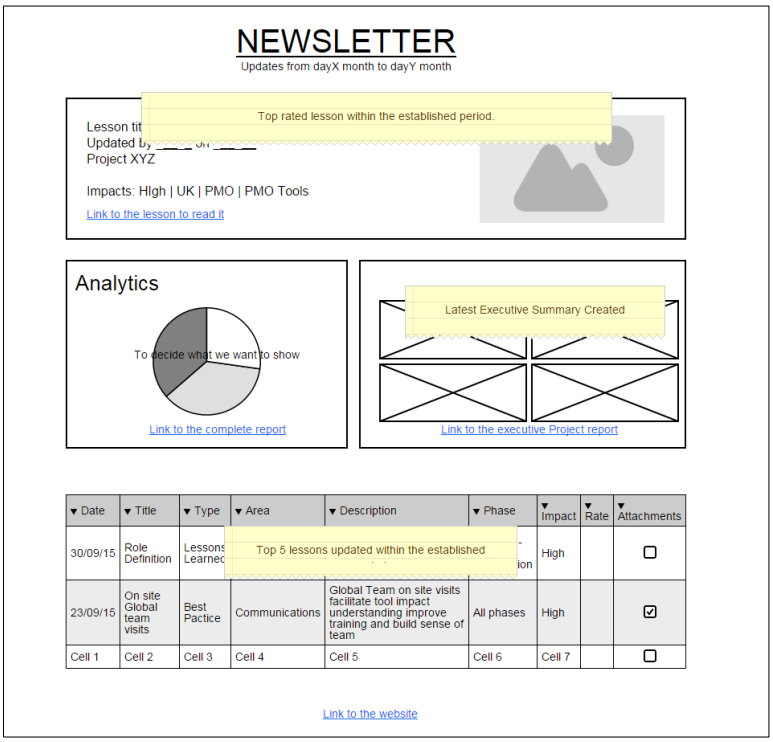
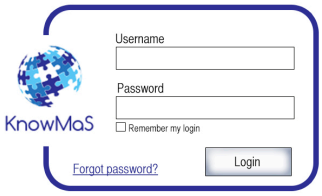


Figure 28 - Wireframe of the automate newsletter

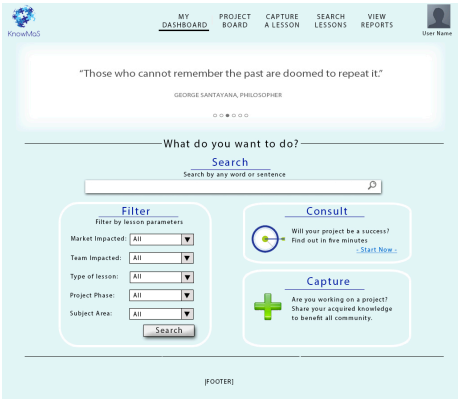
6.3. Hi-Fi Screens

A link to the Hi-Fi Screen images can be found at Annex B. In this section, you can find only the miniatures in order to do not extend the length of this file and avoid repeating the principles explained in the previous sections. The Hi-Fi Screens has been done only for the main pages:

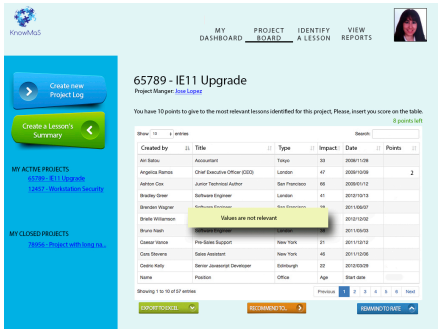
Login



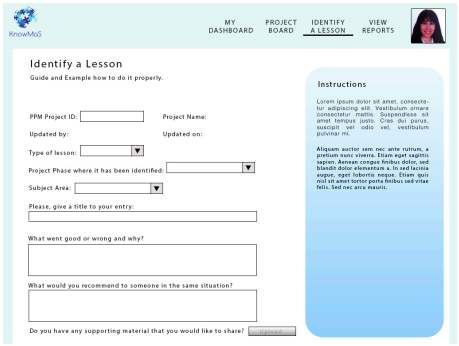
Home



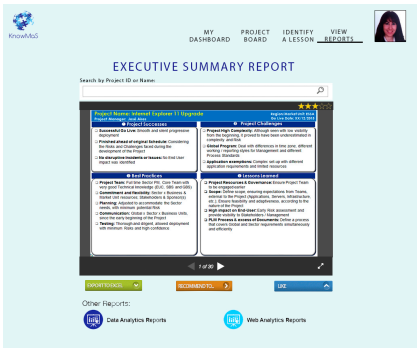
Project Board



Capture a Lesson



View Reports



User Settings

Find also those screens connected interactively in the following link:

https://invis.io/CH5GW9UWP

Chapter 7: Conclusions and next steps

7.1. Conclusions

In this project we have covered the first steps to implement a knowledge management system in a company. We have started looking on the documentation experiences of other, available tools in order to understand the state of the art and available options in the market to build our own tool. Then, we have assessed the current knowledge management level of the company. We have seen that the company has already set up a process to gather lessons learned, but the lack of a proper tool is causing the loss of user's engagement.

We have started working on the user's needs and requirements and how the workflow of the application should work to facilitate their activities. For this first phase of the project, we have focus more on how we should capture and retrieve lessons learned and needs and requirements of project managers and teams. In next phases, we must assess how improve the tool in order to provide valuable content to the PMO Governance team and the Senior Directors, working on dashboard, which offer useful insights and metrics.

As it is a lessons learned project, I think is relevant to share the lessons I have learned:

- I started with an optimistic planning, although, I warn up about the risks of cancellation of construct and test phases. For next projects, it is better to have real contingency weeks without any activity planned during them to close open topics. By other hand, showing a realistic plan made easier to meet stakeholder's expectations. (Lesson Learned)
- Despite of the previous bullet, I think I have accomplished the objectives and goals of this project. I did all the deliverables timely and stuck with the quality criteria. I deliver the mock up and a deep analysis of the current status, proposal of to-be and user requirements gathering the approval from the customer representative. Continuous works through small deliverables have been very helpful to achieve it. (Best Practice)
- Related with the first bullet as well, do not underestimate an unknown topic. Unexpected topics and requirements will easily come up. (Lesson Learned)

In spite of everything, the balance has been really positive. I have applied what I learnt in the Master's Degree while I was learning about knowledge management. The presentation in front of the CIO of my company was really successful. I have been hired and discussions about the possibility of leverage this project is currently held. I have had the opportunity to increase my communication skills in English, what also has provided me more confidence.

There is still a lot to do to obtain a complete and competitive knowledge management system, but this has been a first step to push towards a better tool and process. I would wish to see my company as a knowledge management reference on their field in the future.

7.2. Next Steps

As commented in the previous sections, this has been a first step to achieve a knowledge management system in my company. In the Figure 29, you can see the phases and their related milestones. In this project we have covered the discovery part, understanding where we are and suggesting a solution. In phase 2, we need to pilot the idea, take a sample of potential users and build a pilot of the tool. In this phase, we can start using some of the long term objective metrics proposed on section 1.3.2 to measure the effectiveness and success of the initiative. Finally, assessing the metrics and outcomes of the pilot we can propose improvements and get the engagement of Senior Management to deploy the project across the company.

