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PROJECTS: FROM FREEDOM TO PRISON
HOW PROJECTS LOST THEIR IDIOSYNCRATIC ATTRIBUTES AND ITS MANAGERIAL CONSEQUENCES.

THE CASE OF A LARGE PROJECT ORIENTED GROUP

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ABSTRACT

Project definition over time did not evolve over the last century. The project is an autonomous, unique and temporary organization dedicated to the execution of a unique outcome. This commonly recognized definition is nevertheless questioned by a detailed analysis of the academic literature. A longitudinal analysis on project management literature demonstrate over time the paradoxical status of the project organization being still viewed as an autonomous organization while its paradigmatic status acknowledge its constant evolution towards a highly standardized organization tightly coupled to its parent entity. This raises the question of the management of the tension between standardization and autonomy in project supervision by the central unit.

In an embedded case study, I compare six project-organizations from two different units of a project-based company. The research shows that the project studied did follow the paradigmatic evolution of the project organization toward a standardized organization, and we can conclude to the tight coupling of the project studied to their parent organization. In parallel we also demonstrate that in one entity the supervision practices remain project centric and therefore we can demonstrate the inadequacy of the supervision practices and the standardized project execution while for the other unit the adequacy of the unit centric supervision practices with the tight coupled project organization is demonstrated.

In the discussion and conclusion, we advocate the need for the leadership teams of a unit to acknowledge and benefit from the recognition of such evolution. The loss of project idiosyncratic attributes such as autonomy would require project supervision practices adaptations for the units to cope with such paradigmatic evolution. Unit and project execution would then benefit of project monitoring and supervision adaptation.

ACKNOWLEDGMENT

What a journey, When I started, I never envisaged that the it would last Five years, Five intensive and exciting years. During that time I have been appointed in 2 new different positions and my Family and I moved in 2 different countries…

I knew I was jumping in the unknown and that this unknown would be chaotic on its own but trying to balance this doctoral adventure, the new professional environments and the well-being of our family at the same time has been a challenge that I would have never been able to achieve without the precious help of the people I'd like to thank in those few lines and acknowledge how grateful I am for their support, friendship and love

I would Like first to thank Lionel Garreau, my thesis director. Lionel's availability at any time has been of great help. Lionel helped me, getting into the unknown academic world that I had first some difficulties to understand, and acted as a translator, as a knowledge transmitter going back and force tirelessly from the academic world to the management practices.
I would also like to thank Lionel for his understanding, he accompanied me all along the journey, with no judgment, following the pace of my evolution toward the research and the pace of my professional constraints. I guess many Thesis directors would have lost patience and faith with the little progress I was making in some periods but Lionel kept encouraging me, kept advising while leading my research. Having Lionel letting me defend my work is of great importance and a recognition on its own as I value very much is leadership, is academic rigor and his friendship if I may.

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CONTENTS SUMMARY

« La science des projets consiste à prévenir les difficultés de l'exécution »
Vauvenargues, 1715-1747

« Il faut, dans ses projets, faire la part des hommes et celle des événements imprévus »
Sosthène de La Rochefoucauld-Doudeauville ,
Le livre des pensées et maximes (1861)

PART I: THE BIG ISSUE

GENESIS OF THE RESEACH

1. PROJECTS FAIL

Without being sarcastic, I have been reassured when looking at statistics on project success. It appeared that project success ratio in most companies and most industries is very low as compared to the size of the investments and the importance of such projects. I would have expected higher hit ratio and thankfully I was not the only one to face projects execution issues…

Morris (1987) did not conclude differently in the preface of his well-known book "The Management of Projects". *" I had data on 1449 projects – all that I could then find in the public record; of these, incredibly only 12 had out-turn costs below or on budget! (Later I repeated the exercise with over 3000 projects, with similar results)"*(Morris, 1987, p viii)

As an example in table 1, the Chaos report issued every 2 years by the Standish group highlights that over the last 10 years almost 20 % on average of IT projects launched were not achieved (stopped) and less than 30% of projects will be considered successful in view of the "triple constraint" (schedule, cost and specifications)

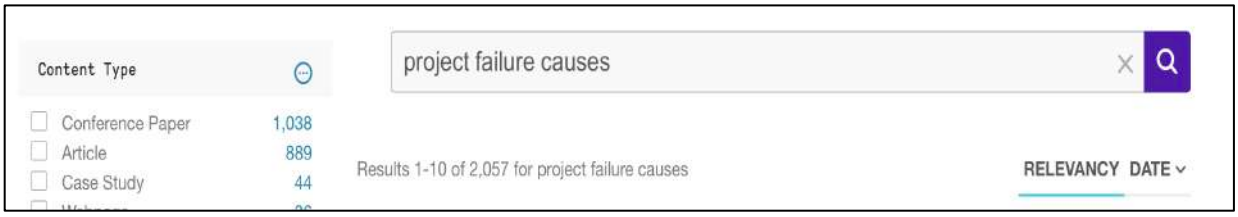
Table 1: Project success ratio in Software industry

	2011	2012	2013	2014	2015	2016	2017
Successful	29%	27%	31%	28%	29%	29%	33%
Challenged	49%	56%	50%	55%	52%	54%	48%
Failed	22%	17%	19%	17%	19%	17%	19%

The Modern Resolution (On Time, On Budget, with a satisfactory result) of all software projects from FY2011- 2017 with the new CHAOS database.
Source: 2018 CHAOS Report: Decision Latency Theory: It Is All About the Interval by James Johnson

Project failure causes seem well known. The PMI refers (Figure 1) to more than 2000 different, articles, conference papers and other references related to Project Failure (PMI website research typing "project failure"- Oct 22) .

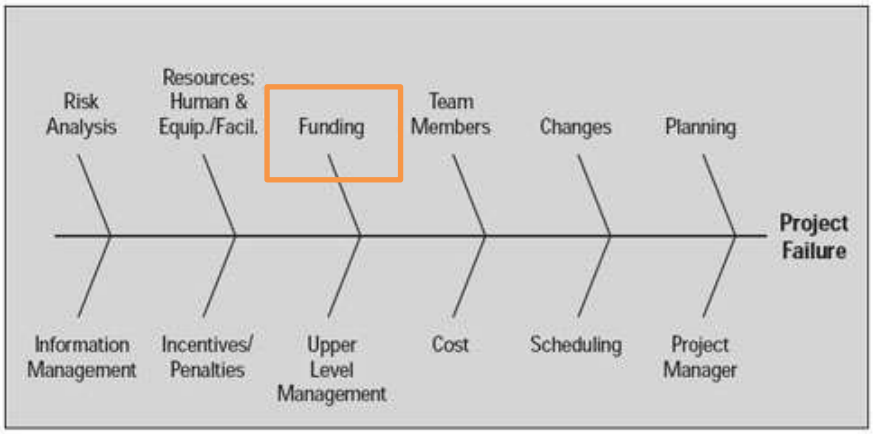
Figure 1 : Project failure literature on PMI website



(Source PMI.org Oct 2022)

An article from Ken Blak (1996) presents the main causes of projects failure (figure 2). It is very interesting to notice that all causes but one are internal to the project. The project management looks like self-absorbed when looking at project execution failure.

