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Agile vs Waterfall

MASTER'S DEGREE REPORT

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MASTER IN INFORMATICS ENGINEERING

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Júri da Defesa

Agile vs Waterfall
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Abstract

In project management the structured process - *Waterfall* - has often led to ineffective project developments. The introduction and the use of new and more agile approaches – agile methodologies - has become an increasingly appropriate answer for organizations to have more effective projects in what concerns time, budget and scope. Over the years, these agile methodologies have been acquiring their position in the market.

On one hand, *Waterfall* method is a structured process in Project Management, on the other hand agile methodologies are based on processes, so they are more interactive and its easier to make changes in the project. Although they are two antagonistic approaches in what concerns principles, characteristics and processes, this is an attempt to understand if there can be an interaction or complementarity between them.

This study is based on my professional experience all over the years and it seeks to demonstrate if it is possible to use both approaches in a business context.

Keywords: *Agile; Waterfall; project management; Agile vs Waterfall*

Resumo

O método do processo estruturado em gestão de projetos – *Waterfall* -, levou muitas vezes a desenvolvimentos ineficazes e a introdução de novas abordagens mais ágeis em gestão de projetos foi-se tornando uma resposta cada vez mais adequada por parte das organizações, para a sua permanência no mercado. Com o decorrer dos anos, as metodologias de tipo ágil foram adquirindo a sua posição no mercado e a sua adoção é cada vez mais comum.

O método Waterfall segue um processo estruturado para Gestão de projetos. Por sua vez, as metodologias de tipo ágil afastam-se dessa linearidade e centram-se em princípios e práticas de gestão de projetos mais interativos e incrementais. Apesar de serem duas abordagens à Gestão de projetos com princípios, características e processos muito diferentes, procurou-se perceber se poderia existir uma convivência ou complementaridade entre ambas.

Este estudo é baseado nas minhas experiências profissionais durante vários anos, procurou-se então evidenciar a possibilidade de uma convivência entre ambas as abordagens num contexto empresarial.

Palavras-Chave: *Agile; Waterfall; project management; Agile vs Waterfall*

Acronyms

BANIF	Banco Internacional do Funchal
BIOREP	Biorepository
BPM	Business Process Management
BPO	Business Process Owner
CMDB	Configuration Management Database
CRP-Santé	Centre de Recherche Public de la Santé
DG TAXUD	Directorate-General for Taxation and Customs Union
eCRF	Electronic Clinical forms
ETL	Extract Transform Load
FAT	Factory Acceptance Tests
GEO	Geostationary satellites
HR	Human Resources
IBBL	Integrated Biobank of Luxembourg
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITSM	IT Service Management
LAB	Laboratory
LIH	Luxembourg Institute of Health
LIMS	Laboratory Information Management System
MEO	Medium Earth Orbit
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
QA	Quality Assurance
SAT	Site Acceptance Tests
SES	Société Européenne des Satellites
SLA	Service Level Agreement
SOP	Standard Operating Procedure
SQL	Structured Query Language
TTP	Trusted Third Party
UAT	User Acceptance Tests
UK	United Kingdom
UML	Unified Modeling Language
URS	User Requirements Specification
US	United States
WI	Work Instruction

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1. Introduction

According to Abbas et al (2008), the emergence of agile methodologies is a reaction to more bureaucratic methodologies and constant changes in the economic environment.

Nowadays, an increasingly significant number of stakeholders recognize the need for execution according to an agile methodology (Thamhain 2014).

The traditional method of project management - Waterfall - when applied to software development projects, has often led to ineffective developments and the introduction of these new methodologies has become an increasingly appropriate response to new types of requirements, each time more complex and more dynamic.

Later Thamhain (2014) also mentions that all organizations are pressured to do faster, better and more economically.

Still within this perspective, the author indicates that the agile methodologies have been the object of much attention and controversy on the part of researchers and followers of this methodology.

While the ones defending it highlight their benefits and advantages over the Waterfall method, especially in the areas of information technology, others are those who are disappointed that these methodologies differ in conventional principles and standards previously established for project management. (Thamhain, 2014)

Also, according to Rigby et al (2016), these agile methodologies have revolutionized information technology.

They were the cause of increased success in software development, being responsible for improving quality and time-to-market and for boosting the motivation and productivity of IT teams.

Within this perspective, Landry & Mcdaniel (2015), point out that the adoption of agile methodologies is becoming an increasingly common practice.

Since the publication of the Agile Manifesto (Beck et al., 2001), these have become increasingly popular.

The choice of this topic has arisen because it aims to show how Agile methodologies and the Waterfall method, despite their differences, manage to coexist and, in a way, complement one another in a complex business context.

According to Mahanti (2006), there cannot be a single methodology applied universally to all projects, so all agile and non-agile methodologies need to be adapted and integrated to support the various projects.

Considering this still the current premise, the starting point of this work is:

"Is there complementarity between agile methodologies and the Waterfall method, within the scope of a software development project?"

The objectives that have been established to be able to answer this question are:

1. Describe the characteristics of the structured project management process - Waterfall;
2. Describe the characteristics of the project management process carried out based on management processes - Agile methodologies;
3. Highlight the complementarity aspects between the Agile methodologies and the Waterfall method, which are highlighted in my main experiences.

In summary, this work intends to go through my professional career and main experiences and with that to, understand how project management processes - agile methodologies - and the structured process of project management - Waterfall, can be complemented in a specific business context.

This is important because, as Gregory et al (2016) points out, these methodologies are increasingly used for companies to respond to the demands of an increasingly competitive market.

Therefore this work is structured in the following way:

- In Chapter 2, the *Theory in Project Management* where I approach the role of a project manager, project management techniques and detailing each methodology Waterfall and Agile by comparing them and identifying their differences;
- In Chapter 3, my *Professional Career* where I describe my professional background and experiences throughout the years;
- In Chapter 4, my *Main Projects on my Professional Career* where I detail my main three professional experiences focusing in my project management experience and especially application of Waterfall and Agile methodologies;
- In Chapter 5, the *Conclusion* summarizes my work in two main topics: Agile vs Waterfall and Career.

2. Theory on Project Management

2.1. The Multi Competent Project Manager

The scope of responsibilities of the project manager is wide but variable. Indeed, depending on the size and the particular context of the project, the job changes.

It is common to meet leaders of small projects who wear many "caps", they do everything from the gathering of needs to tests and developments. After all, don't we see, sometimes, a conductor cumulates his role with that of soloist even as the first instrumentalist!

On large projects, the distribution of roles is clearer, with the project manager focusing on piloting, project coordination and team animation. In the context of a project where all or part of the developments is outsourced, its role is more oriented towards the monitoring and control of the provider. We see that the job is geometrically variable depending on the context.

However, invariably, the primary responsibility of the project manager is to lead the project to completion.

What is a project?

Project Management Institute[1], the international organization for the standardization of project management, defines a project as follows: A project is a temporary enterprise decided to create a product, service or a unique result.

Enterprise: this is the economic dimension of the project, encompassing resources, budget and the risks incurred. And the adventure is new every time.

Temporary: every project has a definite beginning and end, the end marking the achievement of objectives or the observation that they cannot be achieved.

Product, Service, or Unique Result: A project creates unique deliverables, a product, or a product service, a software application, documentation ... Even if elements are reproducible or reusable, the result of each project is unique.

A project is usually subdivided into phases, each of which must lead to provision of deliverables.

We also talk about life cycle to describe the sequence of these phases.

Project management is the implementation of knowledge, skills, tools and of techniques applied to the project in order to respect the requirements, vis-à-vis the client (internal or external) and its own hierarchy.

Although it often comes down to ... doing lists!

Lists of priorities, risk lists, checklists of elements to check, lists of actions...

[1] *http://www.pmi.org or http://pmi-fr.org/*

To achieve the goal, however, the project manager must take into account the three constraints (3Cs) that constitute the project content, calendar and cost (see Figure 1).

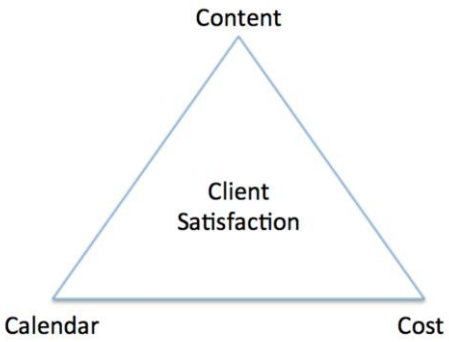


Figure 1 - 3Cs

The success of the project is measured, in fact, to the satisfaction of the customer and the quality of the result, that is to say to the conformity of the product, to what is expected, delivered in the respect of the time limit and budget allocated.

However, as Figure 2 shows, statistically, the studies conducted by the Standish Group [2] demonstrate that the proportion of projects that are considered successful (in other words, respecting the 3Cs) remains low: between 25% and 30%.

That means three out of four projects are partial or complete failures: projects are abandoned en route or succeed, but at the cost of significant overruns, or offer fewer features than expected. Indeed, adding additional content affects the budget, or even the delay.

Shorten the completion time, to respect a date for example, will require a downward adjustment of the content or a budget by allocating new resources.

Source: Standish Reports

Figure 2 - The Success Rate of Projects

[2] *http://www.standishgroup.com/*.

Juggling with these constraints, often having to arbitrate, wrongly, instead of the customer, the project manager will have to tap into his "toolbox", using this or that competence to bring the project to a successful conclusion.

The mastering of project management techniques is a core skill, which the project manager must exploit by adapting to the characteristics of each project.

He must therefore develop analytical skills and understanding of the environment of each project. If, in addition, a team accompanies him and many actors are involved in the project, he must put in place interpersonal skills to animate and coordinate this community.

2.2. Mastering the Techniques of Project Management

The PMI, in its Project Management Body of Knowledge (PMBOK[3]), identifies and classifies project management techniques in nine areas of knowledge and in groups of processes (see Table 1).

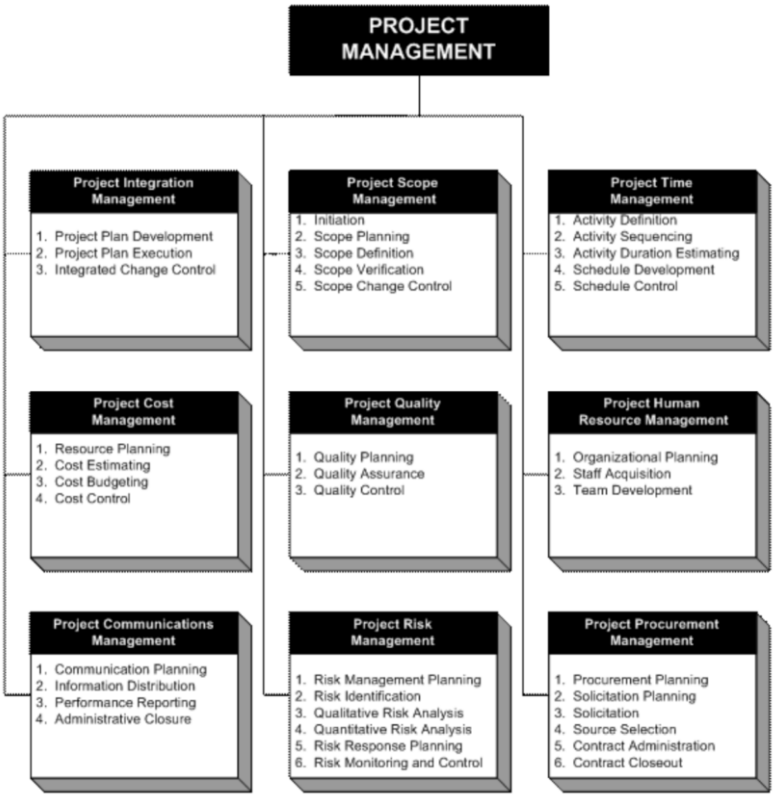


Table 1 - Overview of the Nine Areas of Knowledge

Behind the processes, there are activities to be carried out, generally instrumented with software or office applications.

[3] *Project Management Knowledge Guide, 3rd Edition, (PMBOK Guide), PMI.*

For example, in the area of knowledge, Project Cost Management, the project manager has one or two estimating techniques, which he uses with a tool he has developed in Excel, to deduce the project budget. He knows, moreover, the earned value technique, for the monitoring and control of project costs.

The PMBOK lists and describes these activities but it is up to the project manager to assess their relevance and determine their organization or sequencing, according to the methodology adopted and the degree of formality required, depending on the project (size, criticality, risks, innovation or maintenance, partial or total outsourcing).

As a project management professional, the project manager must:

- Know and master these techniques;
- Know how to explain and justify his choices;
- Be able to reproduce a practice that has worked well in a given context, in a similar context or adapt it to a different context;
- Know how to put forward what he knows and inspire confidence;
- Be recognized as a professional.

2.3. Methodology Comparison per Project Management Area

A Guide to the Project Management Body of Knowledge (PMBoK Guide) [4] is a book that presents a set of standard terminology and guidelines for project management across all types of projects.

While the PMBoK details its own project management processes, it also defines nine main knowledge areas that are typical of all projects, irrespective of the project management methodology used.

[4] *Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide). Fourth Edition. 2008,Project Management Institute. 459*

Figure 3 - The core Project Management Areas as defined by the PMBoK

The 9 Project Management Fields of Practice that comprise project management, as described in the PMBoK are:

- Integration management
- Scope Management
- Time Management (planning, forecasting and estimation)
- Cost Management (budgeting)
- Quality Management
- Human Resource Management (leadership and people management)
- Communications Management
- Risk Management
- Procurement Management

2.4. Understanding the Environment of Each Project

Each project takes place in a particular context: social, economic, functional, national or international, normative, political, technological, historical, strategic... that must be taken into account from the start.

Also, the project manager acts in interaction with his surroundings: directly with the project actors, with the organization in which the project takes place and the environment in which this organization evolves; his role, his responsibility, his tasks or its influence vary according to these factors.

The project manager interacts with his team, the customer, the subcontractors or other suppliers involved in the progress of the project.

Internet service providers, mobile and fixed network operators, governments and institutions, with a mission to "connect, enable, and enrich".[10]

SES is one of the world's leading satellite operators with over 70 satellites in two different orbits, geostationary orbit (GEO) and medium Earth orbit (MEO).

These include the well-known European Astra TV satellites, the O3b data satellites and others with names including AMC, Ciel, NSS, Quetzsat, YahSat and SES.

In terms of human resources, SES has more than 2000 internal employees spread all over the World. Its headquarters are located in Luxembourg where most of the employees are located. Other big offices are as well in US like Washington DC and at The Hague in the Netherlands.

Besides internal employees, SES employs external consultants that come for all kinds of work to be accomplished in order to help SES on specific missions.

My department sits within the IT department at a higher level, then coming down in the hierarchy it belongs to the Business Applications and then finally coming to the level of my department Satellite Applications.

This department of Satellite Applications is led by my first line manager and he is currently located in Washington DC.

The goal of my department is to provide solutions for all the more than 70 satellites fleet managing all the satellites assets and providing essential data for satellite's crucial teams.

Therefore we currently have around 10 big projects on going that needs to be managed and delivered on a daily basis with a constant high set of priorities and demand of the business.

Our currently team is composed by my manager as internal employee, me as an internal employee as well, and more than 10 external consultants hired for specific long-term missions. The team is currently growing as we speak.

My position is IT Project Manager and is precisely to manage all of the projects and respectively to manage the whole team and reporting to management.

Another aspect of my role is to ensure the communication with all of the applications stakeholders and also with the external suppliers of some of our applications.

When I joined the department, some projects were already on going and some I had set up from scratch and all it takes to put in place.

For my current experience at SES, I have been responsible of the execution of projects and maintenance within the applications delivery field, with regard to timely task and project implementation.

These tasks include the advertise of available offerings to the various Business Process Owners (BPO's), proposing and implementing technical solutions for new and enhanced services to solve the customer requirements.

[10] *https://en.wikipedia.org/wiki/SES_S.A.*

I have been as well acting as the interface between the executing party (IT) and the internal and/or external customers and suppliers, also working on developing and maintaining Project Plans and Budget.

In regards to this experience, I will explain in more detail in the next chapter where I will describe the different phases, achievements and conclusions.

4. Main Projects on my Professional Experience

4.1. Project @ European Commission

4.1.1. Context

This was a large European project that took place between 2007 and 2010 mainly in Luxembourg that had the European Commission (DG TAXUD) Directorate-General for Taxation and Customs Union as the Client.

Within the project I have worked for the companies Unisys and then Bull PSF (now belongs to ATOS) that are IT service providers.

The project was called ITSM TAXUD, ITSM standing for Information Technology Service Management and TAXUD that is a domain of the European Commission for the transit, export and import of goods within the European Union and its Member States.

My first position within this project was of Quality Assurance between 2007 and 2008. My first team where I was part of, had around 15 persons working and responsible just for the quality assurance of the applications. There were several test cycles on each application's life cycle and this was taking place on different environments.

Then my next position within the same project was of Application Manager Engineer between 2008 and 2010. This team where I worked on within the project was based in Luxembourg and the team had around 20 persons divided by the type of applications, meaning, applications belonging to Export, Import, Taxation, Excise or Transit of goods.

4.1.2. Mission

The objective was to build, manage, administer and deliver all the applications that handle all the transit, export and import of goods within the European Union.

The project was based in ITIL and shared between companies within a common Consortium.

These companies were Unisys, Bull (now ATOS) and Siemens forming the Consortium to serve the client under a common contract ITSM TAXUD.
Each company had a specific role within the project and under the ITIL framework.

Since it was based in ITIL, the project was organized in different teams across the operations in the Consortium: Analysis, Development, Application Management, Configuration Management, Change Management, Problem Management, Release Management, CMDB Management, Quality Assurance and Service Desk.

These teams were spread in different countries within the European Union. The Client was based in Belgium more concretely Brussels and the main activities of the Consortium was based in Luxembourg. Other teams were based as well in Brussels, Belgium, as well as in Athens, Greece and Warsaw, Poland.

There were quite a large number of people working for the Consortium, the official number was not known but I would say around 100 people. In terms of applications serving the business, there were around 20 applications divided in different business.

4.1.3. Role in the Project

My roles were based on Quality Assurance and then Application Management of Customs, Exporting, Importing, Excise and Taxation applications.

Quality Assurance

The first team I worked in this project was based initially in Brussels and then moved into Luxembourg. This team was built exclusively for this large European project and the project divided in several teams in multiple locations across three companies of the Consortium.

The team where I was part of, had around 15 persons working and responsible just for the quality assurance of the applications. There were several test cycles on each application's life cycle and this was taking place on different environments.

The first initial developer's build of an application was going through a FAT (Factory Acceptance Tests) cycle in order to fully test the application at every level of functionality.

The outcome of this cycle was the identification of issues and/or changes. After this there was a cycle of bug corrections previously identified where the developers had a time frame to implement these ones.

From the FAT cycle a list of changes most of the time was identified and got into a queue of changes for a new change package to be developed and later released.

The second version of the build from the developers was almost the final build but it went as well through a SAT (Site Acceptance Tests) cycle within the client's environment to test the applications as close as possible.

The results from this cycle were similar to the previous one, to correct the issues and release a corrected version.

If major issues were to be corrected, a decision was being made if this would go on that current version or left aside to integrate and be part of a later new change package.

This was crucial to be decided since these major issues could compromise the deadlines planned beforehand.

The final version was delivered in a Conformance environment (before Production) in order that the Client (represented by key users) would test the application(s) in an UAT (User Acceptance Tests) cycle. Production data was refreshed into this environment in order that tests were as closer as possible to reality.

Finally once the UAT was completed and no major or critical issues were found, the application(s) could be taken live into Production. Just before that, a meeting to decide if the application was fit for purpose was taking place between the Client TAXUD and representatives of the Consortium.

As the project was based in ITIL service framework, I have undergone and have successfully obtained the certification on ITIL.

In regards to my role of Quality Assurance I had in Unisys, these are the summarized tasks:

- Analysis and Testing of the applications in the ITSM Project, ITIL based, for the European Commission (DG TAXUD) and 27 Member States.
- Analysis of the application's (Customs, Exporting, Importing, Excise and Taxation applications) business and integration.
- Support to the 27 Member States.
- Testing of the application's design and execution of the test scenarios and test scripts, including user, system and integration acceptance tests.
- Conduct and participate in meetings with the client and developers.
- Document Review and contractual quality deliverables.

Application Management

The second team where I worked on within the project was based in Luxembourg and the team had around 20 persons divided by the type of applications, meaning, applications belonging to Export, Import, Taxation, Excise or Transit of goods.

My role in terms of project life cycle was between the development and the quality assurance of the applications.

As already mentioned on the quality assurance role, applications went through different release and testing cycles. This meant several preparations of the environments, the deployment of the applications and its databases, when applicable data refresh in the databases and also very important a second level of support.

As an application manager, I have managed and administered several environments for the good functioning of each application. There were environments for development, several testing cycles, conformance and production.

My responsibilities for the Application Management role within Bull (Atos) are summarized below:

- Administration, Support and Management of Customs, Exporting, Importing, Excise and Taxation applications.
- Installation, Maintenance, Administration & Monitoring of the applications in Testing, Pre-Production and Production environments.
- Testing, validation/preparation and implementation/installation of new and existing application versions.
- Business analysis of the applications integration.
- Communication and Support proactively with all Member States and conducting and participating in meetings with the client.
- Support the integration of existing and new applications.
- Setting priorities and resolution of both technical and non-technical issues, doing the Incident Management.
- Monitoring progress on problem resolution and handling communication to users at all stages of the problem resolution process and reporting achievements as well as inefficiencies.
- Acting as a single point of contact with the client DG TAXUD.
- Planning of the upcoming new or changed applications.
- Document and Quality Review on contractual quality deliverables.

4.1.4. Tools & Methodologies

In regards to the tools and methodologies used across the project, this is the summarized list:

- Databases: Oracle, TOAD, Sqlplus and SQL.
- Manage Servers: Weblogic.
- Planning: Ms Project.
- Servers: Solaris, Windows, AIX Server, Unix.
- Ticketing System/Incident Management: OWITSM, JIRA.
- Office Tools: Ms Word, Ms Excel and Ms Outlook.
- IT Service Management: ITIL.
- Testing: Unit, System, Integration Testing.

4.1.5. Project Phases

The project had several phases through its life cycle based on a classical waterfall approach.

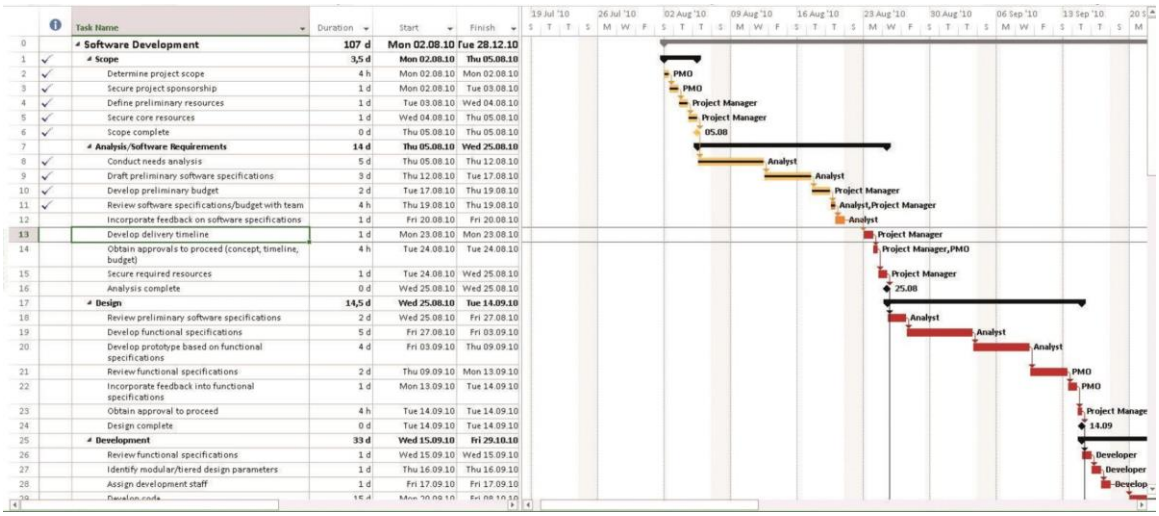


Figure 7 – Project Plan European Commission

The main applications went through the initial first versions considered as core.