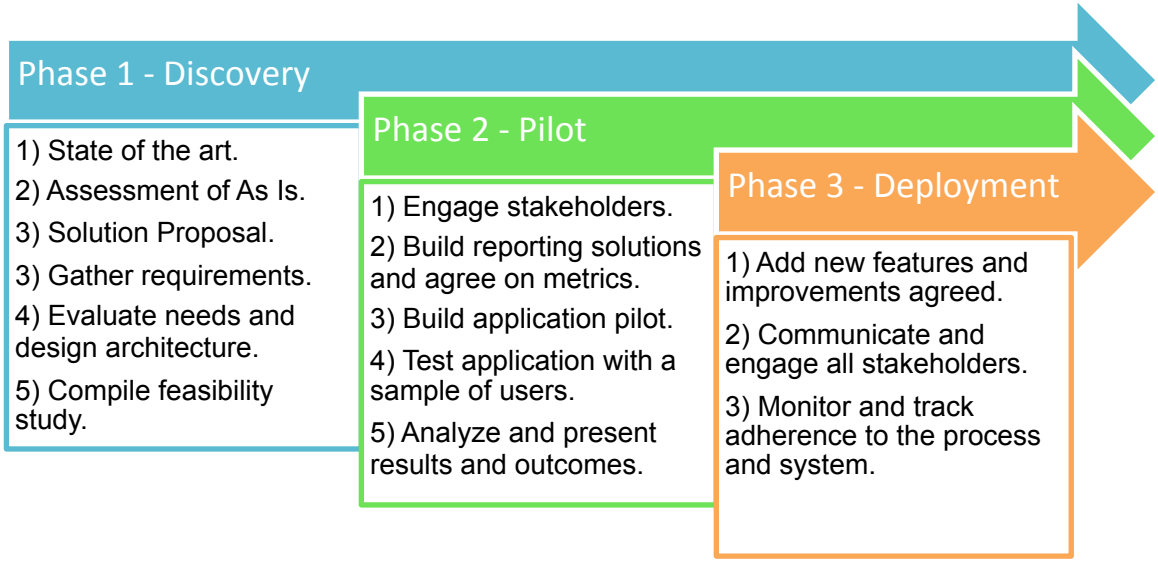


Figure 29 - Next steps diagram

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Annex

List of additional materials to support the project or give more information about the process followed and outcomes gathered.

Annex A: Glossary

Lesson Learned: Knowledge acquired by experience that has a negative impact for a project or the organization and we would like to avoid repetition or improve related process.

Best Practice: Positive experience, which has consistently shown best results (effective) or has decreased the amount of effort or expense (efficient).

Project Manager (PM): is the person responsible for leading a project, carrying planning, execution and closure phases.

Knowledge Management System (KMS): refers to any kind of IT system that helps to store and retrieve knowledge, facilitating knowledge management processes.

Project Portfolio Management HP (PPM): In this project just refereeing a HP tool to manage Projects Portfolio. Our tool will use same project identifiers.

Feasibility and approval (F&A): Phase 1 of the project, when we study the feasibility and align all the key stakeholders, which will sponsor the initiative.

Project Preparation (PP): Phase 2 of the project, when we will plan how we are going to do the project, estimation of tasks, resources and cost.

Business Blueprint (BP): Phase 3 of the project, when we gather the user requirements through different methods, obtaining the requirement specification document at the end.

Realization Design (RD): Phase 4 of the project, when we determine the design architecture and design requirements. We start transforming a conceptual view to a technical jargon.

Realization Construct (RC): Phase 5 of the project, when we built the solution using coding languages, tools and frameworks.

Realization Test (RT): Phase 6 of the project, when we test the integration of the solution as well as we test it with users, gathering the user acceptance test.

Annex B: Project Deliverables

Presentation

Partial deliverables

- PAC 1: Proposal
- PAC 2: Planning + Project Charter
- PAC 3: Requirement Specification
- PAC 4: Design

Product:

- Lo-Fi Wireframe Images
- Hi-Fi Screen images

Business Evidences:

- Customer Representative Approvals
- Proof of Concept request

Annex C: Resume

To understand more about the author of this Project, please, refer to the following link:

http://martaljob.wix.com/martalopezparamio

This is my personal website, where you can find my education, work experience and some projects done in the past.