Figure 2: Project Causes of failure



Source :(Blak K., 1996)

As a summary, the causes are known, there are all organizational, behavioral or skills related – therefore not impossible to fix or improve but year after year, study after study, successful projects are still the exception as compared to the projects that failed or that were not delivered on time, on budget with the right content.

This statement is raising a question. Are all causes, internal to the project, the only problems that lead to unsuccessful project? Are there any external factors that could also explain the low success ratio on project? Would have they been missed when looking at failure genesis?

I believe the answer is yes and looking at project deficiencies taking the project as a stand-alone and autonomous organization might be one of the biases mentioned above. The project environment, the customer environment, the parent unit history and DNA might be as many potential external factors of failure that would negatively impact project execution and successfulness. I will try to illustrate this initial thinking thru three different examples I experienced over the past few years.

2. A PRACTITIONER EXPERIENCE

In the different roles I have been assigned over the last 25 years, I have been confronted mostly to large project-based company. I have been fortunate to discover several different Industries such as Defense with command & control Center for NATO countries, Security for the Oil & Gas plants in Saudi Arabia, Avionic industry in California, Transportation industry and Defense Naval industry in the Netherlands.

During those years, I had to accommodate to different type of legal entities such as Joint ventures (JV) fully owned companies, or partially owned company due to local business rules (49% maxi for foreign investors). I also experienced several group organization, from geographically focused organization to business focused organization and matrix organization trying to balance both geography and Business orientation. Finally, I have worked with many different nationalities, I had often to manage cultural aspect of a multi-cultural environment. At one time, I had to manage 15 different nationalities out of 24 teammates. All those different businesses, organizations or different culture brought their own complexity factors that I had to adapt to run our activities. They also brought their own advantages and strengths that I could use to operationally contribute to the management of the units.

Nevertheless, despite their own specificities, executing and delivering customer project was the common goal in each of those experiences. To be more precise most of the projects I worked on and later that I supervised were Large International System Integration projects with a large mix of Material delivery, Software development and subsystem & system integration.

Interestingly enough, but obviously sad, another commonality was that many of those projects failed to be delivered as per initial costs, schedule and scope. I attended many lessons learned meetings, many audit team, tiger team or red team debriefs and most of the time the same mistakes brought the same negative outcome.

I must admit that I very often felt frustrated with the outcome of those pre & post mortem analysis. In most of the cases the reason were mostly project internal issues such as project organizational issues, inabilities to work together, lack of anticipation risk adversity or wrong initial assumptions… Why were we not able to learn from those experiences? It seemed that whatever the context, whatever the organization or the business we were facing the same execution issues reproducing the same execution mistakes…

The three projects presented below are typical projects I had to supervised where we faced execution issues, and that we treated as project issues with a strong project centric focus. Those projects made me think over time on the influence of external factors leading to project failures.

2.1. The Saudi Cases: The long-term strategy

In 2009, we were awarded two major transportation projects in Saudi Arabia. The first one was the Makkah Metro that would carry thousands of pilgrims in a very limited time from one Holly place in Makkah to the next one. (There are seven places to stop for a pilgrim during the Hajj). This project was politically very sensitive and failing was not even an option. The second project was of great importance as well as it was a main line that would cross Saudi from the Jordanian border to the south-East part of Saudi. This line would carry passengers but more importantly

minerals extracted in the north of Saudi to the Chemical & transformation plants based in south-East of Saudi.

Due to the sensitivity and the complexity of those 2 projects they were initially envisaged to be executed in an export mode where our most experienced units, located in Europe and North America, would develop and deliver the system from abroad limiting the local activities to installation works and Project Management Office (PMO) hosting.

At that time, our Saudi unit was skilled in Project management for security project in the Oil and Gas industry. Saudi was also at that time in a "booming environment" and a major country infrastructure plan was just launched of which those 2 initial projects were part of. There was therefore for us a significant list of transportation prospects in the near future that we were expected to be awarded. We were having enough transportation activities for the next 5 years in Saudi and were expecting additional projects to come shortly.

Following an overall group reorganization emphasizing the primary and critical role of the countries, we were asked to change our strategy in the country, to create a transportation competence center in Saudi, with skilled engineers to support our growth in the country. We then changed our industrial organization for the 2 initial projects and reconfigure our setup from export projects to primarily onshore projects.

After 10 years, the statement is quite negative. Our 2 projects were thankfully delivered but there were both delivered late as compared to our initial commitment and we faced significant costs overruns. This is very understandable as our learning curve has been very slow and it took us time to ramp up and to create the competence by training the teams on the job. This change also had subsequent consequences.

When facing issues to deliver our project, we re-organized our Saudi unit and brought experienced European senior management staff to rescue and deliver the projects. We focused at delivering those 2 projects and we neglected the business development and impacted drastically our competitiveness in the country due to the size and the cost of our structure, so that not only the transportation but also all our civil activities would be impacted. In addition, we never saw the prospects transformed in contract as the oil price dropped and all the infrastructure plan has been either reduced and for some of them, the opportunities cancelled.

Finally, it is also sad to conclude that all the skilled employees left the company before the end of those projects, having limited visibility on short term "after project" future and we had to use our offshore unit to finish the projects while our local workforce brought their expertise to our competitors in the neighboring countries such as Oman, Bahrain or the UAE….

Looking back at the Saudi experience I still believe it was the right strategy the company took at that time. What is not clear to me is the implementation. Why did we jeopardize project success (as per cost, schedule and scope prism) to achieve it? As standalone project, it is obvious that both organization setup were not the optimum and were driven by the long term strategy in the country, not by the short term project's needs…

2.2. The Qatari Cases: "Once burned, twice shy"

We learned a lot from the Saudi experience, at least this is what we thought so that when we were awarded two major Qatari projects, we decided not to reproduce the Saudi Strategy. No competence center in Qatar was clearly our main goal when bidding those two projects. The future pipe of opportunities in the country was also not as big as the one foreseen in Saudi.

The two projects that are still ongoing as of today were quoted in an export mode with limited and low value activity in the country. We had no doubt that we would deliver successfully the project to the Qatari customer (successful from the customer point of view!!) but unfortunately, I am also fully convinced that those two projects will never be classified as successful in our management view. Cost went up from the beginning and we have very little hope to recover those overruns.

The interesting point in this Qatari case is that we were sure to have the right organization to deliver the projects. Our most experienced units would master the technical issues (quite limited), the local organization was optimized to manage our local activities such as installation and local project management.

We started the ramp up of the local organization with few people only as at the beginning of the project, most of the activity is the design and documentation that our offshore units were taking care of. After less than 2 months we received a letter from the customer complaining about our slow ramp up and our disinterest to their 2 important projects. Both projects are linked to the 2022 Football world cup and are therefore politically very sensitive for the customer.

We met the customer and explained that our teams were fully mobilized in France and Canada and were progressing well on the projects. The customer nevertheless imposed us to repatriate a big part of the design phase in Qatar to ease its supervision on their side. Once again, this change created delays as it has been very difficult to find the right skilled people willing to expatriate in Doha for at least 2 years and subsequently the costs of the project exploded as compared to our initial view.