Following the initial core versions several major and minor versions were released and went live.

As already mentioned, a classical waterfall approach was followed leading to the following project phases:

- Requirements Analysis

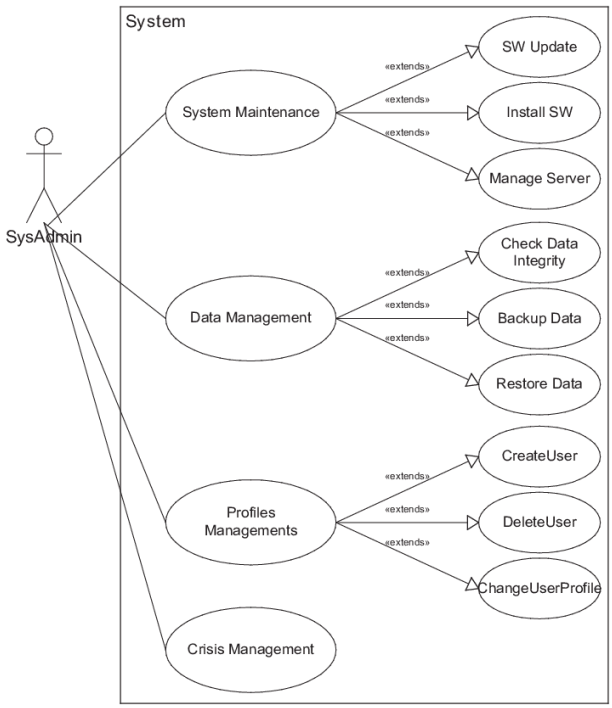


Figure 8 – Use Cases - SysAdmin

Use case name	Find Member Record
Use case ID	UC-10
Brief description	A member record is requested.
Post-conditions	A membership record is returned.
Flow of events	•The Customer Service Assistant finds the member record by entering the member's ID or name. The system displays a list of members which match the information entered by the Customer Service Assistant. •The Customer Service Assistant selects the required member record. The system then displays the details of that member.
Alternative flows and exceptions	No member record is found for the customer.

Figure 9 – Use Case Detailed – Find Member

- Design

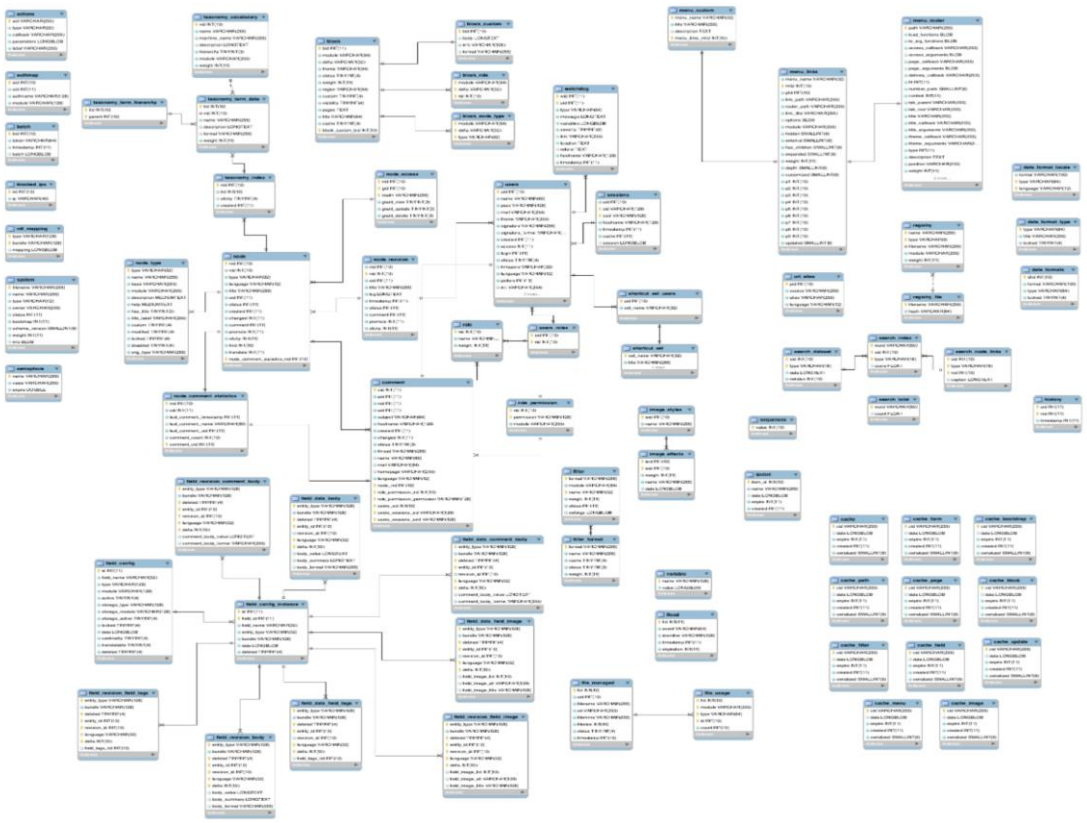


Figure 10 – Entity-Relationship Diagram – Overall Project

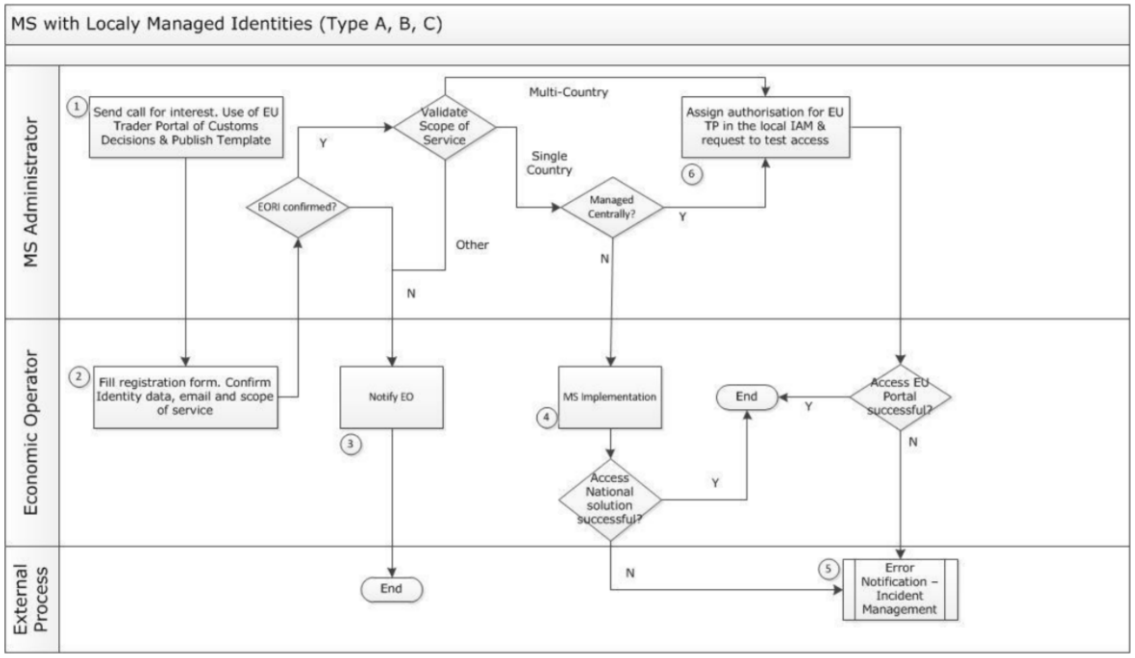


Figure 11 – Business Process Model – Member State (MS)

- Implementation

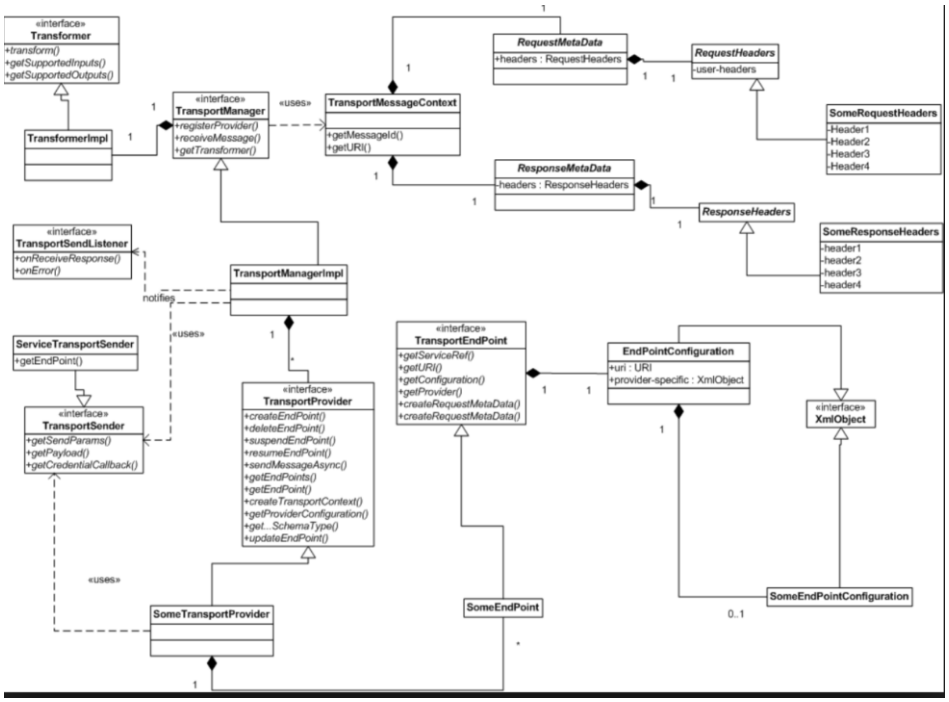


Figure 12 – Class Diagram – Transit of Goods

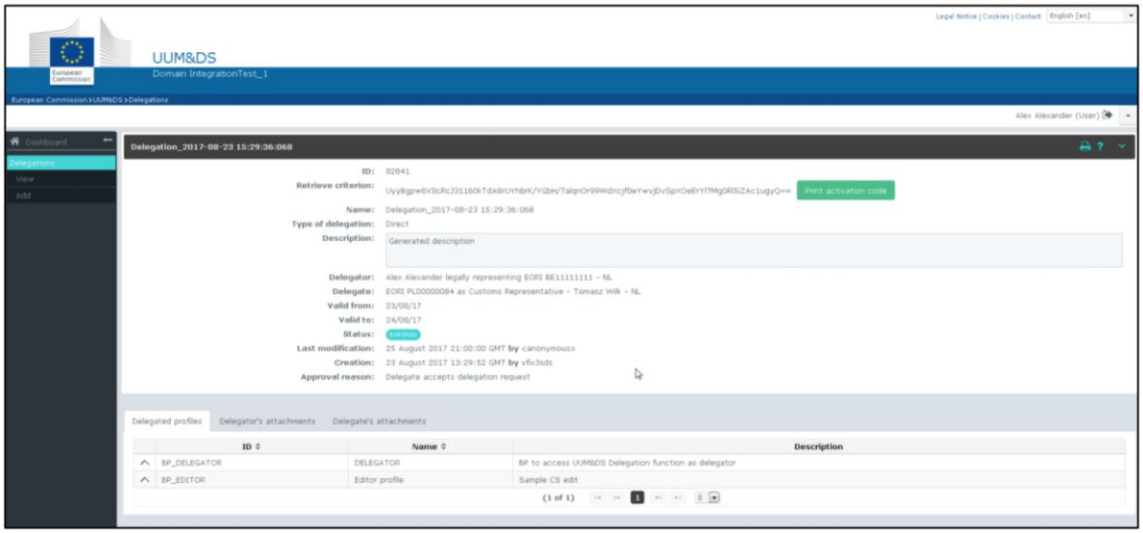


Figure 13 – User Interface of one European Commission Application

- Testing
- Deployment

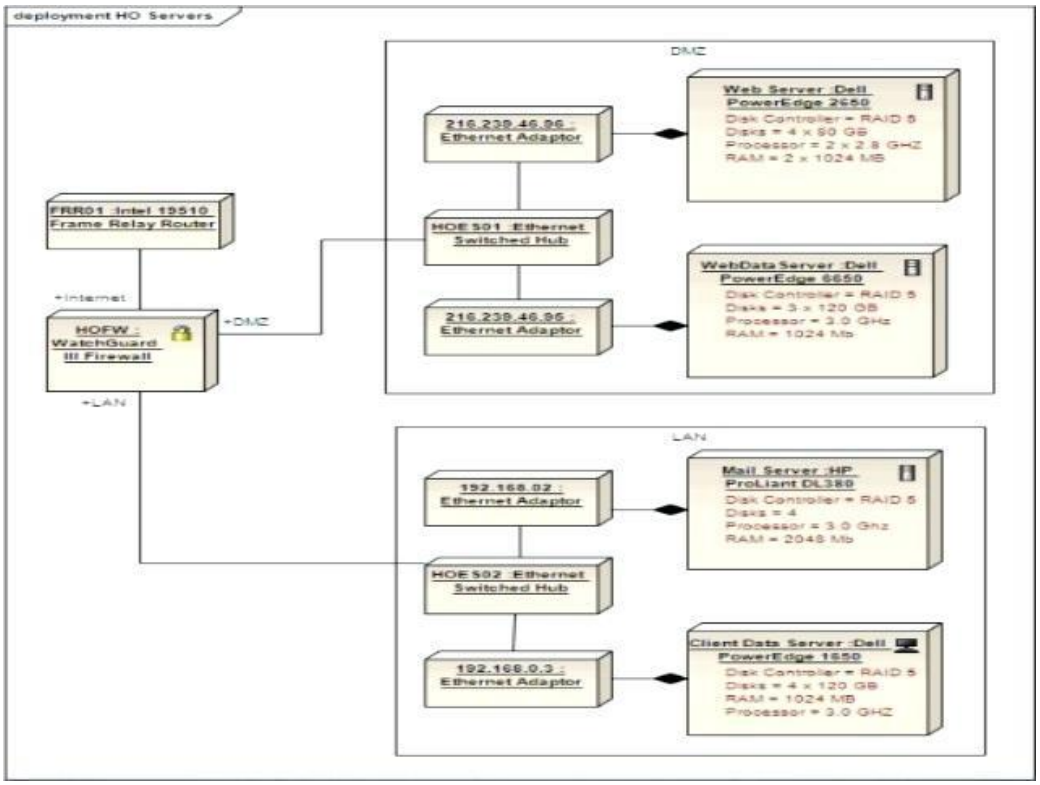


Figure 14 – Deployment Diagram - Servers

- Maintenance
- Support

4.1.6. Challenges encountered

One of the biggest challenges throughout the project was the communication between the teams located in the different countries, cities and between different companies within the Consortium.

This led to many miscommunications and caused several delays on the milestones and deliverables to the client.

Eventually at a certain point each team had a representative to facilitate the communication between teams within the project and as well communication towards the client.

Another point that was difficult to manage was the structure of the project that was based on ITIL. This meant several teams organized within that framework, such as, Application Management, Release Management, Change Management, etc.

This was issue in the sense that not all of the persons working in the project were experienced or certified in ITIL. Therefore it became mandatory that everyone in this project to go through the process of becoming certified in ITIL and like that improving the processes.

The combination between the Waterfall methodology and the IT Service Management framework was not easy to integrate initially. This required quite an effort from the management to integrate and combine these.

One issue worth to mention as well was at the level of languages when communicating between teams. Teams located in Greece and in Poland had some persons in the projects which had issues communicating in English (the official language of the project) leading to many misunderstanding and issues.

This has been improved by nominating a single point of contact within each team to do the important communication and also by moving the Application Management that was done in Poland into Luxembourg.

4.1.7. Conclusion

This project showed that the traditional waterfall used was still beneficial to the client where a detailed planning and milestones were under a tight control.

In the other hand it has also showed that only at the end the customer had a glance of the outcome of the working product therefore it led to the need of adding new changes and other new releases to correct the missed or misunderstood requirements / functionalities of the applications.

In terms of overall project, it was a fulfilling project with challenging moments, filled with many multicultural teams in a demanding teamwork effort. The costumer had high-level standards with deliverables and services within well-defined quality standards.

Individually it was quite challenging specially on learning the business and getting used to work in a Service Management framework.

Also it was quite a challenge to adapt to new ways of working, being outside Portugal and getting used to work in a multicultural environment as well as having a foreign language such as English as a working language.

I have gradually learned the business and got more involved with the technical aspects of the role that then allowed me to be in a better position.

Working within a Waterfall methodology was the ideal case since the client (all European Union Member States) needed to get defined and upfront deadlines and milestones defined.

Even though there were specific deliverables and milestones, the business

did not request to get these in an agile way and neither requested to have a very close follow up.

The most demanding and dynamic factor was to get many changes but even these ones were accounted from the beginning, foreseen and included in a contingency plan.

4.2. Project @ Luxembourg Institute of Health

4.2.1. Context

This project took place between 2011 and 2016 in Luxembourg where I worked in the Luxembourg Institute of Health, more concretely, the Integrated Biobank of Luxembourg (IBBL) during that period of time.

IBBL is part of the Luxembourg Institute of Health since 2015 and provides biospecimen-related services and biobanking infrastructure for applied medical research.

Luxembourg Institute of Health is a public biomedical research organization which was founded from a fusion in 2015 between a research health institute CRP-Santé and IBBL.

This IT team was part of a department called Business Information Solutions serving the internal customers and the external customers.

My position was of Application and Project Manager within the Business Information Solutions.

This IT team was initially composed by 3 persons serving the whole company.

One was responsible for the LIMS project, another responsible for the entire infrastructure and systems and another one responsible for the IT in the laboratories.

With time the team grew with few more people (7), one in the LIMS project, one on testing across all projects and another one for the IT in the laboratories.

4.2.2. Mission

The prime mission was to put in place an IT system to manage the complete samples life cycle within the biobank.

This type of software system, to manage the complete sample life cycle, is called LIMS (Laboratory Information Management System).

In terms of customers, this system would serve not only the internal Institute but also the entire Health community in Luxembourg covering all 4 hospitals and clinics in Luxembourg, plus some external laboratories and health institutions in the neighbor countries.

The key users of this software are internal users and external users of the biobank.

The internal users are scientists that work in the laboratories for sample processing and research, in the bio repository that stores the samples in proper storage, all the other employees for different purposes to use the sample data and clinical data.

The external users are the research nurses, specialized doctors, pathologists and other people working in the health and research area.

Our LIMS software was used to store and manage all data related to samples and clinical data related to the donors of these samples.

These samples (blood, saliva, stool, tissue) were collected mainly in hospitals where the patients had to give their consent that these samples could be used for research and its clinical data used for the same purposes.

Samples were belonging to their clinical studies, these were divided in different categories, such as, Cancer (different kinds), Diabetes, Parkison, Alzheimer, Cohort / Population.

The collected and processed samples were from different types, blood, saliva, stool and tissues.

Our initial LIMS software was tailor made developed by an external Institute in United States with strong relation and experience on this area.

Later on, after several serious challenges encountered, our Institute has taken the decision to stop the development and buy an off-the-shelf product existing in the market with the idea of configuring it and customizing to our needs.

This has also meant to pass through an extensive migration between the old and the new LIMS systems.

4.2.3. Role in the Project

My role in the project was of an Application & Project Manager for more than 5 years and my role has evolved several times throughout the project.

The role involved a constant communication with the customers of the LIMS application.

These customers were of two types, internal and external customers. The internal customers were mainly the persons working in the biorepository and in the laboratories and also all the other internal colleagues including management.

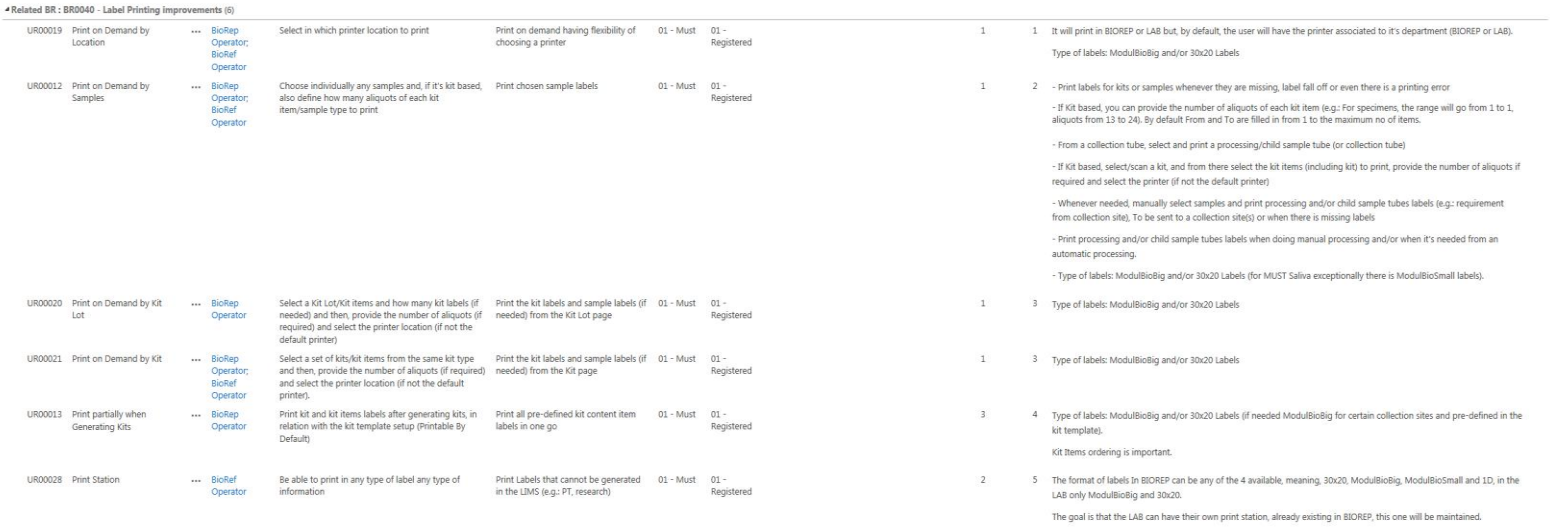
On the external customers they were mostly the research nurses using our systems and some doctors that were the project investigators.

Initially my role was more based in application management with some project management with more hands-on in the system, since the software was being tailor made developed by an external Institute In United States, and required someone more technical on our side and the business analyst on their side.

Since it was a small IT team I have ‘wear several caps’ by working through all software project life cycle.

I was doing the business analysis together with key users of different departments, such as, Laboratory, Bio repository and research nurses.