In the Qatari case, several external factors such as the customer context, the culture of the country and our past local experience drove management decision bias. We had experiences in Middle East countries and we should have had anticipated such reaction from the customer. This is not unusual at all. There was no willingness on their side to create a competence in country but

culturally they cannot understand paying hundreds of Millions and facing on a daily basis very few middle manager and a handful of low skilled local resources.
I strongly believe that this underestimation of local culture is also a subsequent consequence of the Saudi case that I will try to explain after the third case I'd like to describe.

2.3. The Taiwanese Case: The Green field experience

In the transportation, we differentiate what we call the green field to the brown field. The green field being a new metro, a new tramway where we start the project from scratch. The brown field relates to project where the Transportation system is already in place and in operation. In that case, the brown field drives its own complexity factors such as availability of the system to be changed or upgraded during night shifts, security issues, etc.
In the Taiwanese case, it was a full green field as not only it was the delivery of a new Tram system but this was our first Tramway system worldwide and also our first experience in Taiwan. There was therefore a lot of unknown in our side and we took great care before setting up the adequate organization. To explain briefly, we limited the local activities and subcontracted most of the installation to transfer part of the risk. To maintain the cost down we also limited the role of our European unit (Italy) to the Tram system delivery (software and part of the material) with also limited support from a third unit closest to Taiwan but skilled enough to design and commissioned our Tram system. I am sure that we could have optimized this set up but this could have been marginal as we think the organization in place for the project was the optimum one. After two years of execution we are still convinced of the right correlation between our organization and the need of the project. As for Qatar, this is still an ongoing project but guess what? Despite the great care, we took to organize the project team we did face some delays and associated overruns!
The group already ordered an internal audit to understand the reason of such delay and costs increase. We attended a lesson learned debrief from the audit team that found many good reasons of failure inherent to the project such as lack of skills in the third units, lack of support from Italy, some technical reasons as well on the maturity of our Tram product. As a summary, this is a new field for us and it is quite normal to face issues that we will learn from.
Most of us went out of the meeting with the true belief that causes found by the audit team were main reasons of this delay and overruns. But were we sure? Once again, I felt frustrated and not convinced at all, I was strongly convinced that some part of the analysis was missing but I couldn't put a word on it.
When stepping back and reviewing the Taiwanese case, I believe that one of bias that led to execution issues is once again due to an external factor. The industrial set up of the project was not optimized for the project execution but was he best set-up within the context of the Business

line organization at that time. From a business line standpoint the project organization and the responsibility split between units was making sense but I am less and less convinced that it was optimize for a pure project execution success.

I introduced above few examples of external factors influencing the project execution, but I could have found many more that have also never been studied or considered as potential source of project execution failure.

3. QUESTION RAISED? WHAT TO CONCLUDE?

The first conclusion is indeed obvious but limited. The 3 cases or the 5 projects will appear soon in the equivalent of the Standish Group report (dedicated to IT projects only) for challenged industrial projects.

The second one is maybe less obvious and it took us some times to realize it. Looking at the Saudi cases, the initial thinking to deliver those projects in an export mode was the right choice taking into account all the parameters known at this time. There has been a change in the organization driven from an external fact to the projects (implementation of a transportation competences in Saudi) that finally forced us to change the setup, leading to face significant difficulties to respects our commitments towards our customers but towards the management as well. In my view, the change in the country strategy and more precisely the fact we mixed the project execution and the country strategy implementation was the main root cause of what I consider now as a significant failure. We could have led those 2 topics (with different goals which were delivering 2 important transportation projects and implementing a new transportation strategy in the country) in parallel without impacting each other or with a limited inter-dependency. It looked cheaper initially to learn and create the in-country competences "on the job" rather than creating the skillset in parallel and this is where we failed. The costs impact of projects disruptions we created was far more costly.

In the Qatari cases the initial industrial organization was in our view the most efficient one and we were still traumatized from our Saudi experience, we then did not want to renew it in Qatar. By doing so we collectively became "blind" and created a black shield that prevented us from applying another lesson learnt from the past: Do not underestimate the power of the customer's culture. We could have explained our strategy to the customer at an earlier bid stage to get his validation on the proposed organization or we could have taken a stronger local content to fit with the customer expectations that were already known from other projects delivered in Qatar.

Another bias led us to misunderstand the local context. Once the customer forced us to repatriate some of the engineering activity in Doha, we thought that we would have additional funding from the customer. In the past, we faced difficulties and project overruns on previous projects in the

country, but we have always been able to compensate thru variation orders. Once again, we did not look at the country context and did not realized Qatar had less budget than in the past and they became more contractual such that they could impose their view without funding these changes. Based on our past experience we neglected the contractual negotiation and we learned the hard way the country changed.

Past experiences, external factors led us not to take the current context in our assessment. We could have managed it better with better anticipation but we have been fooled by our Saudi Trauma and our past "success story" in Qatar. In the past, the company suffered on few other projects in the country but through Variation order and negotiation, the company has been able to recover its overruns by additional funding.

In Taiwan, we could think we were facing a totally new situation so that no past & traumatic experiences, would dictate our industrial organization. This is true at least at a first sight. In the Taiwanese context, limiting local content was not an issue, we took a skilled unit to lead the project close geographically from Taiwan while we limited the role of the European unit to gain competitiveness. This approach was efficient as we won the project and we picked the best option to allocate resources between Singapore & Italy.

Looking closer to the organization we realized that our organization was the most effective taking into account our current Business Line (BL) organization, meaning that we had to deal with an external factor (the BL Organization) and this project would be executed with the best setup in the context of this BL organization and not with an optimized organization specifically designed to the project interest and need. What would have been our project organization if Singapore would have not been skilled enough? The project need would remain the same with the same needs as a standalone but our responses to this need would have been totally different.

Those examples lead me to question whether or not, project failures are only due to internal issues within the project or more probably as I want to demonstrate, very often influenced by external source such as, company strategy, organizational issues, company resources availability … Thus, this also lead us then to question whether or not the influence of the external environment of a project if denied would not lead to managerial bias. "A *project needs to be conceptualized as a history-dependent and organizationally-embedded unit of analysis*" (Engwall, 2003). I argue that looking at the project as a standalone organization while the project is coupled up to a certain extent with its parent company may lead to management bias.

4. The Grey Literature on projects & Project failures

4.1. What is a project?

Nowadays, the word 'project' is a very generic term used for all and everything and can be found in many different fields. When someone have strong belief how he wants to drive his life in the future with the aim to achieve that goal, we commonly call it a Life project. When a large group of people like a country share the same idea on how they want their group organized, we call it a societal project (Dehaene J.L., 2000). This term is very often used by politicians to describe how they want to transform the society. In education, Dewey (1897) introduced a progressive approach of education that Kilpatrick later developed and called "Project method" (Kilpatrick, 1918) which consisted of a new learning method where class programs and class activities would be organized around a main theme (the project subject) and where the young student would drive their own research to understand and learn while the teacher would only be there to guide them. In healthcare, teams talk about care project or health project to build a plan dedicated to a large action. Leprosy care project is an example of actions and means dedicated to reduce/Cure Leprosy on earth.
I could find thousands of examples of the use of the 'project' term and the following definitions would most likely fit with all the areas where it is used. However, our focus will be on 'project' in the management field but those few examples show how popular the word is. We will see later that the raise of the influential importance of the project concept did not happen randomly nor by chance and that is the current status of a process that started almost five hundred years ago during the "Renaissance" (Boutinet J.P., 2015)

Our research topic is related to the potential tensions created by project management and project organizations that seem more and more standardized and tightly couple to their parent organization and while I believe project organization is still considered in people's mind as a standalone autonomous agile and temporary organization dedicated to a specific achievement. This view is for me the current **project definition: A unique standalone, agile and temporary organization dedicated to the execution of a unique goal.**

Before going further, I would like to check if this definition is still shared today or outdated. To do so, I looked at different definitions from several different sources such as the simple dictionary, the project management institute (PMI), one of the most, if not the most, influential professional organization in project management, or in the international standards (ISO).