This meant defining business processes with Business Process Modeling by identifying as-is situation and then proposing and implementing the to-be process to be improved.



Related BR : BR0040 - Label Printing improvements (6)

UR00019	Print on Demand by Location	BioRep Operator; BioRef Operator	Select in which printer location to print	Print on demand having flexibility of choosing a printer	01 - Must	01 - Registered	1	1	It will print in BIOREP or LAB but, by default, the user will have the printer associated to it's department (BIOREP or LAB). Type of labels: ModulBioBig and/or 30x20 Labels
UR00012	Print on Demand by Samples	BioRep Operator; BioRef Operator	Choose individually any samples and, if it's kit based, also define how many aliquots of each kit item/sample type to print	Print chosen sample labels	01 - Must	01 - Registered	1	2	- Print labels for kits or samples whenever they are missing, label fall off or even there is a printing error - If Kit based, you can provide the number of aliquots of each kit item (e.g.: For specimens, the range will go from 1 to 1, aliquots from 13 to 24). By default From and To are filled in from 1 to the maximum no of items. - From a collection tube, select and print a processing/child sample tube (or collection tube) - If Kit based, select/scan a kit, and from there select the kit items (including kit) to print, provide the number of aliquots if required and select the printer (if not the default printer) - Whenever needed, manually select samples and print processing and/or child sample tubes labels (e.g.: requirement from collection site), To be sent to a collection site(s) or when there is missing labels - Print processing and/or child sample tubes labels when doing manual processing and/or when it's needed from an automatic processing. - Type of labels: ModulBioBig and/or 30x20 Labels (for MUST Saliva exceptionally there is ModulBioSmall labels).
UR00020	Print on Demand by Kit Lot	BioRep Operator	Select a Kit Lot/Kit items and how many kit labels (if needed) and then, provide the number of aliquots (if required) and select the printer location (if not the default printer)	Print the kit labels and sample labels (if needed) from the Kit Lot page	01 - Must	01 - Registered	1	3	Type of labels: ModulBioBig and/or 30x20 Labels
UR00021	Print on Demand by Kit	BioRep Operator; BioRef Operator	Select a set of kits/kit items from the same kit type and then, provide the number of aliquots (if required) and select the printer location (if not the default printer).	Print the kit labels and sample labels (if needed) from the Kit page	01 - Must	01 - Registered	1	3	Type of labels: ModulBioBig and/or 30x20 Labels
UR00013	Print partially when Generating Kits	BioRep Operator	Print kit and kit items labels after generating kits, in relation with the kit template setup (Printable By Default)	Print all pre-defined kit content item labels in one go	01 - Must	01 - Registered	3	4	Type of labels: ModulBioBig and/or 30x20 Labels (if needed ModulBioBig for certain collection sites and pre-defined in the kit template). Kit Items ordering is important.
UR00028	Print Station	BioRef Operator	Be able to print in any type of label any type of information	Print Labels that cannot be generated in the LIMS (e.g.: PT, research)	01 - Must	01 - Registered	2	5	The format of labels In BIOREP can be any of the 4 available, meaning, 30x20, ModulBioBig, ModulBioSmall and 1D, in the LAB only ModulBioBig and 30x20. The goal is that the LAB can have their own print station, already existing in BIOREP, this one will be maintained.

Figure 15 – User Stories – Label Printing Improvements

Code	UR title	UR description	Business Requirement
UR00012	Print on Demand By Samples	AS BIOREP, LAB I WANT TO choose individually any samples and, if it's kit based, also define how many aliquots of each kit item/sample type to print SO THAT print chosen sample labels	BR0040
UR00013	Print partially when Generating Kits	AS BIOREP I WANT TO Print kit and kit items labels after generating kits, in relation with the kit template setup (Printable By Default) SO THAT print all pre-defined kit content item labels in one go	BR0040
UR00019	Print Labels on Demand on BIOREP or LAB Printers	AS BIOREP, LAB I WANT TO be able to print labels from the LIMS interface on BIOREP or LAB printers either at will or, by default, based on my location / department SO THAT print labels as close as possible from where I am working to gain time	BR0040
UR00021	Print on Demand by Kit	AS BIOREP, LAB I WANT TO select a set of kits/kit items from the same kit type and then, provide the number of aliquots (if required) and select the printer location (if not the default printer). SO THAT print the kit labels and sample labels (if needed) from the Kit page	BR0040
UR00028	Print Station	AS BIOREP I WANT TO Be able to print in any type of label any type of information SO THAT Print Labels that cannot be generated in the LIMS (e.g.: PT, research)	BR0040

Table 4 – User Requirements - Label Printing Improvements

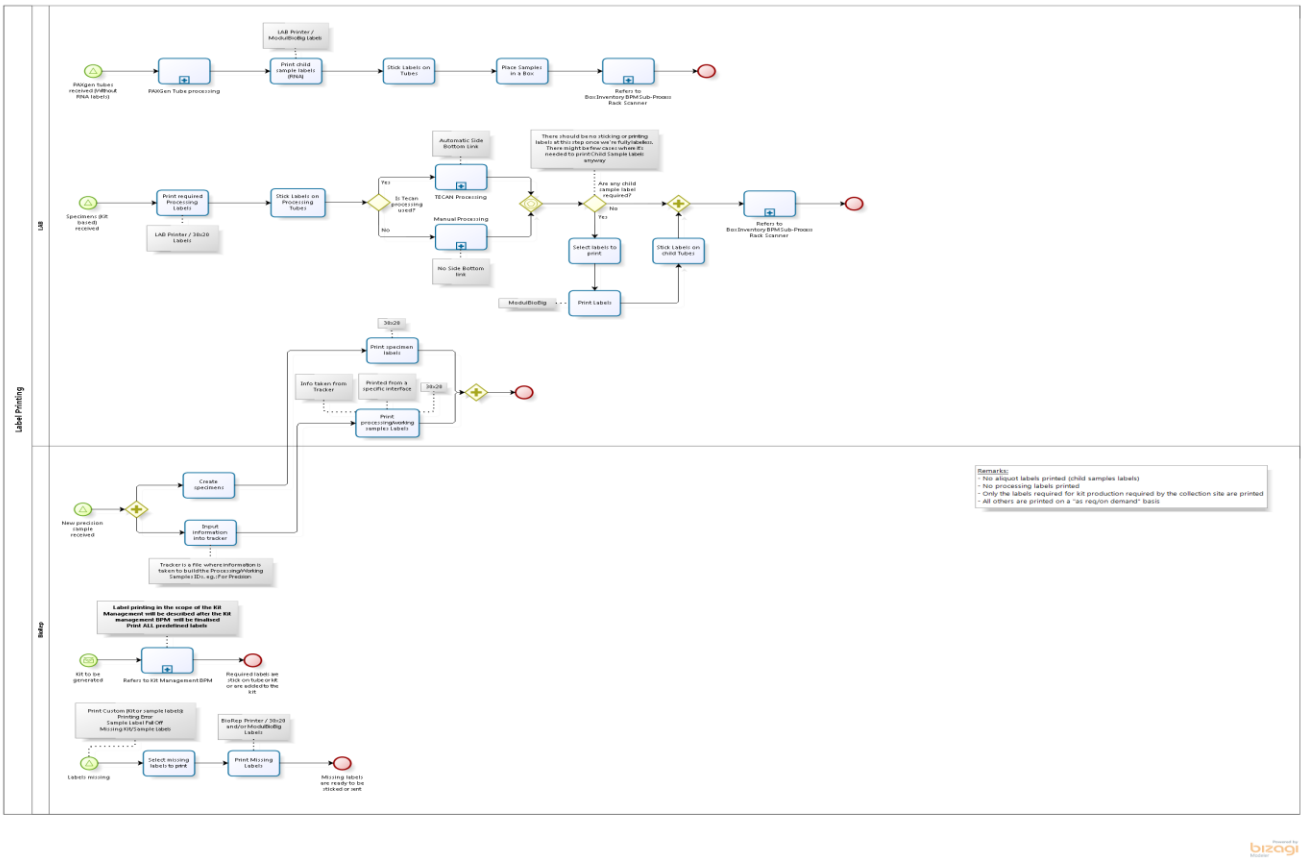


Figure 16 – Business Process Model – Label Printing Improvements

Part of this analysis included doing all the user requirements and design.

UR Code	UR Title	AS A	I WANT TO / THAT	IN ORDER TO	Details
UR00124	Retrieve data from rack scanner files	BIS	retrieve data from rack scanner files	have the data available to be QC'ed	The whole process from the output file of the rack scanner, passing through a database and having this data available for the QC towards the LIMS.
UR00125	Location update via Rack Scanner	BioRep Operator BioRef Operator	Use the rack scanner to scan boxes	update sample positions in a box through bottom ids to reflect the reality	Update the positions for existing samples using the rack scanner by first QC checking every sample between the scanned and LIMS
UR00126	QC Rack Scanner	BioRep Operator BioRef Operator	have a report of the box content scanned in the rack scanner	show results from the QC rack scanner scanning (output of rack scanner matching LIMS box content)	Report Output: - Green color: sample positions in the rack scanner to LIMS are OK; - Red color: samples in the LIMS but not in rack scanner; Bottom ids not known in LIMS: link missing or sample creation; - Orange: samples in the rack scanner not in the LIMS; - Yellow color: samples in the correct box but not in the good positions inside the box according to the LIMS; - Grey color: "No read" positions from the rack scanner; - Purple color (at box level): Optional check: If whole box content has the same Study/Sample Type as the box, if it doesn't then it's a mixed box
UR00127	Sample Creation via Import Interface	BioRep Operator BioRef Operator	create new samples in the LIMS through a user interface	create new samples previously unknown to the LIMS	Single scanning of samples. This is done by batches, per Study, sample type, container type and box id: sample id, bottom id (optional), alias (or more alias), treatment type, box position. If mixed study or sample type or container type, then we do it per box id.
UR00131	QC Imports	BioRep Operator BioRef Operator	have a report on the QC of the sample data to be created or updated in the LIMS	get validated data before importing it into the LIMS	If QC is all fine then the import can be submitted, if not OK then the data has to be corrected (if via Import Interface) or file discarded (via File Upload)

Table 5 – User Requirements Rack & Sample Creation

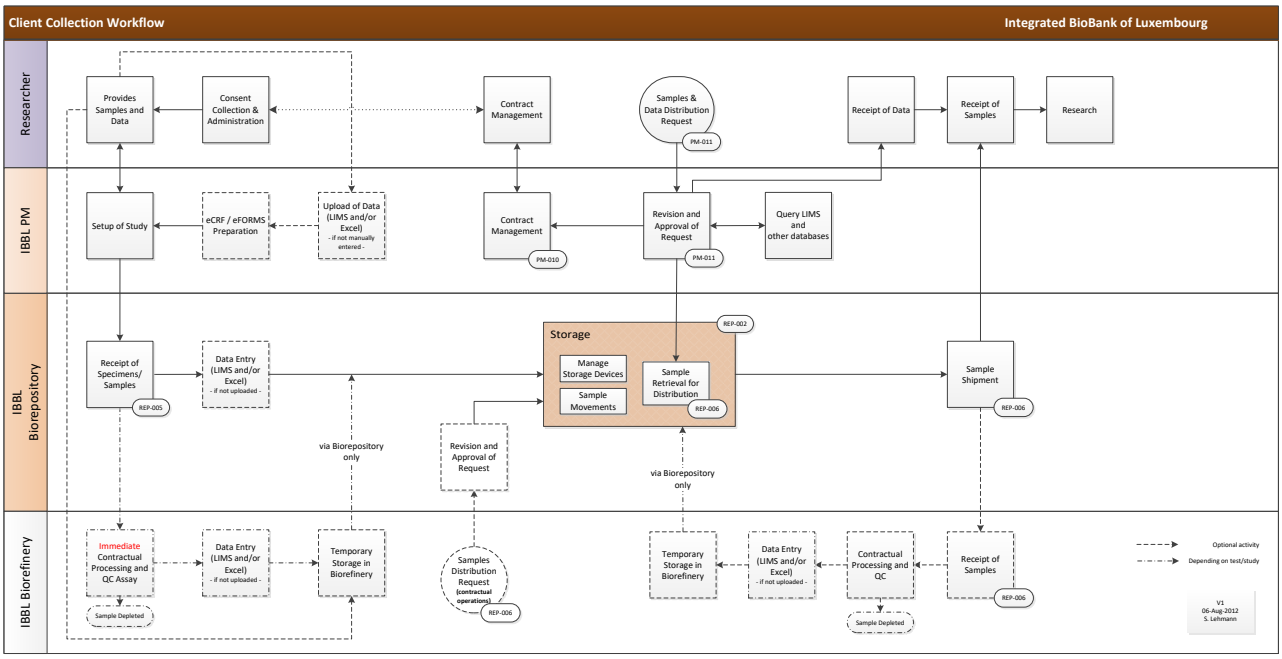


Figure 17 – Business Process Model – Client Collection Workflow

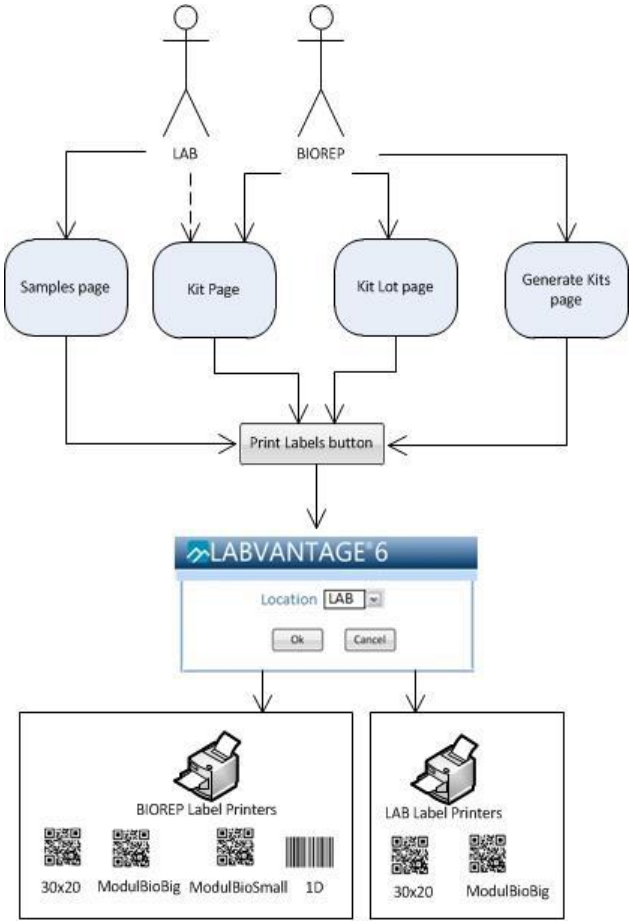


Figure 18 – Label Printing Use Case / Mock Up

All stakeholders must be identified: these are all organizations (departments, services, companies, subcontractors, suppliers...) and all people affected by the project or having a direct or indirect role.

The project manager understands, expectations, expected benefits, issues, conflicts of interest and priorities.

The earlier is the best way to identify possible allies, identify those who might obstacles and consider developing a change management plan.

On the organizational and logistics plan, for example, in a company that practices development offshore, the project will be impacted by time differences and distance between teams.

The human environment is a determining factor for the success of a project.

2.5. Traditional Methods or Agile Methods?

For decades, projects have been managed with a classical approach, the most frequently "cascading" or its "V-shaped" adaptation, based on sequential activities: we collect the needs, we define the product, we develop it then we test it before delivering it to the customer.

These methodologies are characterized by a fierce commitment to planning everything, must be predictable, "at the very beginning of the project.

That's why they're called approaches "Predictive". A project management plan describes how and when the work will be done, the planning, execution, monitoring and closure of the project.

This persistent desire to want to steer the project through plans (plan-driven development) has led the actors of a project to fear, even to oppose systematically any change: change in the content or scope of the project, in the development process, within the team, in short any modification of the initial plans, which must remain in conformity.

"When you find a recipe that works well, it's hard to leave even if you note that its effectiveness seems to be diminishing; there is inertia due to the fear of change, the search for ease or the intoxication of success (what worked yesterday must work tomorrow...). But no!"[5]

Strong to the fact that the initial plans are finally always modified and that the needs continuously evolve to respond to market changes, these approaches have proved too "rigid" at times, exposing organizations to too little responsiveness in the context of new strategic projects.

Then appeared, in the 1990s, less predictive methods, more flexible in regards to adaptation of the needs, thus facilitating the agility of organizations in regards to the market constraints. These are the so-called "agile" methods.

[5] *Jérôme Barrand, in Le Manager agile, op. cit.*

I will be basing my analysis on a theoretical overview of PRINCE2 and SCRUM, respectively the leading traditional and agile project management methodologies in use in Europe.

Note that these are subordinate to the theoretical foundations of the thesis and are intended to understand the processes, concepts and techniques used in different projects during my professional work experience, as well as to gain an understanding of the main practical differences between these two concrete methodologies.

The theory on these methodologies is broken down into the same project management fields described above, in order to allow a structured comparison.

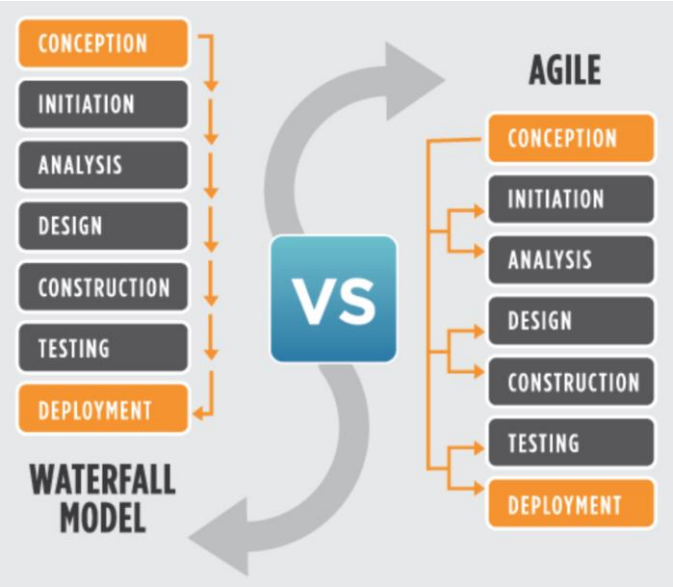


Figure 4 – Waterfall vs Agile[6]

[6] *https://www.seguetech.com/waterfall-vs-agile-methodology/*

2.6. Limitations of classical approaches

2.6.1. Characteristics of a Waterfall Approach

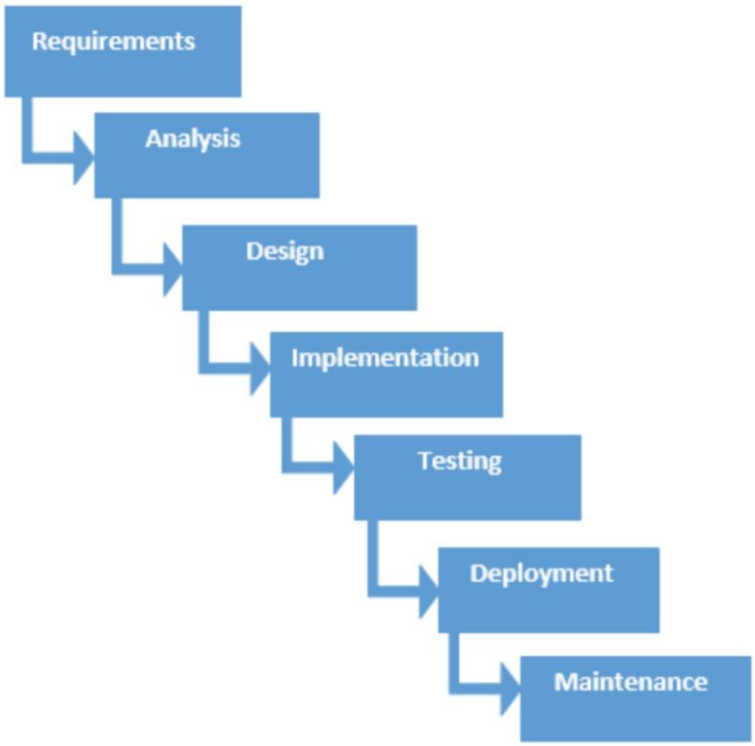


Figure 5 – Phases of Waterfall[7]

The Waterfall is characterized by sequential phases, which follow each other after the validation of the deliverables produced during the previous phase:

- All needs are expressed and collected during the first phase, then detailed analysis of these needs and then the design of the system that will respond to these needs.
- The system design, although textual or represented in the form of diagrams, must be validated before starting the developments.
- Developments must be completed to allow the team of testers to launch its functional and technical test campaigns.
- Finally, once, and only once, that the anomalies have been corrected, we can complete final deployment into production. In this context, and based on the defined scope, the project manager is asked to commit to a detailed schedule of implementation, providing for the start and end milestones phases, and the activities to be carried out. We can guess very quickly, if we have not already experienced them, the flaws of this approach.

[7] http://testingfreak.com/software-development-life-cycle-sdlc-sdlc-useful-software-development-management/

2.6.2. The Flaws of a Waterfall Approach

2.6.2.1. The Inflexibility of the Approach

It is regrettable that the new things, the left room space for maneuver for the customer to specify or change its expectations, the unpredictability of all events are hardly compatible with a predictive approach like the one of Waterfall.

In contrast, during industrial projects of product development on an assembly line, everything is (almost) predictable and the degree of novelty (almost) nothing: the specifications can then be accurate right from the start and the budget and time frame surely established.

In fact, once the project management plan has been validated, it becomes the basis of reference.

The main concern of the project manager then becomes to stick as close to the plan, no matter the events; any discrepancies, concerning the duration of the activities, the productivity or the availability of resources or unforeseen risks, is perceived as a failure, experienced by some as incompetence or an inability to anticipate.

The Waterfall approach is therefore too rigid to allow going back; It supposes that one does well the first time. A decision or an anomaly detected in a downstream phase of the cascade may partially or totally call into question the work validated previously and considered as definitive.

How can we come back to a concept validated two months ago when, at the end of developments, that the architecture developed does not meet the requirements of performance? Especially since the Waterfall approach does not explicitly encourage prototyping who could have avoided this unpleasant surprise.

2.6.2.2. The Tunnel Effect

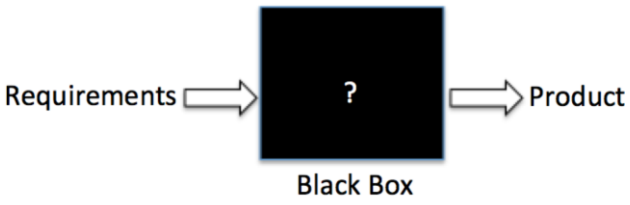


Figure 6 – Black Box

The tunnel effect is another of the features of the Waterfall approach: a project lasts one year, the phase of needs collection lasts two months and the client does not see the result only nine months later!
What has happened in the meantime?
"We do not really know what they do these computer scientists!"
"What will he get out of the box?"

"But that's not what we expected!"
"That's what we wanted but our need has changed a bit since then!"

On one hand, the lack of transparency of the development teams is causing sarcasm on their capacity to cooperate; on the other hand, the length of the technical phases to which the client is not associated makes this one dubious about the upcoming result. Which does not favor the effective collaboration between computer scientists and users!
Even more so if the result delivered does not conform to what is expected.