I first looked at the Oxford online dictionary which gives the following definition of project: *"An individual or collaborative enterprise that is carefully planned to achieve a particular aim".* This definition is quite generic, but it is interesting to note the definition includes 2 main attributes of our understanding of project: the temporary character and the specific purpose associated to the project (uniqueness).

The International Organization for Standardization released the ISO 21500 that defines the Project: "*A project is a unique set of processes consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective. Achievement of the project objective requires deliverables conforming to specific requirements, including multiple constraints such as time, cost and resources."* The ISO standard emphasizes the uniqueness of the set of processes that compose a project. All the definition is oriented toward specific processes and procedures to achieve a unique objective. To be noted that ISO therefore strengthens the idea that project is not standard operation ("*It is not business as usual*") that obeys to a standard set of rules. The uniqueness of the project is also confirmed by the French Standard organization, as the standard X50-106 AFNOR gives the following definition: *"a project is a specific approach which allows to structure methodically and gradually a reality to come. A project is defined and implemented to develop an answer to the need for a user, for a customer or for a clientele and involve an objective and actions to be undertaken*[1]*".*

The Project management institute (PMI), the most influential organization in that field has also its own definition. *''A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists. ... Every project creates a unique product, service, or result. The outcome of the project may be tangible or intangible. Although repetitive elements may be present in some project deliverables and activities, this repetition does not change the fundamental, unique characteristics of the project work. For example, office buildings can be constructed with the same or similar materials and by the same or different teams. However, each building project remains unique with a different location, different design, different circumstances and situations, different stakeholders, and so on. An ongoing work effort is generally a repetitive process that follows an organization's*

[1] Free translation of : 'un projet est une démarche spécifique qui permet de structurer méthodologiquement et progressivement une réalité à venir. Un projet est défini et mis en œuvre pour élaborer une réponse au besoin d'un utilisateur, d'un client ou d'une clientèle et implique un objectif et des actions à entreprendre'

existing procedures. In contrast, because of the unique nature of projects, there may be uncertainties or differences in the products, services, or results that the project creates. Project activities can be new to members of a project team, which may necessitate more dedicated planning than other routine work. In addition, projects are undertaken at all organizational levels. A project can involve a single individual or multiple individuals, a single organizational unit, or multiple organizational units from multiple organizations."(PMI, PMBOK, 2013, p 3)
In its definition, the Project Management institute (PMI) insists on the temporary character of the project and the uniqueness of the expected outcome. The PMI also designate project as the most suited organization type to manage uncertainty.

As a first conclusion of this limited review, I can confirm that my definition of the project is well in line with most current popular project definition.

Nevertheless a part of PMI definition triggered some question on schizophrenic positioning of PMI toward the idiosyncratic and so-called autonomy of the project organization: *"Although repetitive elements may be present in some project deliverables and activities, this repetition does not change the fundamental, unique characteristics of the project work"*(PMI, PMBOK, 2013, p 3). It is very interesting to note that the PMI escapes with the sentence above from their paradoxical positioning of being one of the biggest provider of standardized project management methods and tools and claiming for the idiosyncratic attributes such as autonomy and uniqueness of project in their definition. As many companies follow the PMI recommendations, I am wondering whether this paradoxical statement is not carried to the company structure through the PMI standards implementation.
The question is to determine whether or not this is influential to project execution and how it impacts project successful outcomes.

4.2. What is project failure and why project fail

The commonly accepted definition of Project failure is related to the respect of what is called the Iron Triangle: Costs, schedule and scope. The iron triangle also called Triple constraint has been identified for decades as most used criteria to measure project success or failure. (Atkinson, 1999). The origin of Iron triangle is unclear but Olsen (1971) already mentioned it as success criteria for project. If the project failed to be executed within the given schedule, within the given Budget with the entire defined scope, it will then then fall into the long list of unsuccessful projects. The project triangle legitimacy, as main success criteria has been questioned over time. Bacarrini (1999)

propose each project to define a project start what would be the criteria against the project success would be monitored and assessed.

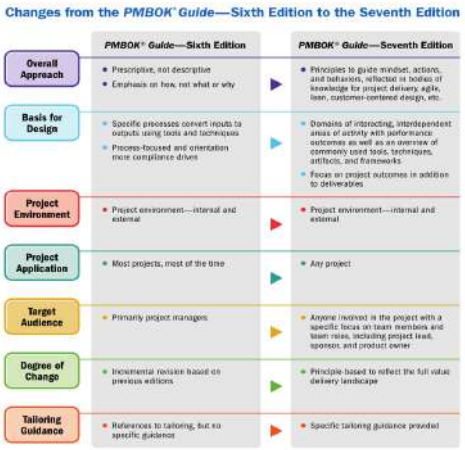
More recently the Standish group modified their chaos report (Chaos Report 2015) by defining, the use of the iron triangle, as the traditional measurement of project success. They then brought a second measurement called “Modern measurement” that would replace the scope of the triangle by “satisfactory deliverables”. That supposedly would include the customer view in the project measurement success. Many other articles related to other criteria emphasize the complexity and diversity of such measurement.

Looking at the PMI, at the Standish group reports or any root cause analysis that I saw in the studied company, the majority of the reason given for project failure are related or described as being internal. As an example, I would find the project management team claiming that they did not have the right resource. Were they unavailable due to another project? Were those resourcing existing in the company? No one defines why the resource were not the right one. On the product side for example we experienced the same comments. The product was not mature when we sold it? What does that mean? Is that related to the project or related to the company product development policy? The statement would be internally driven, never externally driven.

5. The Research Object

Why such a dichotomy between one trend in project management pushing towards standardization and another historical pattern still pushing today for de-coupling project and the permanent organization. Why is the same institute defining the project as an autonomous, unique and temporary organization which aim to deliver a specific and unique scope on one side, and pushing towards more and more standardization toward Project management principles?
Very recently in the statement announcing their 7th edition of the famous PMBOK® Guide, PMI reinforce its paradoxical positioning by allowing tailoring processes (figure 3) to cope with project uniqueness attribute but in the same time providing specific guidance to do so… : “*We’re also providing specific considerations for tailoring the development approach and processes to the unique characteristics of the project”* (PMI website statement Sept.2020)

Figure 3: Paradoxical positioning toward uniqueness and project autonomy



Source PMI website sept 2020

The increasing number of projects lead many companies to Implement a project-based organization (PBO) what I call a "project factory" a standardized permanent organization dedicated to executing project in a very standardized and risk controlled way. Nevertheless, for many of the PBOs, like the company I studied, the primary way of steering project did not evolve. Project review or project performance review where the project manager reports to the organization the status of his project did not change over the years (Schneidmuller, 2001;Turner, 1993, p.80). Therefore, problems and unsuccessful factors are most of the time still manage thru the project angle. It is still rare that Project Portfolio review for example replace the Project review as primary steering tool, which somehow would potentially be a first step of alignment between Project Based Organization and steering tools. This is at least the case in the company studied.