2.6.2.3. Bad Communication

The absence of intermediate milestones prohibits the validation of what will be the final version of the product.

We must wait until the development phase is well advanced to discover the first screens.

The bad surprises at the end of the life cycle and the refusal of change by development teams penalizes the quality of relations with users.

They become even sometimes conflicting; some stick themselves firmly to their original plans to deliver what was agreed on the due date, even if the result does not correspond anymore or not completely to what is really expected; others feel this rigidity as a lack of interest in the added value of the final product.

The succession of people involved, through the different phases, also affects the fluidity of information, even creates a loss of information and energy as well that many breaks in the flow.

2.6.2.4. Late Awareness of Risk Factors

In a Waterfall, risk factors are found late, like performance or integration tests, for example, are deferred after developments, as is the assessment of HMIs (Human-Machine Interface), which - as we know - are often subject to endless very subjective debates.
The risks impact increases with the progress of the project, as an anomaly is detected late, the going back is more complex, its correction will cost more expensive and the bouncing effects will be more threatening.

2.6.2.5. Oversized Documentation

In order to protect against these risks, the Waterfall approach is strongly focused on production of important documentation.

The documentation makes it possible to push the moment when it will be necessary to approach the phase of coding, irreversible phase.

It reassures and, if it would be necessary, it brings proof that the execution progresses; it materializes progress and engages stakeholders.

Indeed, it is easier to refuse the change by brandishing a previously validated contractual document!

Unfortunately, this documentation, often too oversized, does not reflect the reality of developments: we validate an architectural document, it remains theoretical and conceptual as long as it is not implemented and tested in real-world conditions; it is nice to present paper models to the customer, it is more sensitive to this than to what he sees concretely on a screen (IKIWISI, I'll Know It When I See It!).

In the end, we wonder about the usefulness of this documentation, which is, moreover, not always updated throughout the project and therefore quickly becomes unusable.

In this context of too rigid methods, how to increase the level of satisfaction of customers while facilitating project management and improving the quality of developments?

It is precisely with the so-called "agile" methods that we will be able to adopt a more flexible approach, more "adaptive" to the riskiness's of the project.

2.7. An Alternative: Agile Methods

2.7.1. What is an Agile Method?

An agile method is an iterative and incremental approach, which is conducted in a spirit collaborative, with just the right formalism. It generates a high quality product while taking into account the changing needs of customers.

2.7.2. An Iterative and Incremental Approach

The principle of iterative development consists of cutting the project into several stages lasting a few weeks; those are the *iterations*.

During an iteration, a minimum version of the expected product is developed and submitted, in its intermediate version, to the customer for validation.

The functionalities are thus integrated as needed on the life cycle in an *incremental mode*, the system gradually enriching to achieve the required levels of satisfaction and quality.

Each iteration is a mini-project in itself that includes all development activities, conducted in parallel: analysis, design, coding and testing, not forgetting the activities project management.

The aim is to obtain, at the end of each iteration, a subset of the target system and, at the end of the last iteration, the final version of the product.

Warning
The result of an iteration is not a prototype or a "proof of concept", but an intermediate version of the final product.

Iterations follow one to another and cannot be parallelized; they correspond to "Time slots" or "time boxes" whose end date is fixed. They are as well named, in the dedicated literature, sashimi. This Japanese term describes the plate where are magnificently gathered all the slices of the fish.

- The main idea is to recognize that one cannot know everything or anticipate everything, as long as our experience; therefore, it is wiser to proceed cautiously, step by step and adapt when necessary, taking into account the specificities of the project, rather than anticipate and plan everything to the full, knowing that inevitably more or less predictable changes will occur during the project.
- There is no longer a single project management plan established at the beginning of project, which plans a more or less detailed list of activities; but we build up a list of macroscopic needs and an initial macro-planning with the major deliverables and main milestones of the project. At each iteration, we select, with the client, the functionalities that will be detailed and developed, in according to their priority and the micro-planning corresponding to the activities necessary for the development of these features.
- The principle of time-boxing - an immutable fixed due date by iteration - makes it possible to mobilize efforts on clear objectives in the short term. If the objectives are not achieved, the lessons will be learned during the assessment of the iteration in order to correct the conditions of the next iteration, if necessary.
- The advantages of the iterative and incremental approach are presented in Table 2.

Advantage	**The +**
Communication has better quality.	Misunderstandings, incomprehension, inconsistencies are highlighted early in the project; it is still possible to correct them. The user has the opportunity to clarify his requirements when needed. The client receives tangible "proofs" of the progress of the project.
Visibility is better.	The customer can thus visualize the work more regularly, smoothly, without waiting for the end of the project, as that at the end of each iteration, the features retained are developed, tested, documented and validated, ready for operation.
Quality is assessed	The tests are carried out at each iteration, the

continuously.	anomalies detected are corrected on the way.
Risks are detected very early.	Thanks to early development activities, risks are detected early and resolved quickly.
The team takes confidence.	Iteration provides an opportunity to learn, so capitalize or adapt practices for the rest of the project. The first iterations make the estimations more reliable. Change is no longer a threat, but on the contrary, the opportunity to better do and to better satisfy the customer.
The costs are controlled.	The costs are limited, in terms of risks, to the perimeter of the iteration; if it's needed to repeat an iteration, we only lose the efforts of this iteration and not the value of the product as a whole. We can also stop the project after a few iterations if we have no more budget.

Table 2 - Advantages of Iterative and Incremental Development

2.7.3. A Collaborative Spirit

One of the essential values of agile methodology is to place individuals and their interactions at the center of the plan, rather than developing and "over-tooling" heavy processes.

They privilege in fact the communication between the different actors of a project, within the team but also between the team and its various interlocutors such as the client and users.

Communication means the sharing of information, the exchange of different or complementary points of view, mutual aid and not competition, "partnership" relations with the customer...

This team spirit can be expressed through the following qualities:

- respect for the opinions of others;
- the ability to express different opinions in a non-aggressive way;
- the ability to seek and reach consensus without frustration;
- a predisposition to self-discipline or even self-management.

We'll measure the importance of these qualities in the organization of the team, in taking a decision, in the prevention or the resolution of the conflicts, in the dialogue with the customer.

The competence of the collaborators, their motivation and the possibility for everyone to express his individuality (serving the group) will foster creativity and performance of the team and will guarantee the best chances of success for the project.

The role of the project manager is changed: instead of "ordering" and controlling his team, he becomes the manager who knows how to create the optimal conditions to allow each one to contribute effectively to the result of the team for a better client satisfaction.

2.7.4. A Soft Formalism

Agile methods are often referred to as "light" methods in comparison with classical methodologies that require a "heavy" formalism and tools.
Only a few deliverables to produce, in addition to the essential (the intermediate versions of the product), some defined roles, a few steps, a few meetings ... and the approach is formalized.

A difference between the two approaches is essential: only the key elements are "prescriptive", there are few but they must be followed rigorously; that becomes the opposite to classical methods on many points on which none is really followed seriously.

Tools, yes, but effective, wisely and reduced to the bare necessities for automation of recurring tasks, especially testing and continuous integration.

The competence of the resources and the communication between them are, as we have just seen, privileged; therefore, we should not unnecessarily equip a team with complex tools to which they will have to train and adapt; you need tools that adapt to the way you work, to support the process, but which themselves are not an end.

This softness offers the advantage of making evolve the organization, processes and tools, if necessary; we are on an adaptive approach, we even talk about an empirical approach: we observe, we adjust, we experiment, we learn, we correct... The process of starting agile is defined at the start of the project; progressively the team discovers what is working in the context of the project, submits to discussions what is not working, improves the plan, according to the specificities of the project... and this is precisely thanks to its simplicity.

2.7.5. A High Quality Product

Agile methods are sometimes described, by their critics, as artisanal methods or "do-it-yourself", which is to say that quality is not an essential concern.
If we consider that the minimum quality level of a product is its ability to satisfy the client, both functionally and in terms of performance requirements, ease of use or scalability, this is precisely another of the fundamental ideas of the agile approach: to satisfy the customer and bring him value.

- Firstly, thanks to the selection of features to be implemented first, based on continuous value delivery; indeed, we will focus on developing and delivering quickly those of utmost importance to the customer. We will want to avoid to satisfy the exhaustiveness of the needs originally expressed that are not always useful or valuable on arrival.

- Thanks in particular to the constant feedback received from the client by showing him a completed intermediate version of the product - this is permanently aligned with the expectations that can evolve. The result is visible and not theoretically described in documentation.
- Through testing campaigns and quality control during each iteration, all defects can be detected and corrected immediately.
- Thanks to refactoring - daily microevolutions or "cleanups" of the code, integrated development activities - avoids any progressive deterioration of the code by improving its readability and improving its maintainability. Indeed, the refactoring, by eliminating anarchic duplication in the code, ensures that the code makes one thing only in one place. This is the sign of a well-designed code.
- Through the adopting of an adaptive approach, the quality of the process - which affects the quality of the product - is also regularly measured during reviews: any discrepancies noted are subject to discussion and possible modification.
- Also thanks to the respecting the coding standards shared by all members of the team, the scalability of the application is guaranteed.

In the end, it is hard to believe that agile methods do not place in the center of their approach quality and customer satisfaction!
In practice, they are more disciplined and offer better control.

2.7.6. The Acceptance of Change

Embrace change, says Kent Beck, one of the "fathers" of the agile movement... "Welcome change with open arms" rather than fearing and fighting it.

We know that many parameters are unpredictable during a project; it is then better to control this unpredictability without denying it by wanting to be systematically in accordance with the initial plans quickly obsolete.

In fact, we'll avoid the waste of time and energy and the frustrations coming from it, found on projects that cannot accept the change: time (often substantial) devoted to the development of the planning, time dedicated to the analysis of deviations, efforts to catch up, time for negotiation and refusal of changes, time allocated to reorganize the team...

An agile team adopts practices and tools that facilitate change.

2.8. Fundamental Differences Between Traditional and Agile Approaches

The following summary presents, in Table 3, the major differences by theme between a traditional approach and an agile approach.

Theme	Traditional approach	Agile approach
Life Cycle	Cascade or V, without possible going back, sequential phases.	Iterative and incremental.
Planning	Predictive, characterized by more or less detailed plans based on a scope of defined and stable requirements at the beginning of the project.	Adaptive with multiple levels of planning (macro and micro-planning) with adjustments if needed along the flow depending on the changes occurred.
Documentation	Produced in significant amount as a communication support, validation and contracting.	Reduced to the strictly necessary in benefit of operational functional increments to obtain the customer feedback.
Team	A team with specialized resources, led by a project manager.	An empowered team where the initiative and the communication are privileged, supported by the Project Manager.
Quality	Quality control at the end of the development cycle. The customer discovers the final product.	Early and permanent quality control, at the level of the product and of the process. The customer sees the results early and frequently.
Change	Resistance or opposition to change. Heavy processes for the management of accepted changes.	Favorable reception to inevitable changes, integrated in the process.
Progress Follow-up	Compliance measures evaluation to the initial plans. Gap analysis.	A single indicator of progress: the number of implemented features and the remaining work to do.
Risk Management	Risk management with distinct and rigorous process.	Risk management integrated into the global process, with accountability of everyone in the identification and resolution of risks. Steering by the risk.
Evaluating Success	Respect of initial commitments in terms of cost, budget and quality level.	Customer satisfaction by the added value delivered.

Table 3 - Differences Between Traditional and Agile Approaches

Now that we know so much about the major differences between traditional and agile methodologies on their characteristics, advantages and disadvantages, let's go through concrete and hands-on project management practical cases, through my professional work experience.

It will cover several aspects of project management within a working environment, namely, effectively gather requirements, plan the project,

monitor and control the progress of the project, organize and coordinate the team.

The work experience will go through the project management methodologies used, it's pros and cons, what went wrong and what went right.

In the end, we will be able to pin point which methodology waterfall or agile is better, if a combination of them can also be a solution.

At the end of the day the goal is, which one better fits the business?

3. Professional Career

My early days of university made me realize how far I envisaged to go with my professional career.

The university studies, the different subjects along with the professors have influenced me on the path I wanted to pursue.

My professional career started already during university studies where I had the opportunity to start working in parallel with my studies.

My career has had two major parts where the first one started in Portugal and the second and current one lays in Luxembourg where I'm currently settled and well established personally and professionally.

In terms of timeline my career officially started in 2004 and it's on going till current days. I have passed through different companies covering different business areas.

On the following sub chapters I will go through my career from initial up until now in order to give an overall description of my professional experiences by company.

Later on in the next chapter I'll go deeper on what I consider to be my main experiences, meaning, my main projects where I have worked on.

3.1. University of Madeira

During my studies at University of Madeira I had my first professional working experience where I had the opportunity to work as an Assistant Professor for the University of Madeira in the Department of Maths and Engineering at that time.

It was an exciting opportunity and experience to pass knowledge to other students and to be able to gain experience and responsibility at that level.

This work has happened between 2004 and 2006 on my last two years of University studies.

In terms of activities as an assistant professor, I had to prepare the classes and to teach all the different programming paradigms such as, imperative, recursive, etc to fresh students of Engineering degrees.

Besides that I was also teaching general Informatics, including Ms Word, Ms Excel, Ms Power Point, Ms Access, Ms Frontpage and Ms Outlook to fresh students of Psychology and Communication degrees.

Part of my activities were as well to be in charge of the implementation and maintenance of the classes website as well as the support to classes.

In 2005 another opportunity arised in order to work in a project for one month in the IT Department of the University of Madeira in Portugal.

This project was to do the analysis and design of software for an University process improvement. It was requested to improve the process of students registration in the classes at the beginning of a school year.

Throughout UML diagrams and use cases, I have done the complete analysis and design of this process in collaboration with the IT Department of our university.

Besides work and studies in parallel between those two years, I was as well President of student academy during those two years making that time quite challenging in terms of work and time management.

3.2. Expedita

On my last year of studies at the University between 2005 and 2006, I chose my internship at Expedita as a final project.
Initially it was supposed to be only an internship but since they were lacking someone for that position they proposed me to work for them during that year.

In terms of business, Expedita has their activities in the IT area and invests in projects of Research and Development applied to Tourism. This company is settled in Madeira, Portugal.

Concerning my role, I have worked as an analyst and developer .NET in a specific module for a project in the Tourism area. This web module application was a workflow that contained processes and tasks in the backend that related to webpages interfaces in the frontend of the application.

One of my responsibilities was to do the analysis of this module using UML methodologies by creating several diagrams and uses cases.

This also included the business and functional analysis of the web module application based in a workflow system.

Then from this analysis I have developed the module using the .NET Framework and by developing in vb.net, asp.net and java script.

This was an implementation of the interfaces based in a workflow that assembles processes and tasks to each interface and options of the module.

At the final stage mainly I went through the final testing by testing the usability and integration.

For the whole project I have as well created the documentation of the whole module and also provided support to the end users.

This project served as an evaluation of the final project of the university project where I obtained a high grade and served the company by delivering the complete workflow module that they integrated to the application.

3.3. BANIF (Santander)

After the completion of my university studies and first work experiences, I starting working in 2007 in a retail commercial bank in Madeira (Portugal).

This bank was called BANIF at that time and since few years has been bought by a bank called Santander.

BANIF had many offices mostly in Madeira and few of them in the Continental side of Portugal.

Between the completion of my studies in 2006 and the start of this job, I have searched for a job in IT in Madeira but at the time it was difficult to find a job.

Therefore when I joined BANIF it was really good because of the difficulties on finding a job.

My role during that period in BANIF was to mainly do back office and front office operations.

Even though it was not an IT job with IT tasks it has positively contributed to my experience and gave me the opportunity to get to know and have hands on experience in the banking sector.

Some of the operations I was doing in a daily basis was to execute transactions facing the clients, do account managing, loans, insurance, and funds operations related.

This job has lasted a few months in 2007 where I moved to several agencies of the bank where I was needed to support the activities. I have been seen as a resourceful person that managed well his work, especially facing the clients where it required high-level competences.

Overall it was a demanding job with high levels of focus and concentration that brought me only positive outcome and a great work experience in the banking sector.

From there, I made a move on my career that changed my whole life.

3.4. Unisys / European Commission

This was the marking point of my life and career, I moved from Portugal to Luxembourg to a new world full of possibilities and dreams.

This change happened in 2007, in Luxembourg, when I signed to Unisys for a contract to work within a major project for the European Commission.

This project was an agreement between three companies that formed a Consortium.

These companies were Unisys, Bull and Siemens as service providers for the customer / client European Commission and all the European Union Member States.

To me more precise, the customer was DG TAXUD, which means a Directorate General, for the transit, export/import, and taxation of goods within European Union.

My company Unisys is an information technology company that provides a portfolio of IT services, software, and technology.

I worked in this job between 2007 and 2008 and my role in this major project was of a quality assurance engineer for all the applications in this project.

The name of the project was ITSM, which stands for IT Service Management and it was ITIL (Information Technology Infrastructure Library) based.

In terms of tasks, I was responsible for the analysis and the testing of the application's business and integration. These applications, like already mentioned, were related to Customs, Exporting, Importing, Excise and Taxation and were being used by all Member States.

That meant as well that I had to support all the users using these applications but through key contact persons representing the customer.

In regards to the quality assurance, one of the key responsibilities was to do the testing of the application's design and execute the test scenarios and test scripts, including user, system and integration acceptance tests.

One of my most important responsibilities was to conduct and participate in meetings with the client and developers of the project.

This led to exhaustive complex document review and contractual quality deliverables throughout the project.

Since I consider this one of the main projects in my career up until now, I have included more details in the next chapter explaining better the project and achievements.

The next move on my career was within the same project and the same office but in a different company of the Consortium; please refer to the next sub chapter related to Bull (Atos).

3.5. Bull (Atos) / European Commission

From Unisys to Bull was just a change of desk since this was an internal project move within the Consortium.

Besides the change of desk, I have also changed role to become an Application Manager Engineer within the same project for the European Commission.

I have worked in this role between 2008 and 2010 as well in Luxembourg in the same office as my previous work experience.

Bull has been an IT services provider and has became recently part of Atos, a global leader in digital transformation.

My tasks in this project were at the level of the application management, meaning that, I was receiving the builds of the applications from the developers and was taking care of all the application management from that point on.

In regards to these specific tasks on the application management, it involved me doing the administration, installation, maintenance, monitoring of the applications in Testing, Pre-Production and Production environments.

This also involved that I had to do the testing, validation/preparation, implementation/installation and support integration of new and existing application versions.

Another important factor on the planning and activities was the planning of the upcoming new or changed applications along with the important tasks to document and quality review on contractual quality deliverables.

One of the other side activities that were also very important within the project was to do the business analysis of the applications integration and the communication and support with all Member States by conducting and participating in meetings with the client.

One of the key performance indicators where me and my team were evaluated was the setting priorities and resolution of both technical and non technical issues, doing the Incident Management and making sure issues were handled within SLAs (Service Level Agreements). These were critical for customer visibility and evaluation.

Therefore I had in place and as priority, the monitoring progress on problem resolution and the handling communication to users at all stages of the problem resolution process and reporting achievements as well as inefficiencies.

Another key responsibility I had was to act as a single point of contact with the customer DG TAXUD for the progress and quality of the service.

This was a project, like already mentioned, based on ITIL, which means high standards in terms of quality of service delivered and by having internal teams organized as the ITIL framework.

In overall, this was a major and remarkable project that lasted more than 5 years where I contributed to it during three years of my career in Luxembourg for such an important customer that is the European Commission.

3.6. Six Card Solutions (3C)

From the European Commission project I have moved within Luxembourg to another challenging project in a company called Six Card Solutions that became 3C Payment.

This is a company of payment solutions and it's a payment service provider making it easy for consumers to pay anyhow, anywhere, using highly secure specialized transaction flows that support the needs of the clients.

These payment solutions are based in key industry sectors where these solutions are critical for a high-level customer payment experience.

These industries are mainly within Hospitality, Hotels, Food & Beverage, Parking, Retail, Transport and Car Rental.

The company is organized in several operational departments with strong focus on costumer experience. So there is an emphasis on the sales strategy and in having a costumer centric product development.

I have worked in this department of product development where every product and solution would go through an exhaustive analysis and quality assurance process.

Therefore my role was of Quality Assurance Analyst where there was a strong focus on analysis and quality assurance on each solution being developed and each solution under a specific project.

This project has taken place, as already mentioned, in Luxembourg between 2010 and 2011.

My team was composed by 10 people all working on product development and management of a project life cycle.

These project life cycles were based on a waterfall model but not following any specific known model or tool, mostly using the classical structure of a project and the classical project stages of a waterfall approach.

On a more detailed perspective in regards to my tasks and responsibilities, one of them that were key was to advise business on new technology, terminals and payment solutions.

This meant a business process review and an analysis on the current situation of certain processes and workflows and then advising on which approaches, tools and technologies to embrace.

Another key responsibility was to produce and operate automated test platforms to streamline certification of new payment solutions.

In order to achieve these results there was a close collaboration and work with the QA (Quality Assurance) and Sales team to efficiently achieve project rollout to the customer.

Therefore this has led to provide handover support including pilots and initial second line support on these rollouts.

The role responsibilities fall under the following categories: Management, Planning, Advisory, Certifications, Testing, Maintenance and Support.

In relation to testing and management of payment solutions, this is key to the company's business with special highlight on quality assurance. This assurance is based on products and full systems made up of client payment terminals and networking, where it needed to be properly maintained in a test lab.

These tests are also related to bank certifications to assurance that terminals and the products are compliant to the banking and security standards.

All in all, my role in the project was important and has allowed me to gain crucial experience on the analysis and quality assurance within an important sector as payment solutions and banking.

3.7. Luxembourg Institute of Health

This experience was in the public health sector and has played an important role in my career.

I have worked for five years and a half between 2011 and 2016 at IBBL, Integrated Biobank of Luxembourg, which is part of Luxembourg Institute of Health (since 2015).

IBBL is an autonomous not-for-profit institute dedicated to supporting biomedical research for the benefit of patients. They provide biospecimen-related services and biobanking infrastructure for applied medical research[8].

Luxembourg Institute of Health is a public biomedical research organization. Striving for excellence, its researchers, by their creativity, enthusiasm and commitment, generate knowledge on disease mechanisms and contribute to the development of new diagnostics, preventive strategies, innovative therapies and clinical applications that impact the healthcare of Luxembourgish and European citizens. The activities of the Luxembourg Institute of Health are developed within the following research areas: Oncology, Infection and Immunity, and Population Health[9].

The biobank of IBBL has around 50 internal employees and LIH has more than 300 internal employees in collaboration with many research and medical staff from all hospitals and clinics in Luxembourg and also from the countries around.

The IT team of IBBL, belonging to the department of Business Information Solutions, had around 7 persons working on it but to serve a much larger business.

The main flow of activity is around the sample lifecycle, from when it's collected from a donor up until it's analyzed and stored in large freezing containers.

Thousands of all type of samples are managed with a specific type of software called LIMS, which stands for Laboratory Information Management System.

I have been responsible to manage all the project lifecycle of this software that was crucial for the business.

At a higher level I was project managing every project which was related to a certain study and a study being a type of disease, such as, Cancer, Diabetes, Parkinson, Cohort / Population.

Projects in general involved a more agile approach in order to have dynamism on the deliveries and to have key users involved from beginning to end on the process. This allowed a better control of activities and ability to deliver smaller pieces of modules.

On the beginning of the company, the software was being developed by an external supplier, which then made sense to have a more waterfall approach when managing the projects. This allowed me to have a more disciplined

[8] *https://www.ibbl.lu/about-ibbl/*
[9] *https://www.lih.lu/page/aboutus*

control on the deliveries and milestones making sure things were delivered on a specific deadline pre defined beforehand.

So for each project it also involved me doing all the business analysis of new requirements translating it as user and functional specifications.

This then moved into development, testing and deployment in several environments till it reached Production to be available for the final users.

Besides all of these major projects, I had another one that was one shot and involved a huge migration between a legacy and a newly acquired LIMS system.

I have defined a major project business case and then a complex project plan where I defined all the scope, time, costs, risks, benefits and resources allocated to it.

My approach on the project management methodology was more on the classical waterfall with clear deliverables and milestones. This choice was based on the required outcome, which was one final result as a completed migration without any intermediary steps or deliveries.

I have led this project and have had as well hands-on on the technical implementation of the migration together with another colleague.

Some of the tasks were to define, analyze all the data that had to be moved from one system to another along with cleansing, transformation and loading of the sample and clinical data.

In the next chapter I will go through with more detail on this experience since I consider it one of the most important one's up until now.

Overall the experience at this Health Institute was over satisfying touching every step of a full software project lifecycle where I had the chance to 'wear many caps' throughout every project. This allowed me as well to grow in terms of responsibilities and gained many other competences and skills, as well as adapting to a whole new business area and sector such as Health and Research.

3.8. SES Satellites

The move to SES Satellites (Société Européenne des Satellites), where I currently stand, was and has been a huge step in my career where my level of responsibilities increased and where the sector was also quite demanding and challenging which meant a big learning curve on the new business.

This important position started on 2016 and is currently on going and it takes place in Luxembourg.

My company SES, is a communication's satellite owner and operator providing video and data connectivity worldwide to broadcasters, content and

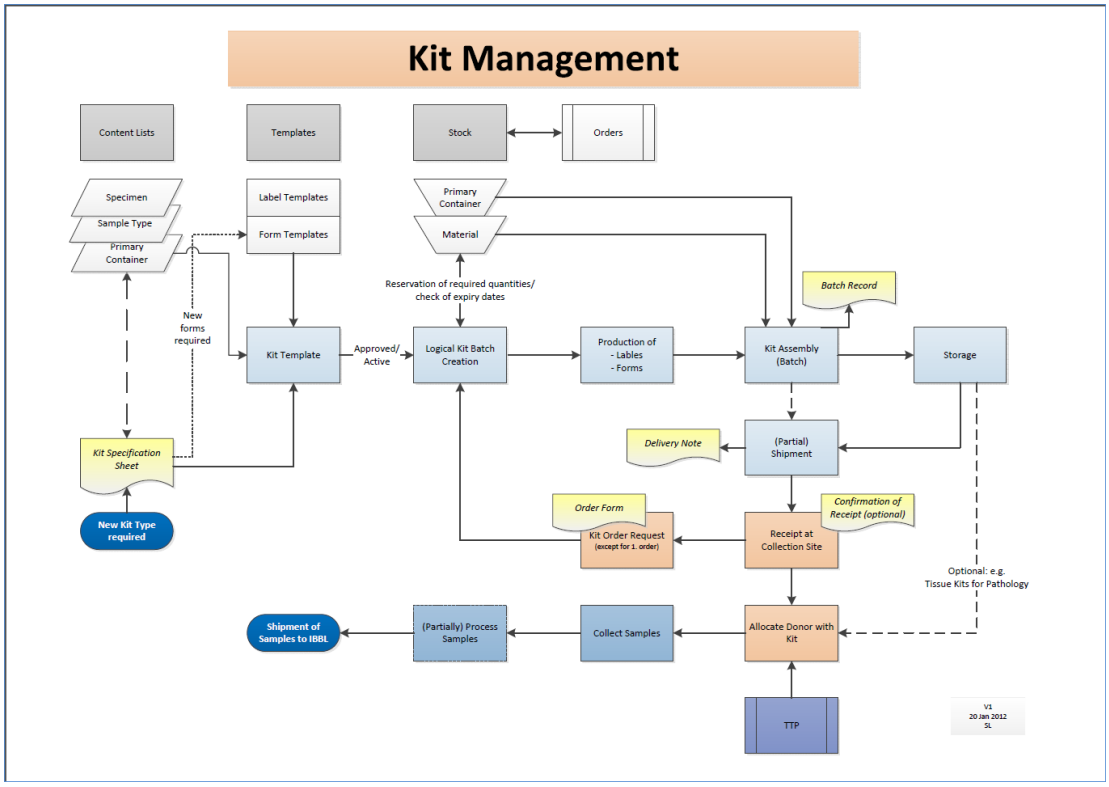


Figure 19 – Business Process Model - Kit Management

The following phase was of implementation in small parts for the customization of the application.

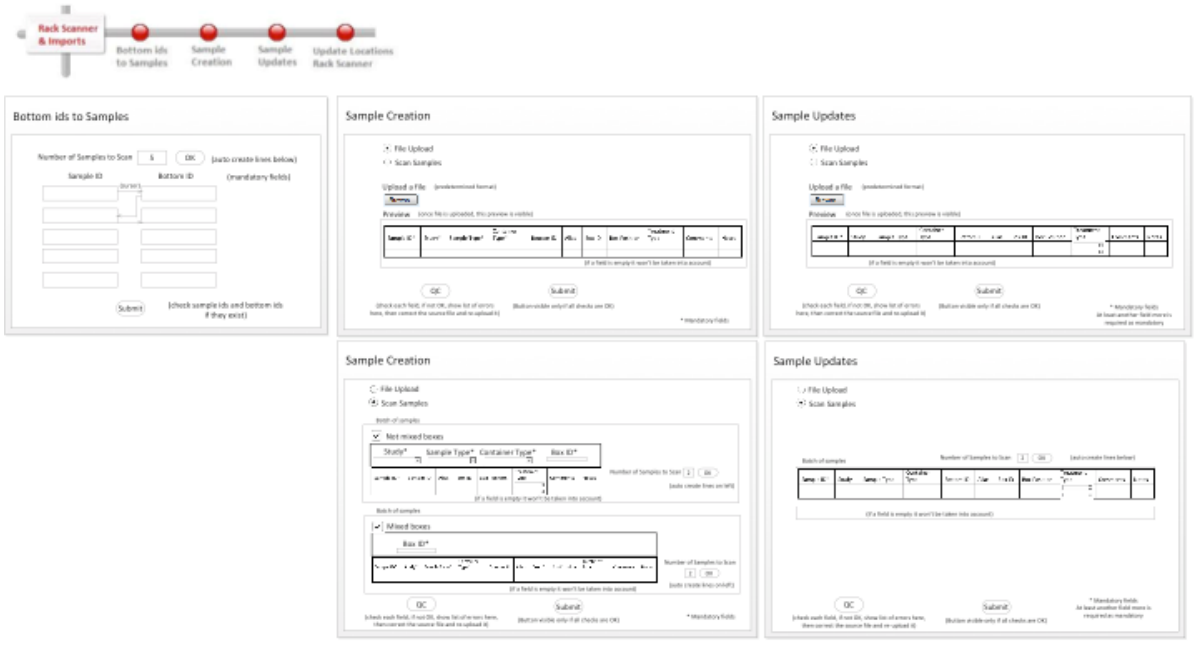


Figure 20 – Rack Scanner & Sample Creation – Mock Ups

During this period I was also the single point of contact towards the supplier by following up the project and putting in place in our side the

appropriate and necessary technical components.

One of my biggest responsibilities was to project manage the on going internal projects in terms of project execution, planning and monitoring.

The definition of projects was at a level of a study, this being said, studies were from different types, such as, Cancer, Diabetes, Parkinson Alzheimer, Population Cohort and many more.

It was at this point that I have successfully completed the PRINCE2 certification for Foundation and Practitioner. This allowed me to officially be certified in this project management methodology and its set of methods in order to apply them within my projects.

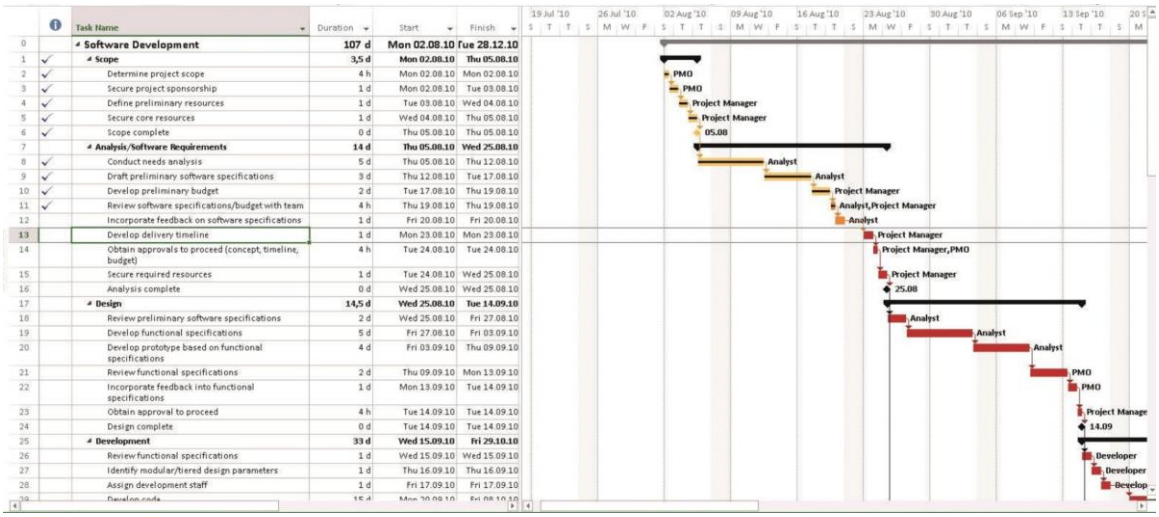


Figure 21 – Project Plan IBBL / LIH

At a certain point our Institute decided to stop the development on their side and buy an off-the-shelf solution the closest to our needs which we could configure and customize internally.

From this moment on, I led the complex data migration between the legacy system to the new LIMS system, taking care of everything needed to this migration namely samples and electronic forms data related.

That meant to, put in place a plan in order to identify all the necessary source data to be passed on, all the transformations, mappings, cleansing of data to the destination system.

This project was complex which involved a lot of extract, cleaning, transforming, mapping and finally loading data from to another system.

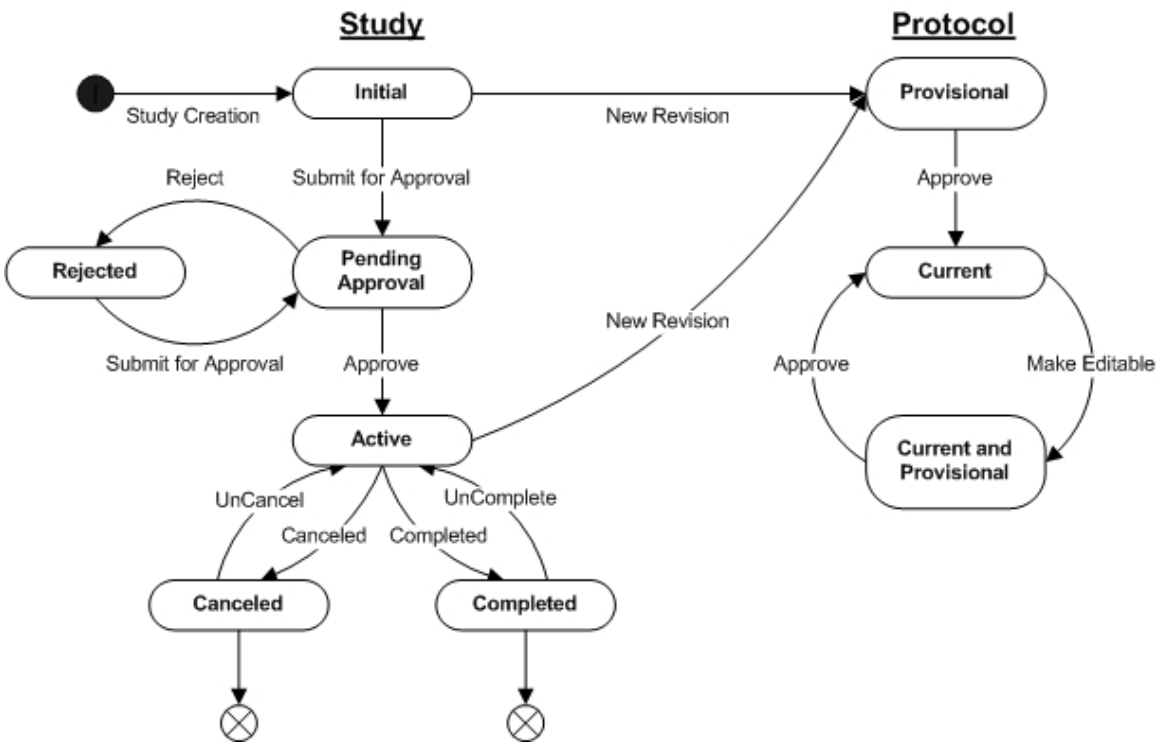


Figure 22 – Status Diagram – Study / Project

This required extensive and proper planning in terms of tasks, resources, schedule, and risks and at the same time the hands-on work of the migration.

In summary, I have worked on different tasks related to the project management and definition of business processes.

The role also included analysis, implementation, deployment, configuration, customization, administration and support (1st and 2nd level, incident management) as well as testing.

In a more technical view, this included as well, installing of applications in different testing and production environments, shell scripting, database scripting, java developing, building reports, internal documentation SOP (standard operation procedures) and WI (working instructions), user and functional requirements, user scenarios and test scripts documentation.

During that project at IBBL, I have worked as well with sensible data related to personal information from the donors where the samples were collected from.

The personal data was pseudonymized through a Third Trusted Party and a reference sent to our systems where the donor samples where stored and managed.

Furthermore, a donor before participating in a study (e.g.: Cancer, Diabetes, Parkinson studies) had to give his consent for the personal data and

usage of the samples.

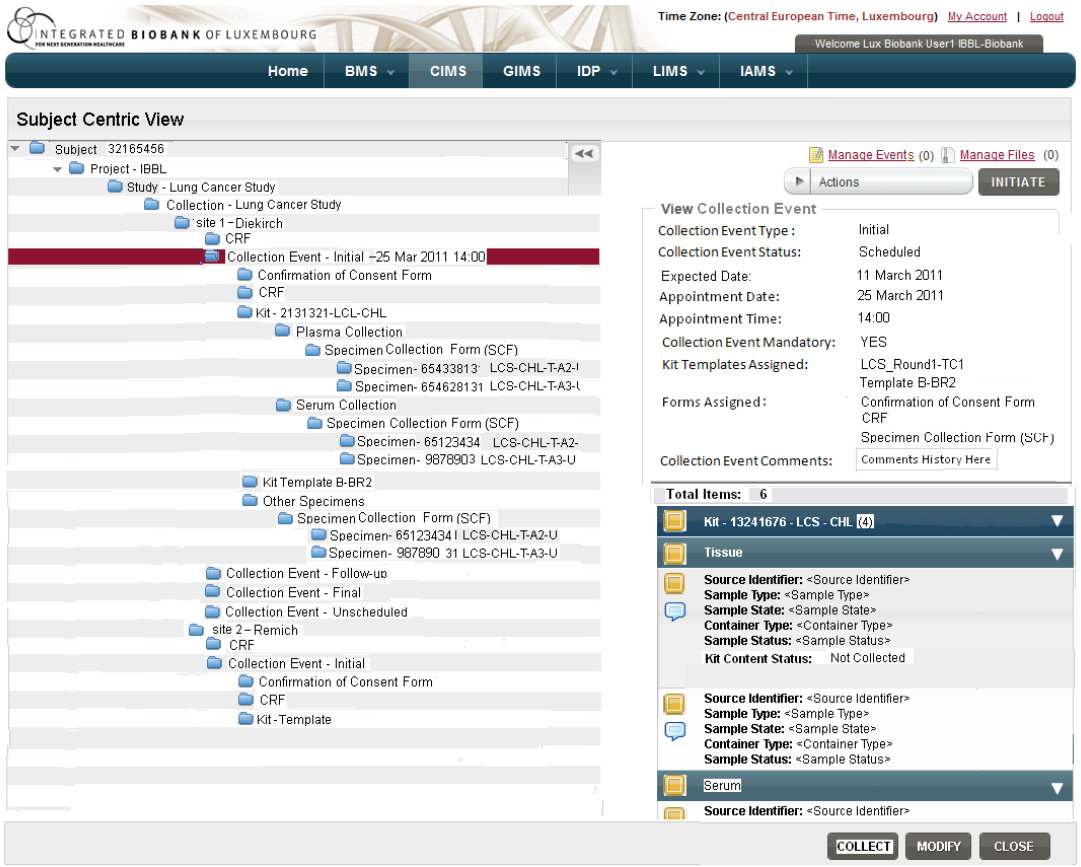


Figure 23 – User Interface – LIMS Bio4D - Subject View

All the data (personal and clinical data) was protected and prepared to be in line according to the General Data Protection Regulation.

The clinical data (non personal data) was entered under electronic clinical forms (eCRF) in secured databases.

I was responsible for the management of data and databases, have also participated and was the single point of contact to put in place the Third Trusted Party for the pseudonymization in respect to the regulation, plus the main contact for the clinical forms with the Clinical Nurses and technical teams.

Summarizing my responsibilities within my role:

- Project Management
- Gathering user needs (software requirements)
- URS (User requirements, UML) drafting for the LIMS LabVantage
- BPM (Business Process Management) specification
- Design, Management, implementation, deployment, configuration, customization, administration and support of the custom made LIMS Bio4D

- Data Migration from one LIMS to another LIMS system (use of ETL)
- Specifications, management, configuration, customization, installation and administration of the LIMS LabVantage
- Single Point of contact of the LIMS users (internal users from the Lab, Biorepository, Clinical Nurses)
- Database Management (Oracle, SQL)
- 1st level user assistance, Incident Management.
- Training to internal and external users
- Test Scripts writing
- Design and maintenance of CRF's (Clinical Forms)
- Office automation interfaces (developed new internal tools)
- Drafting of internal documentation, reporting
- Single point of contact for TTP (Trusted Third Party, donor creation and kit association) users and installation, support, link with eBRC company support.
- Point of contact for external eCRF (Clinical Forms) system, Database backup on our side and maintenance
- Donors Personal data with Consent and Data Protection, pseudonymized to be in line with the General Data Protection Regulation

4.2.4. Tools & Methodologies

In regards to the tools and methodologies used across the project, this is the summarized list:

- Databases related: Oracle, SQL, Sql Developer, Sql plus
- ETL: Talend
- Servers: Linux, Windows, Mac OS.
- Network: Putty, Winscp.
- Office Tools: Ms Word, Ms Excel, Ms Access and Ms Outlook.
- Programming / Scripting: Java, JavaScript, Ajax, NetBeans, Subversion, bash, Perl, vba, XML
- Project Management/Planning: Prince2, Ms Project, Xstudio (Tests Management).
- Business Process Management / ITSM: Bizagi / ITIL
- Ticketing System/Incident Management: JIRA, ManageEngine ServiceDesk Plus.
- Reporting: Jasper Reports, iReport
- Analysis: UML

- Agile Software Development Framework: SCRUM
- Document Management: Ms Sharepoint

4.2.5. Challenges encountered

Throughout the project several different challenges were encountered at many levels.

One of them was related to the evolution of the LIMS system, my Institute had decided (before I joined them) to develop a software custom made which would fit the exact needs of the Institute.

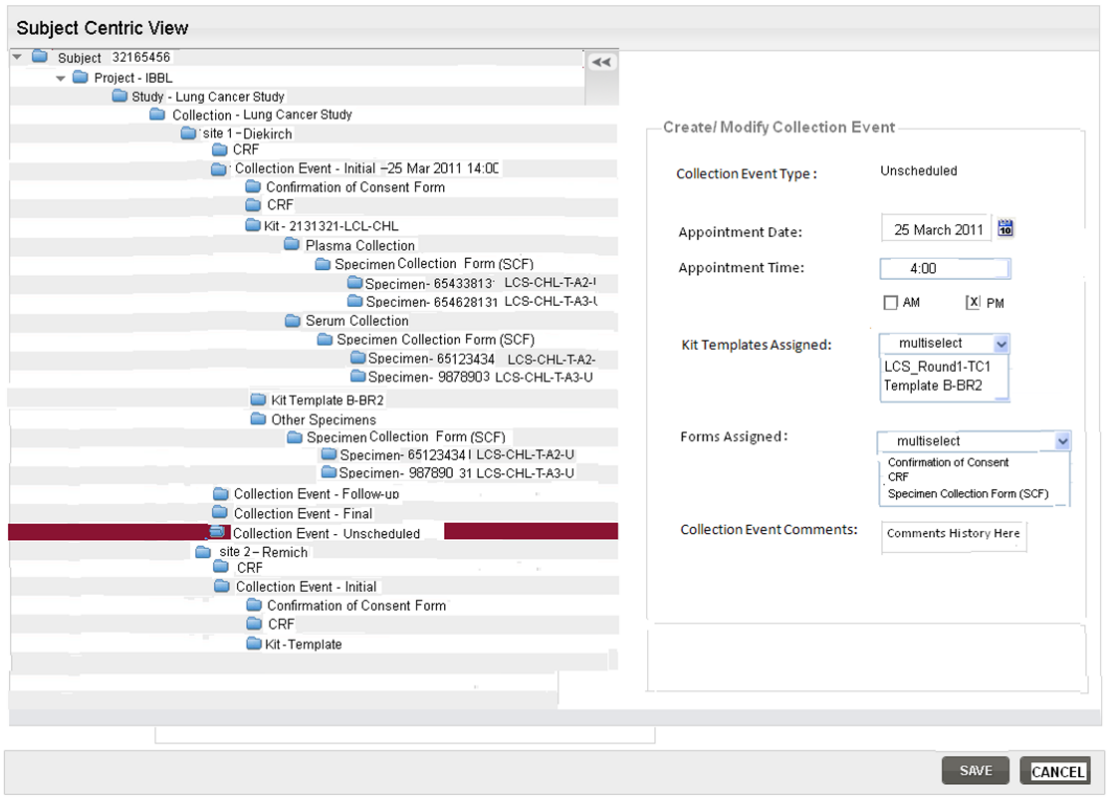


Figure 24 – User Interface – LIMS Bio4D – Collection Event View

The selected supplier was based in United States more concretely in Phoenix, Arizona, the company was an Institute in Genetics with experience in development of laboratory systems.

Initially the choice seemed to make sense as they had experience in the area and in this type of software very specific, so the benefits were high even though some risks associated to it.

As the project progressed the issues increased, these were related mainly to the time zone of 9 hours between US (Phoenix, Arizona) and Europe (Luxembourg) leading to limited communication and limited understanding of our needs.

Another issue was as well their lack of knowledge on the bio banking specific way of functioning and Luxemburgish culture.

This added by the fact that they were available in our time zone very few hours days plus very limited visits to our offices led to serious issues.

The releases produced by them came very incomplete and not functioning to our needs.

This led to more changes and new versions, to more delay in the timeline, to more wasted money on the budget and no practical results, meaning, no usable software with many manual scripts to maintain the system.

From this moment on, our Institute decided to interrupt the agreement with the supplier and search for another off-the-shelf solution.