"During project execution, both program and portfolio management roles include:

• *Identification of bad projects for increased efficiency, participation in steering groups, coordination and prioritization of projects, and collection and aggregation of reports for coordination of projects*

• *Project reviews, coaching, issue handling, and improvement of corporate processes for increased efficiency in execution."* (Blomquist et al., 2006, p 57)

By studying several projects from two different units of a same group, following the same group principles, rules & project guidelines, but having adopted two different set up to steer their business, I would like to demonstrate first the low level of autonomy for each project organization and then confirm the evolution of Project embeddedness within parent company to finally demonstrate that monitoring projects as standalone organizations while project organizations are strongly coupled to the parent company creates tensions in project execution and lead to managerial decision biases that influence project management and company performance.

6. EXPECTED MANAGEMENT OUTCOME

The first managerial outcome would be to have the practitioner questioning and maybe changing their steering vehicles to better aligned them to the project organization evolution.
We are currently experiencing such move in one of the units of the group studied where business is reviewed thru 3 different angles. Project review remain but at a lower level of the organization to ensure proper coordination within all department, then the main review at management level is what is called the MBR "Management Business Review" where projects are presented by the Customer Account Team (Geographical organization) and then by the Product team. Therefore, project and Issues are reviewed thru different angles; from a project angle, then from a product angle and from a customer and regional standpoint. One of the expected outcome of this case study is to analysis the effect of such steering tool in project execution.

The second managerial outcome could lead managers to question project-based organization that became overtime more a production function (Turner, 2002) embedded in the permanent organization and rethink the way to organize a team to achieve tailored customer projects or any non-recurring activities. Should they consider giving back project organization its initial purpose and therefore reduce standardization and integration/coupling or should they consider another organization to manage non-classical activities? In other words, is the project organization still the right set-up to execute project.?

7. STRUCTURE OF THIS THESIS.

In the Part I: **"the Big Issue"**, I start with my practitioner statement that Project success rate in term of schedule, scope and financials are somehow disappointing. I am therefore questioning if organization are looking enough at external failure root causes as most of the time, retex are made at project level and internal project failure are well known. From this external environment, I am more precisely questioning the level of autonomy that the permanent organization leaves to the project organization and the adequacy between the level of autonomy left to the project organization and the supervision practices the permanent organization use to steer its activity.

In the Part II: **"Theoretical Framework"**, we analyze the overtime evolution and dyssynchronization between the Project definition that remain an autonomous, temporary organization and the project paradigm that tends toward a fully standardized and integrated organization tightly coupled to the permanent organization. In the second chapter of the part II we review the growing contradictory trends in project management trying to understand the reason of the growing standardization in project management practices and therefore its associated push towards tight coupling with the permanent organization and the idiosyncratic need of the project organization towards a decoupled positioning vs the permanent organization. Both being contradictory but simultaneous and unavoidable trends we review this antinomy (Van de Ven et al., 1988) through the paradox theory.

In the following Part III, **"Empirical research"** , In the first chapter, I will define the framework of my research and explain my choice of using the embedded case study. After detailing and presenting the case of Thales, I then explain the data collections process and present the data collected for my research. Finally, I show the data analysis process I we used for the research.
In the second chapter, I will show the result of our research by analysis the level of autonomy of each project and the supervision used to steer its performance. From the project by project analysis we will show the commonalties and conclude at the unit level of the adequacy between the coupling level of the projects and the supervision used by the permanent unit to steer its activity.
The last part of this chapter present the comparison between the 2 units studied that help provide some conclusion for the case studied.

Finally in the last. Part IV: **"Discussions and Conclusions"**, we will show the theoretical and practitioner contribution of our research as well as the limitation of the work presented.

PART II: THEORITICAL FRAMEWORK

CHAPTER 1: TOWARDS THE PROJECT PARADIGM EVOLUTION

In this chapter I will demonstrate the potential growing disconnect overtime between project definition and project paradigm. We understand paradigm as defined by Thomas Khun (1970, p.viii): "*what I have since called paradigms. These I take to be universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners*." Or as said by Dubreil (2004, p18): "*As per Khun definition a paradigm is a dominant imaginary structure used as a reference to a current trend of thought*[2] *"*.

In the introduction I emphasized the paradoxical positioning, towards autonomy and uniqueness on one side and the standardization effort on the other side, of practitioners' organizations such as PMI and its potential management consequences. In this chapter I want to review the project management academic literature in order to analyze the project paradigm evolution over the last decades.

1. CONSTRUCTION OF THE ANALYSIS GRID OF PROJECT MANAGEMENT PARADIGMS

In their article "Lost Roots: How Project Management Came to Emphasize Control Over Flexibility and Novelty" (2010) Lenfle and Loch argue that by shifting from a Trial and error iteration and parallel trials to a phased approach in project execution, projects shifted from a flexible to a more controlled environment. This eye opener article led me to question whether or not the project execution approach was the only project characteristic that gradually transitioned from an open and decoupled environment to a more standardized and controlled organization. Is the project execution approach the only project attribute that would explain and characterize the contradictory evolution of the project definition and the project paradigm?

1.1. Project paradigm evolution approach

Papers related to the evolution of project paradigm are scarce but I believe this phenomenon would deserve more attention.

New managerial practices very often emerge as a reaction to the most common & popular practices in places that do not fit with new challenges faced (Le Roy et al. 2013) or from particular strategical, economic & industrial threats (Birkinshaw et al. 2006). Not surprisingly, the 40's were

[2] Free tanslation from : « *Un paradigme, selon la définition de Thomas Kuhn, est une structure imaginaire dominante qui sert de référence à la pensée de l'époque* »

such specific times from which we saw the emergence of Modern age project Organization (Kwak, 2003; Morris,1987). After several decades of bureaucratic and standardized organization developed by Taylor (1911) and later by Fayol (1916), the US Defense industry and its heavy hierarchical organization was unable to face the tremendous need for innovative weapon technology. The US Ministry of Defense launched the Manhattan Project with the aim to develop as fast as possible the first nuclear Bomb of the History. The Manhattan project is very often cited as the first project of the Modern Age of Project Management (Shenhar & al., 2007; Seymour & al., 2011). This project as mentioned earlier was a reaction of contemporary organization unable to cope with the urgency of developing innovative weapons that the second world war was making it vital for the US and their allied (Kwak 2003).