In between the legacy system and the new system, a complex migration took place that led to many challenges, especially on the identification, analysis, transformation, cleansing of data between systems.

As the new LIMS system was in place installed, new projects came up in order to get a fully functioning system according to our needs.

At that time we did not get much support from the seller that required from us more time on understanding their product.

4.2.6. Project Phases

The first LIMS system developed by the supplier was project managed through an agile approach with several iterations and sprints leading to several software releases.

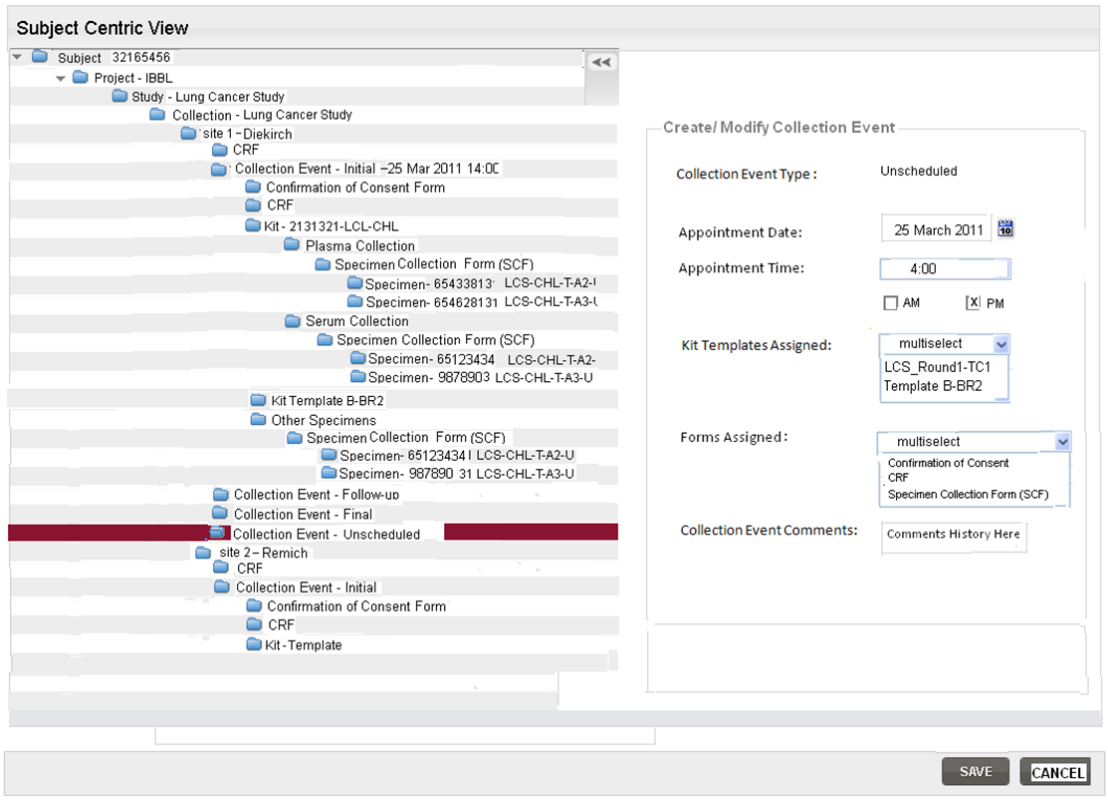


Figure 25 – User Interface – LIMS Bio4D - Create Event View

For the second stage, the migration to the new LIMS system and consecutively putting in place the new system, a traditional waterfall approach was put in place for the core software project.

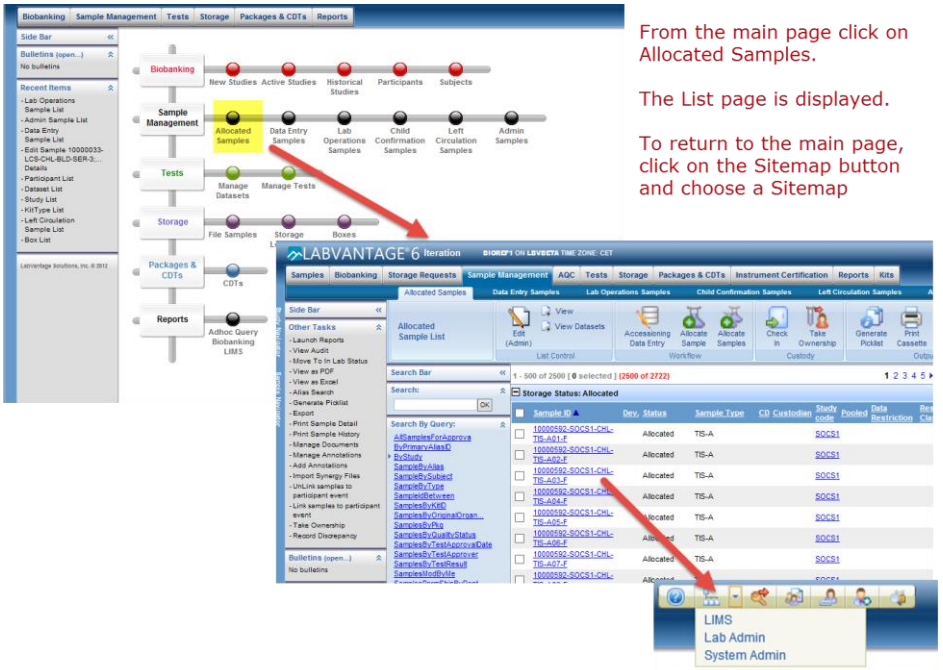
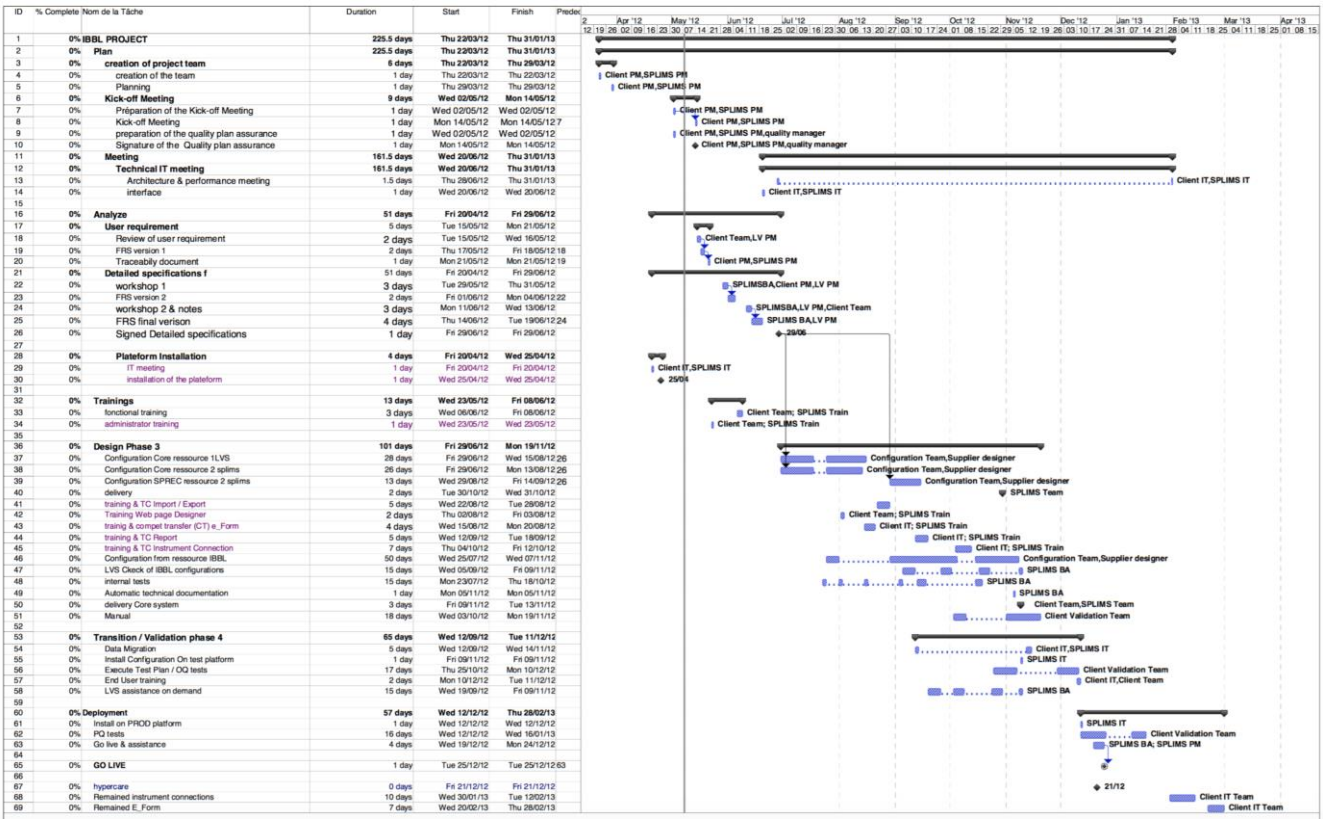


Figure 26 – User Interface – LIMS Labvantage – Allocated Samples

I have based the project in the project management methodology PRINCE2 by putting in place the necessary methods and processes.

In order to prepare well the project, I have defined a detailed project plan with its activities, tasks and resources availability.



ID	% Complete	Nom de la Tâche	Duration	Start	Finish	Predec
1	0%	**IBBL PROJECT**	**225.5 days**	**Thu 22/03/12**	**Thu 31/01/13**	
2	0%	**Plan**	**225.5 days**	**Thu 22/03/12**	**Thu 31/01/13**	
3	0%	**creation of project team**	**6 days**	**Thu 22/03/12**	**Thu 29/03/12**	
4	0%	creation of the team	1 day	Thu 22/03/12	Thu 22/03/12	
5	0%	Planning	1 day	Thu 29/03/12	Thu 29/03/12	
6	0%	**Kick-off Meeting**	**9 days**	**Wed 02/05/12**	**Mon 14/05/12**	
7	0%	Préparation of the Kick-off Meeting	1 day	Wed 02/05/12	Wed 02/05/12	
8	0%	Kick-off Meeting	1 day	Mon 14/05/12	Mon 14/05/12	7
9	0%	preparation of the quality plan assurance	1 day	Wed 02/05/12	Wed 02/05/12	
10	0%	Signature of the Quality plan assurance	1 day	Mon 14/05/12	Mon 14/05/12	
11	0%	**Meeting**	**161.5 days**	**Wed 20/06/12**	**Thu 31/01/13**	
12	0%	**Technical IT meeting**	**161.5 days**	**Wed 20/06/12**	**Thu 31/01/13**	
13	0%	Architecture & performance meeting	1.5 days	Thu 28/06/12	Thu 31/01/13	
14	0%	interface	1 day	Wed 20/06/12	Wed 20/06/12	
15						
16	0%	**Analyze**	**51 days**	**Fri 20/04/12**	**Fri 29/06/12**	
17	0%	**User requirement**	**5 days**	**Tue 15/05/12**	**Mon 21/05/12**	
18	0%	Review of user requirement	2 days	Tue 15/05/12	Wed 16/05/12	
19	0%	FRS version 1	2 days	Thu 17/05/12	Fri 18/05/12	18
20	0%	Traceabily document	1 day	Mon 21/05/12	Mon 21/05/12	19
21	0%	**Detailed specifications f**	51 days	Fri 20/04/12	Fri 29/06/12	
22	0%	workshop 1	3 days	Tue 29/05/12	Thu 31/05/12	
23	0%	FRS version 2	2 days	Fri 01/06/12	Mon 04/06/12	22
24	0%	workshop 2 & notes	3 days	Mon 11/06/12	Wed 13/06/12	
25	0%	FRS final verison	4 days	Thu 14/06/12	Tue 19/06/12	24
26	0%	Signed Detailed specifications	1 day	Fri 29/06/12	Fri 29/06/12	
27						
28	0%	**Plateform installation**	**4 days**	**Fri 20/04/12**	**Wed 25/04/12**	
29	0%	IT meeting	1 day	Fri 20/04/12	Fri 20/04/12	
30	0%	installation of the plateform	1 day	Wed 25/04/12	Wed 25/04/12	
31						
32	0%	**Trainings**	**13 days**	**Wed 23/05/12**	**Fri 08/06/12**	
33	0%	fonctionel training	3 days	Wed 06/06/12	Fri 08/06/12	
34	0%	administrator training	1 day	Wed 23/05/12	Wed 23/05/12	
35						
36	0%	**Design Phase 3**	**101 days**	**Fri 29/06/12**	**Mon 19/11/12**	
37	0%	Configuration Core ressource 1LVS	28 days	Fri 29/06/12	Wed 15/08/12	26
38	0%	Configuration Core ressource 2 splims	26 days	Fri 29/06/12	Mon 13/08/12	26
39	0%	Configuration SPREC ressource 2 splims	13 days	Wed 29/08/12	Fri 14/09/12	26
40	0%	delivery	2 days	Tue 30/10/12	Wed 31/10/12	
41	0%	training & TC Import / Export	5 days	Wed 22/08/12	Tue 28/08/12	
42	0%	Training Web page Designer	2 days	Thu 02/08/12	Fri 03/08/12	
43	0%	training & compet transfer (CT) e_Form	4 days	Wed 15/06/12	Mon 20/08/12	
44	0%	training & TC Report	5 days	Wed 12/09/12	Tue 18/09/12	
45	0%	training & TC Instrument Connection	7 days	Thu 04/10/12	Fri 12/10/12	
46	0%	Configuration from ressource IBBL	50 days	Wed 25/07/12	Wed 07/11/12	
47	0%	LVS Check of IBBL configurations	15 days	Wed 05/09/12	Fri 09/11/12	
48	0%	internal tests	15 days	Mon 23/07/12	Thu 18/10/12	
49	0%	Automatic technical documentation	1 day	Mon 05/11/12	Mon 05/11/12	
50	0%	delivery Core system	3 days	Fri 09/11/12	Tue 13/11/12	
51	0%	Manual	18 days	Wed 03/10/12	Mon 19/11/12	
52						
53	0%	**Transition / Validation phase 4**	**65 days**	**Wed 12/09/12**	**Tue 11/12/12**	
54	0%	Data Migration	5 days	Wed 12/09/12	Wed 14/11/12	
55	0%	Install Configuration On test platform	1 day	Fri 09/11/12	Fri 09/11/12	
56	0%	Execute Test Plan / OQ tests	17 days	Thu 25/10/12	Mon 10/12/12	
57	0%	End User training	2 days	Mon 10/12/12	Tue 11/12/12	
58	0%	LVS assistance on demand	15 days	Wed 19/09/12	Fri 09/11/12	
59						
60	0%	**Deployment**	**57 days**	**Wed 12/12/12**	**Thu 28/02/13**	
61	0%	Install on PROD platform	1 day	Wed 12/12/12	Wed 12/12/12	
62	0%	PQ tests	16 days	Wed 12/12/12	Wed 16/01/13	
63	0%	Go live & assistance	4 days	Wed 19/12/12	Mon 24/12/12	
64						
65	0%	**GO LIVE**	1 day	Tue 25/12/12	Tue 25/12/12	63
66						
67	0%	hypercare	0 days	Fri 21/12/12	Fri 21/12/12	
68	0%	Remained instrument connections	10 days	Wed 30/01/13	Tue 12/02/13	
69	0%	Remained E_Form	7 days	Wed 20/02/13	Thu 28/02/13	

Figure 27 – Project Plan – IBBL /LIH Project

One of the most important aspects was to define the critical path combining important tasks and all of its dependencies.

Then for the following releases I took an agile approach in order to be more dynamic on delivering quicker to the internal customers and consequently to our key users a bigger involvement from beginning to end of the releases.

For this, I have chosen and followed the Scrum agile framework and therefore defined sprints and iterations for the development and deliveries.

I had as well defined our daily scrums with the developers and testers by going through the backlog and progress of each work package.

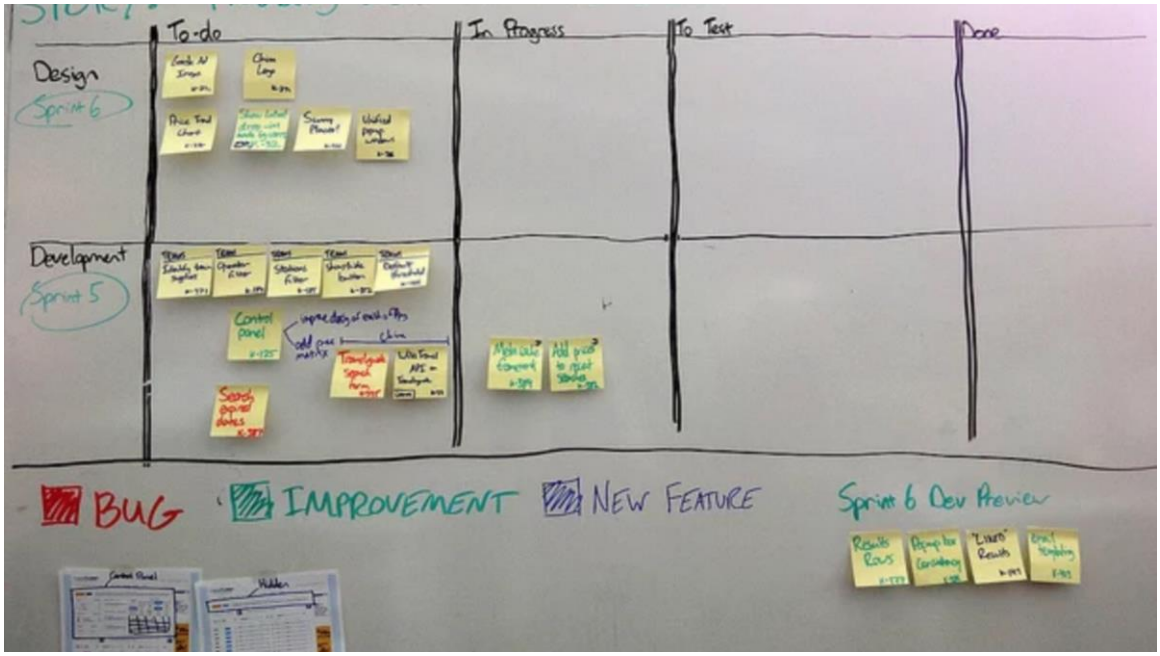


Figure 28 – Manual SCRUM Board

The prioritization and decision of new requirements and changes was done in a meeting between the product owner, customer, stakeholders, key users and executives.

At the end of each sprint there was a workable increment module where it could be presented to the stakeholders / key users.

This led to a sprint review as well and a new backlog discussion to make sure priorities were set.

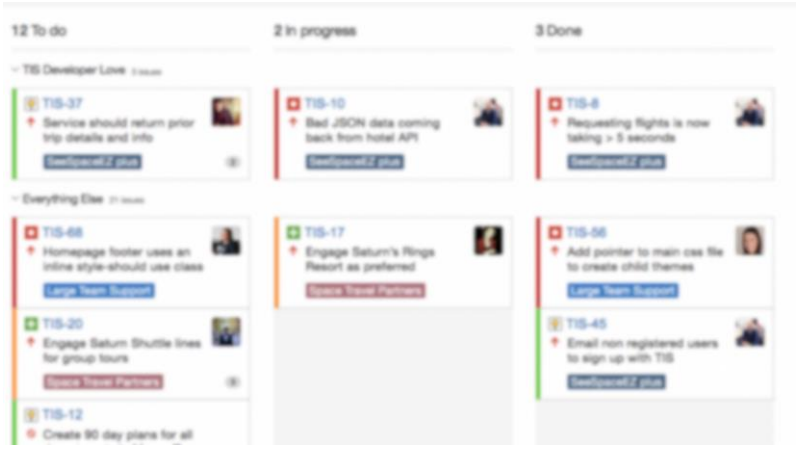


Figure 29 – SCRUM Board in JIRA

4.2.7. Conclusion

This project passed through very high demanding moments on different business and technical decisions that resulted in a fast and adaptive environment.

It started with wrongly applied processes to manage the projects, only with a rearrangement of the project methodologies it moved forward.

In terms of project management, I have had the two methodologies used, the waterfall and the agile, at different stages of the project.

At a certain point these methodologies were combined and were used with effective results.

At a later stage of the project the Agile was mostly used since that from the business they needed to have more deliveries, an increased number of changes and the need of a closer look and follow up from the key users.

Depending on the needs and scope of the project, the combination of methodologies is an interesting approach. In my opinion it is a very good solution to projects that requires a good controlled planning and delivery of milestones combined with a fast paced dynamic development to achieve faster results with the continuous participation of stakeholders and key users.

Agile or Waterfall individually applied are also very good solutions, it will always depend on the needs of project and business culture and strategy.

In this case at a certain point the Waterfall approach was ideal, then the project evolved and a combination was perfect and finally for the new change packages an Agile methodology fitted like a glove.

We need to be not only Agile on the methodology but also and especially agile on our way of thinking to find appropriate solutions.

There is no right or wrong approach, what it matters is to achieve success by finding the most suitable approach.

On a personal level, my role has evolved drastically from an overall technical hands-on experience into a more project management role with more responsibility.

Initially there was an adverse project on going with already taken decisions and commitments already taken leading to zero space of maneuver to change things.

Once management decided on a different direction I had the opportunity to take decisions in order to change the project and its processes.
So I have transformed a negative situation into a positive one and put in place my ideas.

This transition of role with more responsibility has led me to a difficult period of adaption in order to accommodate the new responsibilities.

With a lot of dedication, effort and commitment I was able to turn the non-ideal position into a situation of comfort and being able to control what was around me.

This allowed me to see with clarity the situation and to start putting in place my ideas for processes and methodologies.

One of the biggest important points when putting something in place is the human side, all the communication and relations with everyone, being colleagues, managers or other people somehow as well involved.

The technical side and the experience I have built up until now are very important but valuing and emphasizing the human competences are definitely half way through for guaranteed success.

In terms of methodologies used, I felt comfortable using every one of them.

Even though I did not use them to their full extent, the core basis of the methodology applied correctly gave me my good results.

Like already mentioned, Agile, Waterfall or a combination of both worlds has helped me on moving forward with my projects. I have applied each one of them accordingly and when I felt was the best moment to use them.

One of the biggest challenges was to get people onboard to work under my processes and under the way projects were setup since this meant a change for the people.

Then making them aware of the added value and benefits has led to clarify them on what we would get on working with such a way.

From there, projects run smoothly, deadlines were achieved and scope maintained under control. Costs increased but with the contingency foreseen, helped to achieve it without over spending.

4.3. Project @ SES Satellites

4.3.1. Context

This large project at SES Satellites (Société Européenne des Satellites) started taking place on 2016 and is currently ongoing now in 2019 in Luxembourg.

SES is one of the world's leading satellite operators with over 70 satellites.

The IT at SES has in total, around the World, more than 200 persons that contribute to deliver IT to the company. Those IT persons are divided between internal employees and external consultants from different companies offering their services.

My team belongs to the Department of Satellite Applications that belongs to a higher Division named Business Applications.

I have been working in the position IT Project Manager with the management of a team of external consultants and all the communication with the stakeholders and external software suppliers.

4.3.2. Mission

One of the main objectives was to put in place key satellite applications to serve the satellite business. These applications are meant to contain all the satellite fleet (more than 60 satellites in Space) and all of their satellite components.

These applications are used by key people within the company that work with external customers and also internal people that operate the satellites and people that perform critical operations with them.

The external users are customers or possible customers to our business that needs for example to get their television channels or internet data in any part of the World, from any city to any city. It can be for customers that are in a fixed place or can be mobile like in a plane or in a ship. They request how much service they need, it is then calculated and a space inside a satellite(s) is allocated to that client(s).

As for internal users, these are the ones steering the satellites in a daily basis, the ones that do the calculations on signals, transmissions and all the technical satellite business related, namely Sales Engineers and Asset Managers, and also Sales people that need all the information they can on available services to be able to sell the products and services to the customers.

4.3.3. Role in the Project

My current role is project manager and coordination of a team of consultants.

As a project manager I manage several projects that have cross dependencies between them.

With this I manage as well the resources allocated to the projects and their availabilities.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**OSP MONICS 10 Integration**	**103 days?**	**Fri 23-09-16**	**Wed 22-02-17**		
2		**Increment 1**	**76 days?**	**Fri 23-09-16**	**Mon 16-01-17**		
3		Development of Increment 1	41 days	Fri 23-09-16	Fri 23-12-16		Bernhard Hausen
4		Deployment in PreProd	1 day?	Mon 02-01-17	Mon 02-01-17	3	Adrian Kalinyak;Manuel Martinez Fernandez
5		Testing	5 days	Tue 03-01-17	Mon 09-01-17	4	Chris Phillips;Stakeholders
6		Training	5 days	Tue 10-01-17	Mon 16-01-17	5	Chris Phillips
7		Deployment in Production	1 day	Tue 10-01-17	Tue 10-01-17	5	Adrian Kalinyak;Manuel Martinez Fernandez
8		**Increment 2**	**31 days?**	**Wed 11-01-17**	**Wed 22-02-17**		
9		Development of Increment 2	19 days	Wed 11-01-17	Mon 06-02-17	7	Bernhard Hausen
10		Deployment in PreProd	1 day?	Tue 07-02-17	Tue 07-02-17	9	Adrian Kalinyak;Manuel Mar
11		Testing	5 days	Wed 08-02-17	Tue 14-02-17	10	Chris Phillips;Stakeholders
12		Training	5 days	Wed 15-02-17	Tue 21-02-17	11	Chris Phillips
13		Deployment in Production	1 day?	Wed 22-02-17	Wed 22-02-17	12	Adrian Kalinyak;Manuel Martinez Fernandez

Figure 30 – SES Project Plan - Waterfall

These projects are in the area of satellite applications and they need to be delivered in the agreed schedule, within budget respecting the scope.

For each application there is a group of stakeholders accountable to their applications and also key users that are more involved to test the functionalities of these applications.

I'm responsible for the communication with the stakeholders therefore I have weekly meetings with them in order to have them involved in all the process.

Some of these applications are developed by two external suppliers, one of them based in US and another one based in UK.

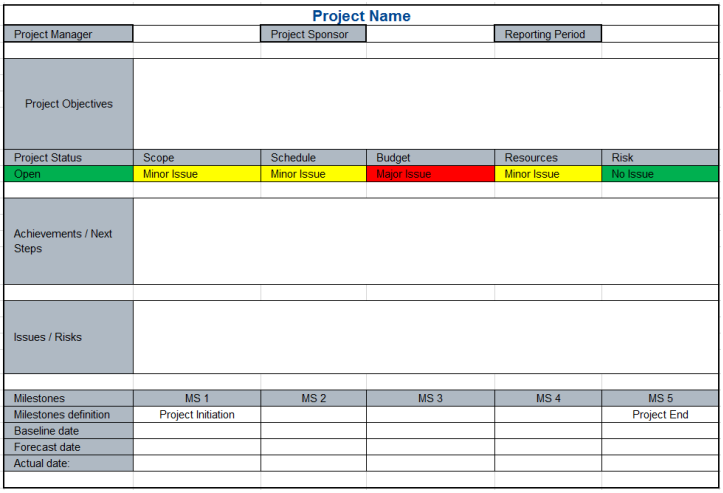
The development of some applications is done in-house by my team and also all the integration part where we call it Service Bus. This Service Bus is a middleware that integrates all of our applications by routing and mapping the data between applications and systems.

Here as well I'm responsible for the communication with the suppliers where the meetings are held on a weekly basis in order to follow up their work and check on their progress.

There is as well another weekly meeting but more technical to go through the Support queue of tickets raised by our internal users.

In respect to communication on the overall of projects, I have monthly meetings with the project sponsors where I show them a dashboard with all the projects and the indicators of each projects.

More concretely, the dashboard shows whether a project is green, yellow or red in terms of progress. This progress is measured in terms of time, cost and scope as main key performance indicators but it is as well shown the changes, risks and issues raised throughout the projects.



Project Name					
Project Manager		Project Sponsor		Reporting Period	
Project Objectives					
Project Status	Scope	Schedule	Budget	Resources	Risk
Open	Minor Issue	Minor Issue	Major Issue	Minor Issue	No Issue
Achievements / Next Steps					
Issues / Risks					
Milestones	MS 1	MS 2	MS 3	MS 4	MS 5
Milestones definition	Project Initiation				Project End
Baseline date					
Forecast date					
Actual date:					

Figure 31 – SES Project Report Status

Coming back to my team, the team size has been varying throughout the time since some people joined and left meantime.

Currently the team is composed by 15 people (started with 10) working in different areas covering the whole software project life cycle.

We have currently 3 business analysts covering all applications during the interaction between business and IT.

In terms of development we have 6 developers serving all applications and the service bus development.

Then we have 3 DevOps for all the installations, deployments and management of environments for the applications.

Finally for the Support and Testing there are 3 resources working on it being the interface with the users.

My team works in a daily basis across all projects depending on the priorities and needs in order to serve the overall project ecosystem.

Going through my role a bit deeper, I have been responsible of the execution of projects and maintenance within the applications delivery field, with regard to timely task and project implementation.

These tasks include the advertise of available offerings to the various Business Process Owners (BPO's), proposing and implementing technical solutions for new and enhanced services to solve the customer requirements.

I have been as well acting as the interface between the executing party (IT) and the internal and/or external customers and suppliers, also working on developing and maintaining Project Plans and Budget.

Below some other tasks:

- Analyzing and proposing alternative technical solutions (with development team support as needed) to BPO's, then work with them to document the changes and their benefits.
- Coordinating and supervising an external team of IT consultants in order to ensure the delivery of expected solutions to internal business customers.
- Interface with end users, customers and stakeholders to understand, analyse, document and develop IT system requirements in both the service and project delivery process.
- Managing Critical Vendors in support of Systems.
- Managing and measure the support for applications during and after implementation.

This also means being responsible for setting realistic expectations about the scope and timing of delivery, following the established IT processes in the implementations.

Last but not least, this role also includes HR tasks, I have been managing a team and taking care of all HR processes, including recruitment, new contracts, performance, time sheets, benefits, follow up objectives, time management and training.

In terms of competences within the project, I see myself as a person with the ability to work internationally in a matrix-managed and results-oriented environment, as well as working autonomously and being a team player.

Other competences are the ability to lead a project team, to tackle complex projects and develop workable solutions in pressure situations, to liaise with management and take decisions appropriate to this level.

Finally, the ability to interpret complex technical issues and communicate the business value of IT standards and structured approach, good communications skills, both written and oral and finally high-level design, technical analysis and evaluation skills.

4.3.4. Tools & Methodologies

In regards to the tools and methodologies used across the project, this is the summarized list:

- Project Management/Planning : Prince2, Ms Project, Scrum
- Business Process Management / ITSM: BPM Bizagi / ITIL
- Scripting / Programming: unix shell, bash, Perl, vba.
- Databases related : Oracle, SQL, Sql Developer, Sql plus.
- Issue/Project Tracking: JIRA , ServiceNow
- Office Tools: Ms Word, Ms Excel, Ms Access, Ms Outlook.
- SAP

4.3.5. Challenges encountered

Upon my start on this project, I joined a team that was already in place. This team had already 10 external consultants from different companies. I was the only internal to the company, except my first line manager.

One of the first challenges was to understand the current processes and methodologies in place and used by the team. Another point was to evaluate the current issues or bottlenecks that were causing delays and discussions within the project team.

There was no concrete methodology in place to manage the projects, the responsibilities of the team were not clear and priorities on the projects were not in place.

My first actions to solve these issues were to interview each member of team and discuss openly to understand their view on the current situation, and to define an overall description on the current as-is situation.

The goal was to describe clearly the as-is situation, come up with the to-be situation and improvements, then finally to implement the identified plan and set of measures.

I have defined clear responsibilities to each member of the team and how would they communicate within the team and the project.

Then I have put in place a cross-project project plan detailing resources, tasks, timelines, dependencies, costs, benefits and risks.

In order for all of this to work properly, higher-level management meetings were required and took place to define and organize the queue of priorities at project level coming from the business and executive management.

Another important aspect was to define as well a proper communication plan with the team, with the project stakeholders and also with the project sponsors.

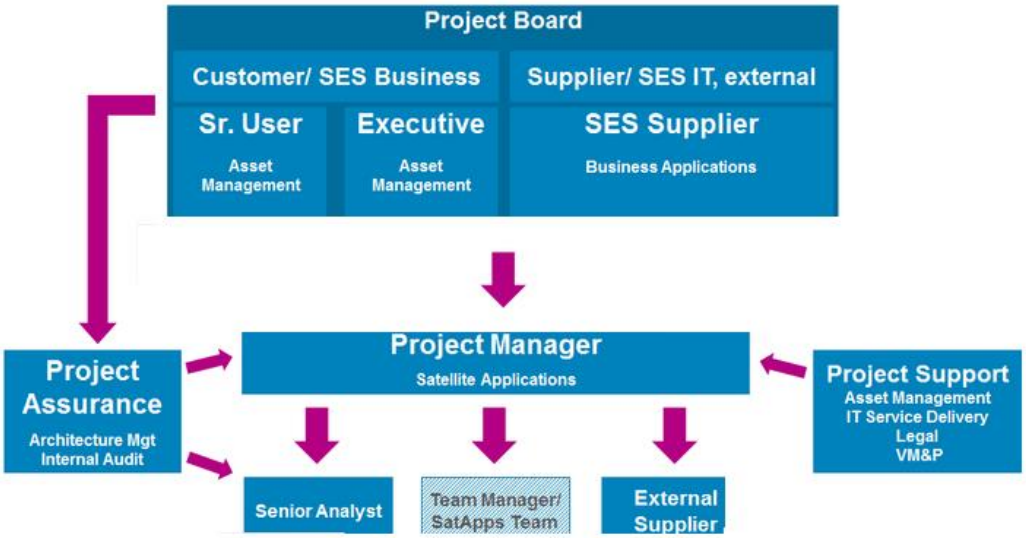


Figure 32 – SES Project Team

This meant as well to put in place escalations, risk registry and changes workflows evaluation.

SES

Project Name

Risk ID	Risk Description	Risk Category	Severity * (H, M, L)	Submitter	Risk Owner	Date Raised	Risk Response[1]
#1	Risk 1	Legal/Regulatory/Compliance	Low				
		Finance	High				
		Legal/Regulatory/Compliance	Medium				
		Employee	Low				
		Commercial	Medium				
		Technical/IT	High				
		Other					

[1] Risk Response function of the Severity value

HIGH - Priority and management attention required. MITIGATION / CONTINGENCY required
MEDIUM - Additional management attention may be needed. REVIEW needed
LOW - Minimum oversight needed to ensure risk remains low. MONITORING welcomed

(*) Severity is based on the values of the likelihood and Impact from the Risk Matrix below

6. Very Severe / Catastrophiic					
5. Severe					
4. Significant					
3. Moderate		#1			
2. Minor					
1. Insignificant / Negligible					
Impact / Likelihood	1. Remote	2. Rare	3. Unlikely 4. Likely	5. Very Likely	6. Almost Certain

Likelihood- The probability that a given event will occur
Ranked on a scale of 1 – 6 with one representing a remote chance of occurrence and six an almost certain chance of occurrence

Impact- The result or effect of an event
Ranked on a scale of 1 – 6 with one representing an insignificant / negligible impact and six representing a very severe / catastrophic impact.

Figure 33 – SES Project Risk Registry

Project Name					
Change request initiation					
Change Request Number		Date raised (dd-mmm-yyyy)		Change Request type	Engineering Change Request: ECR
Change request title					
Initiator of change	<Name>		<Role>		
Change classification	Design change	Reason for the change	Performance increase	Priority	Urgent
Description of the change					
Change impact assessment					
Impact on the Scope					
Impact on the Schedule					
Impact on the Budget					
Risks / Constraints / Issues					
Decision:	Accept the Change				
Comments / Justification					
Approved by (role)	Configuration Manager (if any)	Project Manager		Project Sponsor	
Approver name					
Approval date (dd-mmm-yyyy)					
Change Implementation					
Closure actions	Action Description			Owner	Due date
Action 1					
Action 2					
Action 3					
Action 4					
Implementation start date (dd-mmm-yyyy):			Implementation end date (dd-mmm-yyyy):		

Figure 34 – SES Project Changes Registry

This allowed proper prioritizing of the work, funneled to the team and to our projects making the resource planning easier and clearer for everyone.

	Task Mode	Task Name	Notes	Resource Names	Duration	Start	Finish	Pre	% Com	Milestor	Status
1		**Go Live OSP v14.2**			**38 days**	**Fri 26/01/18**	**Tue 20/03/18**		**39%**	**No**	**Late**
2		**Release Roll-Out**			**1.5 days**	**Fri 26/01/18**	**Mon 29/01/18**		**100%**	**No**	**Complete**
3		Deliver Final Release	CGI delivers a release and informs SES via	CGI	0 days	Fri 26/01/18	Fri 26/01/18		100%	No	Complete
4		Acknowledge Release	Acknowledge the release by sending an em	MPE/CPH/SNE	0 days	Fri 26/01/18	Fri 26/01/18	3	100%	Yes	Complete
5		Plan Release	Initiate planning process - Check if the cap	MPE	0.5 days	Fri 26/01/18	Fri 26/01/18	4	100%	No	Complete
6		Communicate Release Schedule	Inform all interested parties of the plannec	MPE	0.5 days	Fri 26/01/18	Fri 26/01/18	5	100%	No	Complete
7		Plan Release Test	Based on the release notes, create a Syster	CPH	0.5 days	Mon 29/01/18	Mon 29/01/18	3	100%	No	Complete
8		Create Release Configuration	Based on the release notes and the Contro	CPH	0.5 days	Mon 29/01/18	Mon 29/01/18	3	100%	No	Complete
9		**Setup Environment for Testing**			**14 days**	**Mon 29/01/18**	**Thu 15/02/18**		**100%**	**No**	**Complete**
10		Build Service Bus	Build the OSP software stack (the depende	HBO/SGO	0.5 days	Mon 29/01/18	Mon 29/01/18	3	100%	No	Complete
11		Build System Release	Release the Service Bus and its apps	HBO/SGO	0.5 days	Mon 29/01/18	Mon 29/01/18	3	100%	No	Complete
12		**Environment for Functional Tests**			**5 days**	**Tue 30/01/18**	**Mon 05/02/18**		**100%**	**No**	**Complete**
13		Deploy in DT1	Deploy the new version in DT1	GIL	0.5 days	Tue 30/01/18	Tue 30/01/18	11	100%	No	Complete
14		Refresh from Prod Data	Export / Import from OSP Prod data (issu	GIL	5 days	Tue 30/01/18	Mon 05/02/18	11	100%	No	Complete
15		**Environment for Integration Tests**			**1.5 days**	**Wed 14/02/18**	**Thu 15/02/18**		**100%**	**No**	**Complete**
16		Deploy in DT3	Like Prod, including OSP 12...	GIL	1 day	Wed 14/02/18	Wed 14/02/18		100%	No	Complete
17		Refresh from Prod Data	Export / Import from OSP and MSD Prod	GIL	0.5 days	Thu 15/02/18	Thu 15/02/18	16	100%	No	Complete
18		Environments Ready for Testing	Confirmation on Environment final state	GIL	0 days	Thu 15/02/18	Thu 15/02/18	17	100%	Yes	Complete
19		**Integration Tests of OSP with SLBT and CPO**			**15.5 days**	**Fri 16/02/18**	**Fri 09/03/18**		**62%**	**No**	**Late**
20		**Development**			**9 days**	**Mon 19/02/18**	**Thu 01/03/18**		**100%**	**No**	**Complete**
21		Robot to Duplicate and Activate a SATCFG in OSP	One already exists for Monics transfers	HBO/SGO	1 day	Mon 19/02/18	Mon 19/02/18		100%	No	Complete
22		Robot to Create a New Revision in MSD	And to modify some data and publish it	SGO	4 days	Thu 22/02/18	Tue 27/02/18	21	100%	No	Complete
23		Create a Robot to Compare the Results	Compare accordingly all 8 sets of data	HBO	6 days	Thu 22/02/18	Thu 01/03/18	18	100%	No	Complete
24		Create DB Users in Orchestration Database	8 specific DB Users in Orchestration DB		1 day	Fri 16/02/18	Fri 16/02/18	18	100%	No	Complete
25		Run loads for SLBT and CPO with OSP 12	Run loads for SLBT and CPO with OSP 12	GIL/HBO/SGO	2 days	Wed 28/02/18	Thu 01/03/18	22	0%	No	Late
26		Upgrade OSP from Version 12 to 14.2	Upgrade OSP from Version 12 to 14.2	GIL	1 day	Fri 02/03/18	Fri 02/03/18	25	0%	No	Late
27		Refresh OSP Database	Use same db dump from 1st load	GIL	0.5 days	Mon 05/03/18	Mon 05/03/18	26	0%	No	Late
28		Run loads for SLBT and CPO with OSP 14.2	Run loads for SLBT and CPO with OSP 14	GIL/HBO/SGO	2 days	Mon 05/03/18	Wed 07/03/18	27	0%	No	Late

Figure 35 – SES Project Plan – Go Live

Communication and planning improved, therefore projects were on time and resources were used in a better and more efficient way.

Issues or changes were treated in the proper channels, ending up in the proper queues of work and then prioritized and budgeted accordingly.

Dependencies on the cross projects became clearer and better to plan accordingly, the critical path of the projects were less affected as well.

At a higher scale, business took more responsiveness from us, users were satisfied and project sponsors started to have more visibility on the on

going progress and projects started to get more profitable and within timelines.

Project Name					
Project Manager		Project Sponsor		Reporting Period	
Project Objectives					
Project Status	Scope	Schedule	Budget	Resources	Risk
Open	Minor Issue	Minor Issue	Major Issue	Minor Issue	No Issue
Achievements / Next Steps					
Issues / Risks					
Milestones	MS 1	MS 2	MS 3	MS 4	MS 5
Milestones definition	Project Initiation				Project End
Baseline date					
Forecast date					
Actual date:					

Figure 36 – SES Project Report Status

In terms of methodologies used, I have put in place a traditional waterfall approach for the projects with our suppliers external development / testing and an agile approach for our internal development / testing.

	Task Mode	Task Name	Duration	Start	Finish	Pred	Resource Nan
1		**Increment 1 SLBT**	**1376 days**	**Thu 02/02/12**	**Thu 18/05/17**		
2		**Optimal Satcom**	**59 days**	**Fri 02/12/16**	**Fri 24/02/17**		
3		**CP4 - Analysis, Review, Approval, and Planning**	**21 days**	**Fri 02/12/16**	**Tue 03/01/17**		
4		Change Order #4 Approval	0 days	Fri 02/12/16	Fri 02/12/16		
5		Requirements Analysis (Elaboration, UCs, etc.)	15 days	Mon 05/12/16	Fri 23/12/16	4	
6		Review and Finalize Design/Changes	5 days	Tue 27/12/16	Tue 03/01/17	5	
7		**Priority 1&2 Implementation**	**38 days**	**Wed 04/01/17**	**Fri 24/02/17**		
8		Implementation Planning	5 days	Wed 04/01/17	Tue 10/01/17	6	
9		**Sprint 1**	**13 days**	**Wed 11/01/17**	**Fri 27/01/17**		
10		Implement Allocated Requirements/UCs, Fix Defects	8 days	Wed 11/01/17	Fri 20/01/17	8	
11		Install on SES Server for SES Review & Testing	3 days	Mon 23/01/17	Wed 25/01/17	10	
12		SES Feedback and Review with OS	1 day	Thu 26/01/17	Thu 26/01/17	11	
13		Update Backlog for Sprint 2	1 day	Fri 27/01/17	Fri 27/01/17	12	
14		**Sprint 2**	**13 days**	**Mon 23/01/17**	**Wed 08/02/17**		
19		**Sprint 3**	**13 days**	**Thu 02/02/17**	**Mon 20/02/17**		
24		**Sprint 4 (Shortened)**	**9 days**	**Tue 14/02/17**	**Fri 24/02/17**		
29		**FAT, UAT, Training**	**59 days**	**Fri 24/02/17**	**Thu 18/05/17**		
30		FATRR	0 days	Fri 24/02/17	Fri 24/02/17	28	
31		FAT Preparation Increment 1	10 days	Mon 27/02/17	Fri 10/03/17	30	
32		Factory Acceptance Testing Increment 1	10 days	Mon 13/03/17	Fri 24/03/17	31	
33		Delivery Readiness Review Increment 1	1 day	Mon 27/03/17	Mon 27/03/17	32	
34		Delivery Preparation Increment 1	1 day	Tue 28/03/17	Tue 28/03/17	33	
35		Onsite Preparation, Integration and SAT Increment 1	5 days	Mon 27/03/17	Fri 31/03/17	32	
36		User Acceptance Testing (Onsite) Increment 1	3 days	Mon 03/04/17	Wed 05/04/17	35,34	
37		Increment 1 Acceptance	0 days	Wed 05/04/17	Wed 05/04/17	36	
38		Onsite Training Increment 1 - Betzdorf (Including one	4 days	Mon 08/05/17	Thu 11/05/17	37	

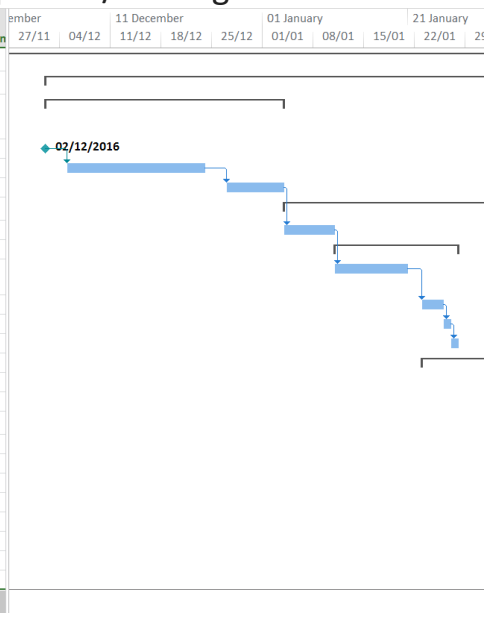
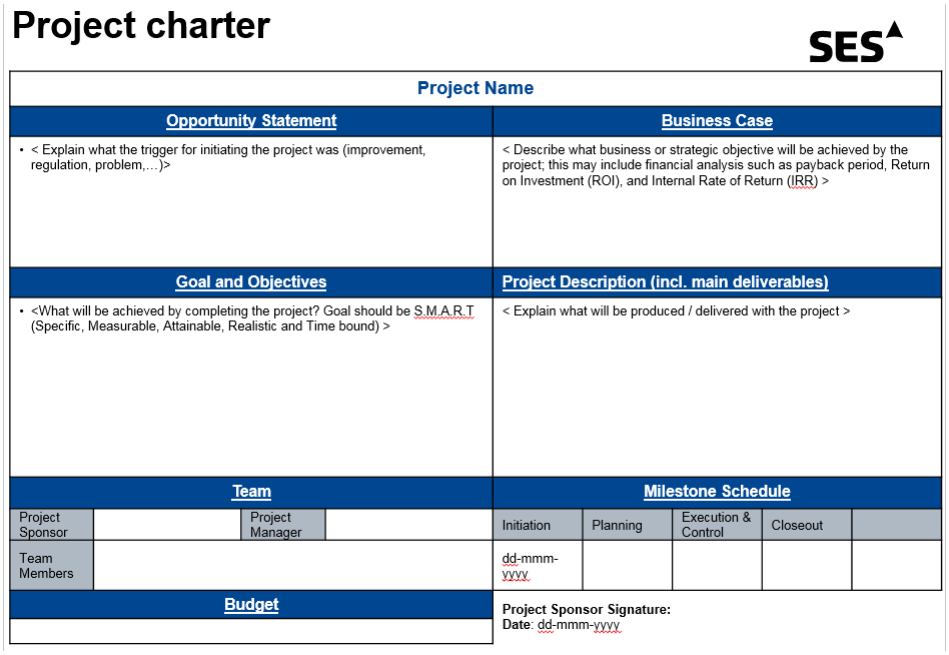


Figure 37 – SES Project Plan – Waterfall & Agile Sprints

I have chosen to follow PRINCE2 as a methodology but not the full methodology described by the book. The internal communication was done by me as the project manager to the project sponsors and stakeholders and as well to technical team. Changes, risks and issues were logged and handled in a proper queue of our systems.