What the current PBOs and the Manhattan project have in common? With the growing influence over time of the Prince principles initially in the UK and the principles of the Project Management Institute (PMI) from the US at the end of the 50's, both pushing for standardization, phased approaches and many other principles, it is interesting to question whether or not the Manhattan Project is the father of such modern Project Management dictated by those powerful institution and their controlled environment; As mentioned by Lenfle & Loch (2010): "*the Manhattan Project did not even remotely correspond to the "standard practice" associated with PM today. Indeed, the Manhattan and the first ballistic missile projects fundamentally violated the phased project life cycle approach. Both applied a combination of trial-and-error and parallel trials in order to "push the envelope", that is, to achieve outcomes considered impossible at the outset*".

I argue that in fact this project is a perfect example of the first of a five steps dynamic of project paradigm evolution. Since the early stage of project management, the project paradigm came from few projects dedicated to a specific achievement and fully separated to the main organization , to a multitude of projects, some of them being repetitive, fully embedded in the parent organization. Project Based Organization can nowadays be seen as another production models as were Fayol's and Taylor's models; A project factory if I may say. Kwak (2003) linked the origin of Project management to Fayol, Taylor and Gant. Talking about project factory can be seen as thumbing its nose to history and a nice tribute to the fathers of automated, standardized, repetitive production. In actual fact, We have come full circle.

1.2. Project paradigm's attributes

To analyze the Project paradigm and the project definition evolution, I looked at a neutral definition of project and extracted from it the project idiosyncratic characteristics.

After considering a non-academic definition from the field of Project management practitioners, such as the PMI, the Prince 2 principles or the IPMA I concluded that the neutrality of such organization might be questionable. As mentioned earlier I noticed the paradoxical positioning of the PMI related project standardization versus decoupling. I believe using a definition from one of the influential professional organizations would not provide the expected neutrality.
On the other end, using the academic literature would not also fulfill our impartiality requirement for the definition I was looking for. Academic literature is strongly related to its epoch and the context associated. Selecting one view over hundreds of views proposed by academic literature would definitively increase our risk of being subjective.
I therefore decided to Look at a project definition, if any, from the International Standard Organization (ISO). Using such organization's definition would definitively limit our risk of subjectivity and would be acceptable, both from a practitioners view point as well as from an academic point of view. Luckily, I found ISO issued in 2012 a norm defining what is a project and what are the main processes for Project Management. Using the ISO21500 definition would definitively avoid any theoretical influence from one paradigm to another.

ISO21500 defines project as follow "*3.2 Project: A project consists of a unique set of processes consisting of coordinated and controlled activities with start and end dates, performed to achieve project objectives. Achievement of the project objectives requires the provision of deliverables conforming to specific requirements. A project may be subject to multiple constraints, as described in 3.11. Although many projects may be similar, each project is unique. … /… Every project has a definite start and end, and is usually divided into phases, as described in 3.10…/… 3.11 Project constraints: …/…. The project deliverables should fulfil the requirements for the project and relate to any given constraints such as scope, quality, schedule, resources and cost. …/…*"

Using abstracts from the definition I established 9 different attributes that can characterize a project. The table 2 summarizes the definition.

Table 2: Project attributes definitions

ISO21500 Project Definition's abstract	Associated project attribute	Definition
1 - with start and end dates 2 - Every project has a definite start and end	Temporality	The Temporality attribute is the lifetime of the project as an organization. This temporality might be definite or permanent.
Although many projects may be similar, each project is unique	Object	The object attribute relates to the purpose of the project organization. Why the project organization has been set-up and how unique, specific is the project organization.
1 - Achievement of the project objectives requires the provision of deliverables conforming to specific requirements 2 - constraints such as scope	Scope	Project scope: "*The work performed to deliver a product, service, or result with the specified features and functions. The term project scope is sometimes viewed as including product scope*" PMBOK (2013).
A project consists of a unique set of processes consisting of coordinated and controlled activities	Processes	Project Processes: "*A process is a set of interrelated actions and activities performed to create a pre-specified product, service, or Result*" PMBOK (2013)
constraints such as resources	Resources	"*The members of the team who carry out the work of creating the project deliverables".* PMBOK (2013)
constraints such as costs	Budget	"*Determine Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline."*PMBOK (2013)
constraints such as schedule	Schedule	"*The project schedule is an output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources. At a minimum, the project schedule includes a planned start date and planned finish date for each activity*" PMBOK (2013)
constraints such as quality	Quality	"*Quality requirements, which capture any condition or criteria needed to validate the successful completion of a project deliverable or fulfillment of other project requirements."* PMBOK (2013)
and is usually divided into phases coordinated and controlled activities	Execution Approach	"*the phasing and relationship of activities within the project's life cycle"* PMBOK (2013)

2. STUDY OF ATTRIBUTES EVOLUTION OVER TIME

2.1. The need for a timeline:

In the preface of his reference book, Morris (1987), is claiming a chronological approach in Project management. According to Morris, history knowledge is strongly required as there is a lack of information in the context of which projects were executed and those references on contextual environment are missing when trying to understand project evolution over time. Engwall (2002) argues in the same way, that linking project to its history and its environment is a necessity to better assess a project situation; "*Theories on project management are dominated by a perspective on singular projects, treating the unit of analysis as a lonely phenomenon. Anchored in a comparative case study, this paper discusses how the interior processes of a project are influenced by its historical and organizational context".*

There are different categories of chronological approach, the one we would call, not dated precisely and the one with stronger time borders.

In the first category Garel (2003) is referring to the 4 models proposed by Midler (1996); the entrepreneur model, the engineering model, the Taylorian model and finally the concurrent period. Those models arise over time but did not strictly succeeded to the previous one so that models might have been used during the same period in parallel. In his article "For an history of Project Management"[3] Garel (2003) also refers to the 3 maturity level of project management; the degree Zero of project management situated in the first part of the 20th century that brought autonomy to project management and the degree One of project management which started in the mid-20th century that drove project Management towards standardization of methods.

In the second category, Mark Kozak-Holland (2011) is organizing his book in a chronological way to address several determined period of Project management history covering several centuries. Morris (1987) organized his book by chapters covering a decade from the 50's up to the 80's. Chiu (2013) recommends 3 different periods for research studies in History of Project Management: 1950s to early 1970s; 1970s to early 1990s and then 1990s to 2010s.

Kwak (2003) is proposing 4 different periods of Project management (Table 3):

[3] Free tanslation from : « *Pour une histoire de la gestion de projet » Garel 2003*

Table 3: Project Management Historical Periods by Kwak (2003)

Periods	Theme
Prior to 1958	Craft system to Human Relations Administration.
1958 – 1979	Application of Management Science
1980 – 1994	Production Center: Human Resources
1995 to present	Creating a new environment

Kwak,2003

At this stage, I see that several proposals of timeline already exist. All are relevant and helped me to elaborate and to propose my own chronological, historical subdivision.

The analysis of the project literature allowed me to bring out five different periods (table 4) that will help me, according to this grid, to better understand the project paradigm evolution over time.