Project charter

SES

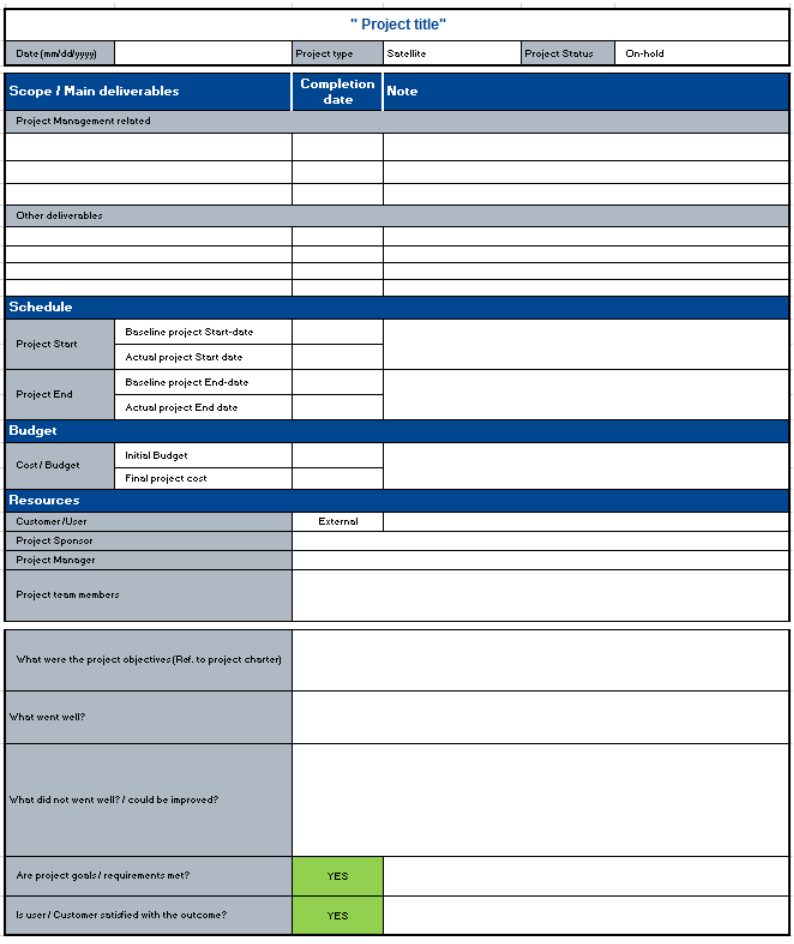
Project Name	
Opportunity Statement	**Business Case**
• < Explain what the trigger for initiating the project was (improvement, regulation, problem,…)>	< Describe what business or strategic objective will be achieved by the project; this may include financial analysis such as payback period, Return on Investment (ROI), and Internal Rate of Return (IRR) >
Goal and Objectives	**Project Description (incl. main deliverables)**
• <What will be achieved by completing the project? Goal should be S.M.A.R.T (Specific, Measurable, Attainable, Realistic and Time bound) >	< Explain what will be produced / delivered with the project >

Team				Milestone Schedule				
Project Sponsor		Project Manager		Initiation	Planning	Execution & Control	Closeout	
Team Members				dd-mmm-yyyy				

Budget	
	Project Sponsor Signature: Date: dd-mmm-yyyy

Figure 38 – SES Project Charter

Milestones and deliverables with the supplier were managed incrementally as PRINCE2 methods along with the proper communication plan.



" Project title"					
Date (mm/dd/yyyy)		Project type	Satellite	Project Status	On-hold

Scope / Main deliverables		Completion date	Note
Project Management related			
Other deliverables			
Schedule			
Project Start	Baseline project Start-date		
	Actual project Start date		
Project End	Baseline project End-date		
	Actual project End date		
Budget			
Cost / Budget	Initial Budget		
	Final project cost		
Resources			
Customer /User		External	
Project Sponsor			
Project Manager			
Project team members			

What were the project objectives (Ref. to project charter)		
What went well?		
What did not went well? / could be improved?		
Are project goals / requirements met?	YES	
Is user / Customer satisfied with the outcome?	YES	

Figure 39 – SES Project Final Report

As for our internal development and testing, we have used SCRUM as the agile methodology, but not to its full extent. I have organized daily scrums meetings with maximum 15 minutes to quickly do a round tour on current progress, next steps and any blocking points. These daily scrums were part of sprints of 2 weeks. The basis of work was the backlog of tasks from defined work packages coming from business priorities.

4.3.6. Project Phases

The overall project was organized on cross projects interdependent on each other. Since there were several different suppliers and in different locations (UK, US) plus our internal team, I have combined project management methodologies that fitted better our business.

Therefore I have combined PRINCE2 and SCRUM methodologies, one for traditional waterfall and the other for agile respectively, in order to get the best of both worlds.

In one hand the organization and well planning of waterfall and in the other hand the agility and dynamic of development of the agile. This was possible since I did not use both methodologies to their full extent and used it as convenient as possible.

As for the PRINCE2 project phases, this was the driver methodology, projects were organized in accordance with the suppliers as, User Requirements, Functional Specifications, Design, Development in several modules, Testing at many levels, Deployments, Support, Continuous Improvement (changes, issues, etc.).

Regarding the SCRUM methodology, it was encapsulated within the PRINCE2 projects especially in the internal Development and Testing on several iterations and increments. This development was more related to middleware development and was in relation with the suppliers' development.

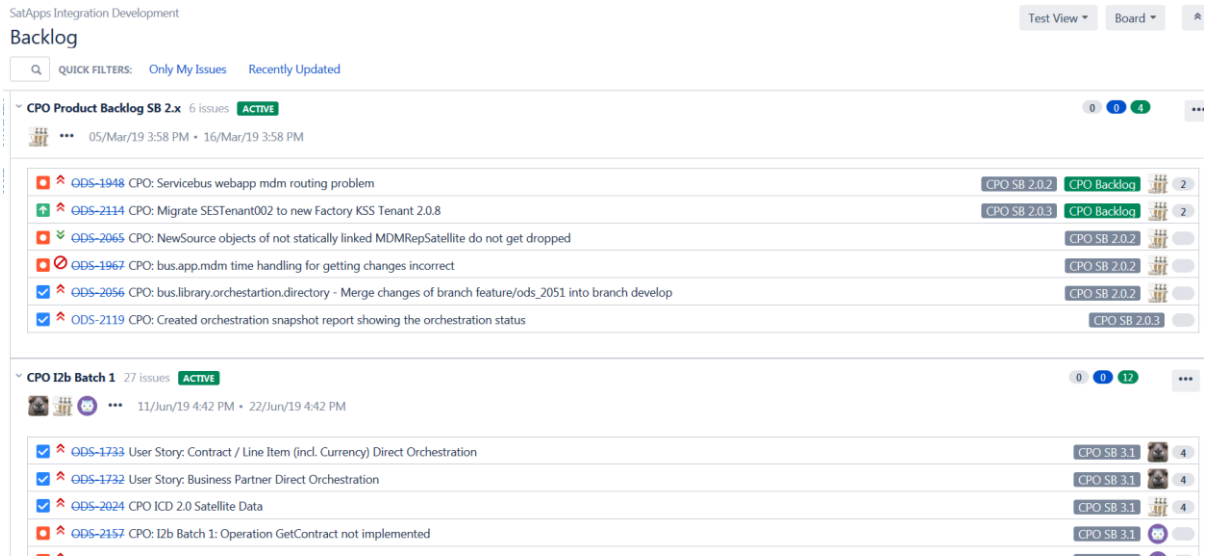


Figure 40 – SES SCRUM Sprints & Backlog

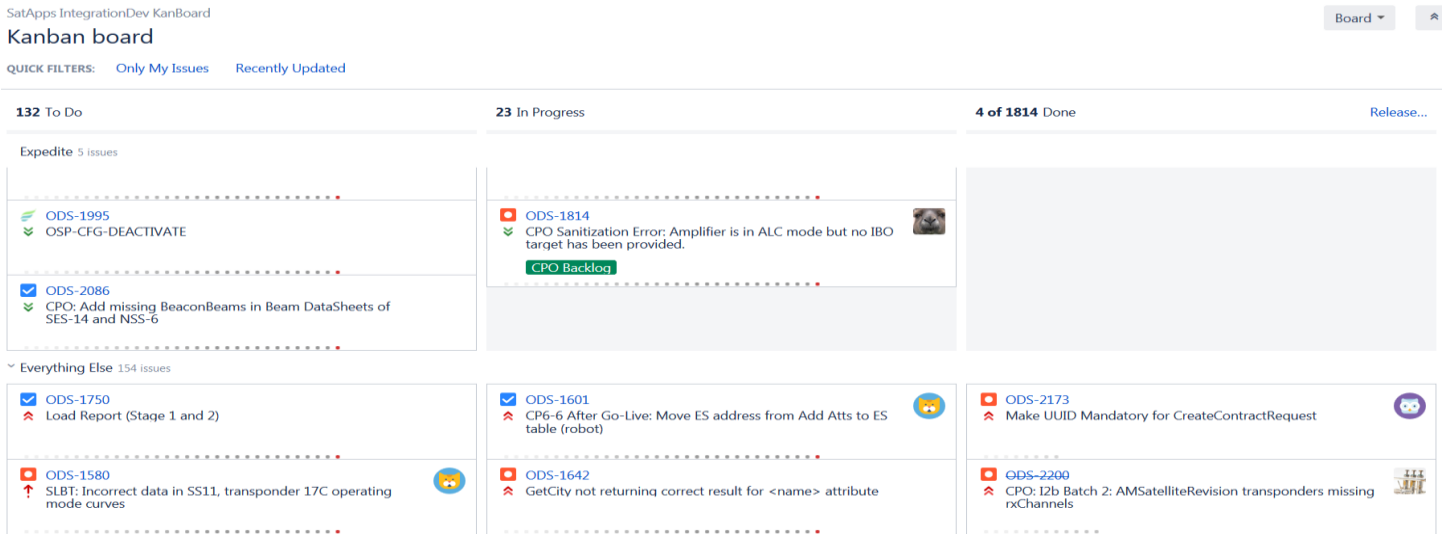


Figure 41 – SES Kanban Board

4.3.7. Conclusion

This current project evolved immensely over time to become more business and customer centric. The methodologies put in place have clearly set the cross-projects at a higher level of quality and efficiency for much better results to the company.

This project is a clear example on how project management methodologies can be **combined** in order to deliver efficient results. From experience, the choice of a methodology will depend on the business needs of each company and what has to be achieved.

Sometimes only agile or only waterfall can be sufficient to achieve what is expected and also something that has a strong influence on this choice is the culture of the company.

In our case we can ask ourselves the question, would it have worked by using only one of the aforementioned methodologies? The answer is **not really**.

By only using **agile**, the stakeholders and key users wouldn't have had a functional product after few sprints, the applications in this business have a specific way of working, meaning that, the core product wouldn't have properly worked until all pieces were together. Only Agile here would only work after the core product would be finished, for new change packages then agile is the ideal where we would see module by module developed and functioning.

By only using **waterfall**, this would mean that the development and testing is stable from beginning to end on the supplier side and on the internal side. On the internal side this would have worked by only having development and testing resources used for one project at the time to be in line with the suppliers' development. But this is not the case, we have cross-projects that

need dynamic development and testing in our internal team where they switch from project to project according to priorities and availability of resources.

At a personal level my performance had a progressive learning curve in the sense of that when I arrived to the company and I started this project my experience and ideas were based on other ways of working and a different vision on methodologies and there was mostly this idea of applying something specific in terms of project management methodologies.

Then bit by bit with time passing I evolved and adapted to set up and mindsets in order to achieve my goals.

At the very beginning when I arrived, my team had several issues and one of them was communication between them.

Another issue was that projects were managed without any specific methodology or process in place therefore leading to delays and extra costs to the delivery of the projects.

Project cost estimation

	Material & equipment	Contractors Manpower			Other direct costs	Total cost before SES Manpower	SES Manpower			TOTAL PROJECT COST
	Cost	Total mandays	Average rate	Total contractor manpower cost	e.g T&E		Total mandays	Average rate	Total SES Manpower cost	
	EUR	Mandays	EUR/day	EUR	EUR	EUR	Mandays	EUR/day	EUR	EUR
Workpackage 1				0		0				0
Workpackage 2				0		0				0
Workpackage 3				0		0				0
Workpackage 4				0		0				0
Workpackage 5				0		0				0
Workpackage 6				0		0				0
Workpackage 7				0		0				0
Workpackage 8				0		0				0
Workpackage 9				0		0				0
Workpackage 10				0		0				0
Total	0			0.00	0.00	0.00			0.00	0.00

Figure 42 – SES Project Cost Estimation

One of my first approaches was to put in place my ideas in order to improve on the project management and delivery.

So my action was to do a complete analysis of the overall situation and to get a clear picture on the as-is moment in the team and in all projects. Then I had individual meetings with each one of the members of the team in order to have a clear idea on their job, tasks, concerns and ideas.

Once I managed to define a plan I have started to implement my ideas and restructured the team and defined their way of working and communication.

At the level of projects I have defined and specified how projects were to be managed, put in place new processes and also combined project management methodologies between Agile and Waterfall.

For the reality and set of objectives to be achieved this was the best approach to put in practice with some adjustments on the methodologies, not purely applying the methodologies.

Each company, each team and each business have very particular specificities therefore each case and project is different.

Overall it was quite a challenge and opened my mind to think differently and more openly in order to embrace other alternatives.

5. Conclusion

Agile vs Waterfall

As it was demonstrated throughout my professional career, I have embraced many ways of working and many ways on using project management methodologies.

Each and every company had their own methodologies (or lack of them) when it came to the management of their projects.

My choice in a company for a project management methodology was based in several different criteria but there were two that stood out: the business strategy of the company and the type of each IT project.

The end result is common to every single company, they all want that their company succeeds no matter which business or sector they are. In order to achieve that, project management plays a key role and it is crucial to put in place the best appropriate project management methodology.

The **business strategy** of a company has a strong impact on how projects are managed in the sense of wanting to get or not a faster return on investment and how fast they want to obtain results. This has a direct impact on how shorter or longer timelines are expected as well as strong impact on costs and scope. Therefore a correct and proper choice on the project management methodology is crucial but highly dependable on the business vision where it can change from one day to another.

The **type of an IT project** is a decisive factor on how projects will be defined, setup and executed. It is key to properly identify who will be involved in the project, if only internal resources or as well external resources. To clearly identify where implementation will take place, if only in house, only through an external supplier or a mixed combination.

Summarizing these factors, the business defines their strategy and objectives and from there the type of project takes shape and is clearly identified. Having this in place and completely clear, the decision on the project management methodology is taken on solid grounds.

An **Agile** project has provided, in my experience and in a positive way, more dynamism and clarity on the work being done. Dynamism on the sense of delivering more often, having more iterations on modules and dealing easily and in a not complex way with changes. Clarity and transparency to everyone especially the key users and stakeholders on the progress and what they were going to get making them more involved from beginning till end.

This led as well to less positives outcomes such as constant change leading to many iterations on deliveries and pushing the dates and costs a bit further. Also there were not many imposed fixed milestones and deliveries in favor of dynamism, as a consequence as already said dates and costs were

pushed a bit more. The scope kept increasing even though stakeholders and sponsors were informed and in agreement of the whole project progress.

These projects were mostly developed internally with not much exposure to externals.

What counter balanced on all of this was a very complete and proper risk analysis that foreseen and fall backed to contain these contingencies.

Benefits at the end were achieved even with minor deviations but what really prevailed was the success of the projects. Success of the projects meant a success to the companies.

In regards to **Waterfall** projects, there were many positives outcomes especially on clear definition of deliveries and milestones upfront, less exposure on the technical teams from the business leading to less pressure.

Teams were well organized with clear objectives and deliveries.

Since there were external suppliers involved in some of these projects, this methodology fitted like a glove in terms of control and proper expectations and follow up on their deliveries and milestones. That included all the development and testing of the software.

In the downside, this methodology was less dynamic and difficult to manage changes, many surprises at the end, led to delivery of a final product different from initial expectations not because it was badly defined but that the business meantime evolved and changed / added requirements. This meant more change packages, more testing cycles, costs / scope and timeline increased.

These projects had an exposure to externals, there were external consultants for in-house development as well as external suppliers for development & testing.

In terms of risks, these were highly accounted from the beginning with large margin on fallback plans and mitigations.

Benefits were in majority achieved for the business at the end and after the projects.

When *combining* **Agile** and **Waterfall** methodologies in one project together the initial thoughts were of disbelieve and that the idea is quite absurd.

The truth is that I had the idea and the need to use a bit of both worlds and to use in the same project. The idea came up after the first evaluation right before defining the project.

After getting the business needs and especially the business objectives, I have started to evaluate how would I achieve that with the means I had at my disposal.

Therefore, the idea was to involve an external software supplier and combining with our internal development. The project type was very specific and therefore needed a very specific approach and methodology.

I have gone through the approvals process with the project sponsors and after several negotiations and presenting the business case and the benefits of this approach they have approved my methodology of combining Agile and Waterfall methodologies on the same project.

My first goal was to get the perfect fit for a supplier that responded to our criteria in terms competences, know how on the business, good quality on deliveries and respecting timelines within an affordable budget not compromising the quality. Another crucial aspect was to be in the same time zone of Luxembourg or very close.

After the Request for Information and Request for Proposal, and many back and forth, I have taken my decision along with management on the right one. They were actually based in UK that meant one hour behind which was good.

The strategy in place I had was a **Waterfall** methodology with the supplier and part of the overall project, and **Agile** to our internal team.

This **Waterfall** approach included development and testing from the supplier of the core software and more on the frontend and also all of its testing. They were bond to deliver certain number of deliveries and achieve milestones on specified deadlines.

From my team, we took all the internal development/testing for backend and all the integration development related to the core software in relation to other existing applications.

Another part that was shared was on the business analysis, where our team represented the business analysis for our internal clients/key users / stakeholders and their business analysis was focused on our analysis having us as their client.

Our team then worked on **Agile** for all the development and testing making sure we were delivering the application on the integration and backend. Then gradually my team was delivering parts of the software to the supplier and vice-versa complementing each others creating a combination between agility and control.

Key users were involved throughout the project on the progress especially in the part of data. Data in that company was very important and by having key users / stakeholders defining the correct data to be used and to be passed from application to another. This allowed that somehow the application requirements were validated to its full extent and if something missing or wrong would be spotted then it could, in due time and with less impact, been taken care.

As a **conclusion**, in my opinion and according to my different experiences in all of these methodologies, there is no right or wrong methodology or approach.

It all comes down to what could be better fitted to achieve successful results, at the end of the day that is what the business is expecting.

I understand nowadays companies want to achieve faster results and to be very dynamic on their approaches in order to be successful, time is money!

But everything needs to be well evaluated, each methodology has its own space depending on the needs and on what and when has to be achieved.

I personally had overall positive experiences by using individually Agile, by using individually Waterfall and by using a combination of both Agile and Waterfall.

I must say that for future projects, I will be honestly more open to use the combination of both, like already said, a bit and a combination of both worlds, Agile and Waterfall, is ideal and successful from what I experienced!

Career

Personally and professionally I had the opportunity to grow and to learn with every experience.

In every company and project I have been through I have retained positive and negative things where it helped to shape who I am today.

Even in the less positive experiences I have taken lessons learned and have transformed those into positive and as a learned lesson.

I have become someone more mature and knowledgeable, to listen and always be open to learn.

One of the key competences I value the most is the human side, to communicate with people, motivate, learn, listen and be proactive.

The technical side is surely very important and requires a daily learning and adapting to new business, areas, technologies, tools and above being able to adapt to new environments.

I have fortunately had the opportunity to always work in multi cultural and multi language environments and that has been priceless, it helped me to grow as a better professional and as a better person. Open to exchange new cultures and new challenges.

Living and working in Luxembourg since 2007 has allowed me learning new languages and experiencing other ways of living and working.

I have been able to adapt to new environments and learn new languages as French and Luxemburgish and improve significantly my English level.

Languages are a crucial factor here in Luxembourg, it is a country that has 3 official languages French, Luxemburgish and German plus English as the highest used overall in the business of the country.

So languages are a key factor on my day to day work, being English and French the main languages of my work, to communicate verbally and in

writing, to do business, to write documentation, reports, to organize, moderate and run business meetings.

But being Luxembourg such a multi cultural country, in my day to day I have the opportunity to speak also other languages such as my native language Portuguese, Spanish and even Romanian.

So, I can say that I grew as a professional and as a person but nothing of that wouldn't be enough if I didn't also learn the languages and well integrated in the country.

I know now more than ever that human relations within each company, team and project are a crucial part despite of having great technical competences.

This doesn't mean that technical competences are not important, they are, they are as well key to successfully perform.

In my case, I have had the opportunity to do a lot of internal and external trainings, get certified in several methodologies and technologies and learn from more experienced professionals on IT and not only. I had as well the chance to learn new business areas and sectors not just in IT.

Initially in the beginning of my career I was not sure in which path I would go in IT, as you know IT is big and has many areas where to get specialized.

As years passed I have worked in all the areas of a software project lifecycle, not only I gained valued experience I have also understood the next steps I wanted to take in my career.

In the beginning I worked in a more technical and hands on roles within a software project life cycle. After few experiences I have gained more responsibility and was able to manage projects and teams and still being able to advise and take decisions on technical matters.

All in all, I feel I reached a level of experience and knowledge in order to evaluate the Agile vs Waterfall and apply the correct methodology accordingly.

In overall my professional career up until now has been growing progressively and exponentially and I feel I am now stable and I know what I want for my future.

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