Table 4: Five periods toward project paradigm evolution

Periods	Brief description
< 30's	The origin of Project Management
30's to 50's	When Engineering took over Construction leadership in the field
60's to 70's	The Anglo-Saxon prevalence in Project Management Field
80's to 90's	Project massification : When exceptional becomes routine
00's to 10's	When project loose its innovative intrinsic capabilities

Understanding the past is helping to innovate and create the future, "*By adding history and organizational context, the study illustrates the explanatory power of a broader perspective on project management*." (Engwall, 2003). Therefore these proposed periods have a key role to understand the Project paradigm; "*history can help us to better understand the roots of project management and the evolution of current managerial practices. This could lead us to recognize innovative managerial solutions from the past that are still relevant today and contradict the dominant model of project management"* (Söderlund & al, 2013). Garel (2003) also argues: *"In general, the study of Management practices, without analysis, without historical context, without debate, production of discourse or theory, would never constitute a so-called management thinking"*[4]

[4] Free translation of *"De manière générale, l'étude des pratiques de gestion sans analyse, sans mise en perspective historique, sans mise en débat, sans production de discours ou de théories, ne constitue jamais une pensée managériale. »* (Garel, 2003)

2.2. Project from antique to the early 1900'

2.2.1. Before the 30's: Centuries of project management genesis

This period covers centuries, from the pyramid ages to the industrial birth in the 19th that could be qualified as the pre-Modern Project management. This historical reference is key to understand what would come next. All main concepts, all main practices and processes were born before Modern project outbreak. Morris (1987) mentions The Tower of Babel as the first project when people found out how difficult was the coordination and the communication to execute such ambitious handover and that ever since Project Manager would need a common language to overcome the difficulties. All idiosyncratic elements defining the project are already present: autonomy, uniqueness , temporality (Boutinet, 2015 p. 69) Morris (1987), Kwark (2003), Kozak-Holland (2011), Söderlund & Al (2011, 2013), Garel (2003)

The intent of this part covering several centuries is not to evaluate Paradigm's attributes evolution as I cannot state any Project paradigm (as per the definition I am using in this research). Nevertheless, our intent is double.

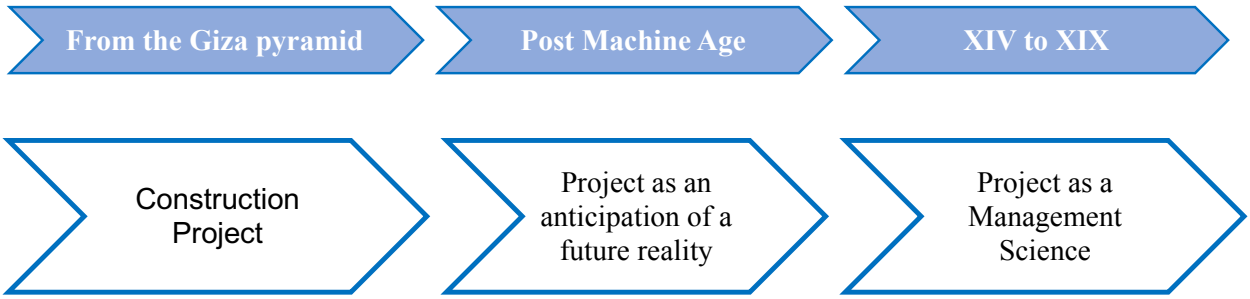
First by looking back at project history, I want to propose a reference on common project understanding where project definition and project paradigm were fully synchronized. Using the historical information from last centuries would provide a solid ground for this understanding purpose.

Secondly, I want also to defend the view that splitting Project Into two main periods mainly before the early 1900's and after the early 1900's sometimes called by some academic Modern Project management is too simplistic. Having a better understanding of Project evolution from the early Modern Era to the machine Age (Chiu, 2013) will provide meaningful inputs for analyzing project and project management evolution over the last decades.

Several books (Kozak-Holland 2011) made analogies comparing latest current practices such as suggested by PMBOK with historical projects. I argue that those analogies are meaningless. What was considered as proper management in the past is obviously/thankfully also found in the practices imposed by Professionals associations such as PMI. I argue that whether or not we approve such standards, we cannot deny that they are all leading to a pragmatic and rational intent on Project management and project execution, as were project leaders, in former centuries.

In my View, the importance of looking at historical evolution of projects is the demonstration of 3 disruptive project views that appeared over the past. I can therefore define 3 periods resulting from these 3 different views of the project.

Figure 4: 3 periods, constitutive of project from antique to the early 1900' by Chiu (2013)



Construction Project Era – From the Earliest Times to the medieval Period

The first Era is clearly related to Project as a construction initiative which aim to build significant infrastructure; Structural construction projects such as pyramids, the Great Wall of China… (Kozak-Holland (2011, p 30) . Chiu (2013), divided this large Era in two (Figure 4). The first one goes from Earliest times to the classical antiquity and the second one goes up to the Medieval period. From the first period Chiu (2013) argues that "*this era of project activities was foundational for all that followed"* where " *humans built upon the knowledge and traditions of the previous period*". At that time Master Builders were the leaders with huge responsibilities being in charge of both Design and project execution.

From the second period, Chiu (2013) rightfully conclude that : "*The discussion of these buildings* (Notre Dame and many others) *has indicated beyond doubt that significant divisions of responsibility in terms of labor and project management, and advanced skills in design, engineering, and construction, were essential to their successful erection. As with the previous period, the cultural and scientific environment was an important shaping factor, both aesthetically and structurally. .../.... What the Medieval period did in terms of building was to transmit previous knowledge and prepare for future knowledge. This was a crucial transitional period."*

2.2.2. Project as an anticipation of a future reality: An Heritage from the renaissance

The second occurs at the renaissance. Project are still related to construction but project is also seen as an anticipation of a goal to be achieved. Brunishetti, Alberti, Italian architects from the XV's century (Boutinet 2015) are clearly part of the forerunner that divided design and execution (Garel, 2018 p 30). For the first time, there is first an anticipation (Drawings, Plans) before the realization. For the first time as well this can lead to different responsibilities that can be taken over by 2 different leaders, one being responsible for the design phase (the anticipation phase) and a second one for the realization. The renaissance is the second very important period for project history. Boutinet (2015) explains the current definition of Project and the growing importance of

Project is coming from this period. Before the Renaissance everything related to the future was in the hand of God, therefore people did not have to plan and could focus on the present which appear to be already challenging. Starting at the renaissance, humankind started not to rely only on god in regards to their destiny and developed plan to better assess the future and to give it a more familiar and predictable view. In that regard, all our willingness to predict and better master our future started at the renaissance though the growing intent to build project as a goal to a reality to come. Looking at project as a way to plan the future realization, the renaissance has been highly important to the ongoing growth of projects development in the construction area but over time it also spread over many other areas … (Among others, life Project, Political Project, civilization Project). Ever since, Project has been subject to many analysis, philosophical thinking.
The table 5 hereafter synthetize what has been thoroughly presented by Boutinet (1995)

Table 5: Evolution towards the modern project concept as per Boutinet. (2015)

Period	Description	Key contributors
The Renaissance Period ~XV°	Project design and Project execution are for the first time segregated and might lead to 2 different leadership. Growing use of scientific, graphical and mathematical technics. Brunesllleschi invented the « *Spectiva artificalis* » a perspective graphic technic. « *However, the discovery of the perspective encourages the systematic use of the anticipatory drawing of the work to be carried out and therefore of the project.*[5] » (Boutinet 1995)	Brunelleschi, Alberti, Ph de L'Orme
the Enlightenment, The age of reason XVIII°	The enlightenment philosophers questioned the prevalence of God over the Human. For them, God is not the only one that influence Human future. Human becomes a key contributor to imagine, plan, to anticipate his future though the growing importance of Project as an anticipation of future reality. Project is assimilated to Progress for the society as written by Defoe in 1697 in his book :"*An essay upon project".*	Defoe Kant
German Idealism and phenomenology XIX°-XX°	For Fitche project is a mean to the liberty of human kind. Project is the perpetual effort of Men to the absolute freedom. Scientific innovation as a mean toward the quest for freedom. Project is seen as a humankind progress. From the emergence of phenomenology (philosophical movement) philosophers look at project as Intentionality. Once again, it refers to the anticipation of. A future to be realized	Fitche Hurssel Sartre, Heidegger

Before, presenting the third Era, I propose a baseline on Project attributes based of the 2 first Era

[5] Free translation of : *« Toujours est-il que la découverte de la perspective encourage le recours systématique au dessin anticipateur de l'œuvre à réaliser et donc au projet » Boutinet (2015)*

The academic literature is scarce for these periods, but the table 6 summarizes what can be found on writings about project history such as the ones from Morris (1987), Kwark (2003), Kozak Holland (2011) , Söderlund & Al (2011, 2013) , Garel (2003), Boutinet (2014, 2015) , Joffre & Al (2006). There are also many articles dedicated to one specific project from the past like *:" Florence Duomo project (1420-1436): Learning best project management practice from history*" Kozak Holland & Al (2014).

Table 6: Project attributes before industrialization

Attributes	Status	Comments	Academic literature
Temporality	Definite	Project could last for decades or even centuries but temporality was definitively a definite period.	Morris (1987), Kwark (2003), Kozak-Holland (2011) Söderlund et al. (2011, 2013) Garel (2003) Boutinet (2014,2015) Joffre et al.(2006) Seymour et al. (2011)
Object	specific	Each organization was specific	
Scope	Unique	Each project has his own scope, his own deliverables, his own legend…	
Processes	Specific	No formalization of processes so we can estimate they were tailored to the project needs. Nevertheless oral transfer of knowledge and practices was established so Master Builders were potentially not starting from scratch.	
Resources	Dedicated	Resources were dedicated to project despite the commonly accepted thinking that in many countries they might have been slaves, Kozak-Holland argue that major construction project were launched to provide jobs to the farmer and low skilled labor in times of economic peril.	
Budget	Unlimited by sequences	Budget were certainly not controlled as they would be in the future but it would also be exaggerated to think that budget were totally unlimited. Lack of cash was more a cause of schedule extension than a cause of termination. In that sense project budget were not limited	
Schedule	Very basic	Schedule were not anticipated but the resultant of events (wars, Lack of cash, pandemics …)	
Quality	stringent	Quality was key as many of those construction are still in place after several centuries.	
Execution Approach	Trial & Errors	Basic technology was existing and trial & errors was the main execution approach. Experience was driving execution not methodology	

2.2.3. Project as a management science

The third Era is concomitant to the scientific innovations boom that occurs over the last century. Our civilization transfers to the technologic Era as the project do. During this period the Engineering field is taking the leadership in term of Project execution model and methods to the Construction field which have been driving the project management practices for centuries. Project management is now seen as a sum of methodology and operating mode in order to optimize project execution.

New organization theories were proposed by Fayol or Taylor in the early 1900's, and methodology and operating models were first described and implemented to optimize and divide repetitive tasks. Nevertheless ,those management theories and especially Fayol's theory would somehow be at the origin of project management defined as a set of method and technics to execute a project in a standardized way; Kwak (2003, p 1) mentioned: *"Some literatures pointed the origin of project management to Henri Fayol's (1916)"*. In the same way Gantt, introducing a new technic of tasks scheduling is also seen as a precursor of Project Management. (Chiu, 2010)

The third era has not been integrated on purpose to the paradigm attributes status of the period as those few last decades over centuries of project history would strongly and inadequately modified the status of the period. I argue that this era is more the transitional border from the pre industrialization to the industrialization arising. Therefore it makes sense not to create a 6th period nor to give it too much emphasis in a period covering thousands of years.

2.3. Project in the 30's -50's:

2.3.1. The 30's- 50's: The end of Original Project management when Engineering Industry took over building industry leadership.

As mentioned by Lenfle & Loch (2010), the 40's and especially the Manhattan project cannot be seen as the Father of Modern Project Management. For us the Manhattan Project is the end of the Original Project management as perceived for centuries in a sense that I argue Project lost its idiosyncratic freedom in the 40's/50's. Modern Project Management links to technics and processes while Original project management (in opposition to Modern Project Management) as leader to achieve a specific goal remained the same for centuries. "*I would call an architect, the one who, with a marvelous and precise reason and rule, knows first how to divide things with his mind and his intelligence, and secondly how to assemble with accuracy during the construction work all these materials which by the movements of weight, the assembly and the piling up of the*

bodies can serve effectively and worthily the needs of man" [6] Alberti 1485 in Boutinet (2015 p-18)

This period is therefore crucial to be looked at in our sequential and chronological study. The influence of Planning, controlling and execution technics would prevail from Management skills emphasis. *"In that respect, what emerges is a narrow historical understanding of projects as static objects, rather than dynamic organizations*" (Söderlund et al., 2013).

Morris (1987) and Navarre (1993) are dating the arrival of Modern Project Management or the Degree 1 of Project management as per Navarre (1993) in the 30's-50's.

The fifties can be seen as the continuum of the growth of engineering Project. I argue that from an historical point of view, this is clearly the period when Engineering project became more important and more influential than construction project. Before 50's most major projects were construction projects and this for centuries. Stonehenge, Great Chinese wall, pyramids…. From now on Space projects, technological project would become referential (Joffre et al. , 2006, p50). At the same time, I proclaim that in the fifties, there is a shift in Project Management.

Project management is not seen any more as an Organizational leadership exercise meaning leaders driving the execution of one common goal but more as a technical expertise, using tools and method to deliver project. Leadership and Management have been reduced over technical experts.

2.3.2. Academic definition of Project

Morris argue "*in 1939 modern project management was just emerging as an embryonic discipline Although probably evident only to a very few…*". (1987, p.8). Very little literature has been found on Project management from this period for two main reasons. First as mentioned by Morris this was an "embryonic discipline". The second reason is that the very few interested in such organization type, mainly the military and engineering industries, were not academics and were busy to execute and deliver the vital project, running to find a quick winning end to the second world war. It is therefore very difficult to find any Project or Project Management definition coming from that period. Academics would later start to theorize and develop a management field.

Reading General Groves, the Head of the Manhattan project, in his book: "Now it can be told, the story of the Manhattan project" (Groves 1962), there is a continuous use of the word 'project' but

[6] Free translation of : « *J'appellerai architecte celui qui, avec une raison et une règle merveilleuse et précise, sait premièrement diviser les choses avec son esprit et son intelligence, et secondement comment assembler avec justesse au cours du travail de construction tous ces matériaux qui par les mouvements de poids, la réunion et l'entassement des corps peuvent servir efficacement et dignement les besoins de l'homme »*

also ‘enterprises’ is very often use as well. Interestingly enough, The head of US Army corps of engineering who initiated the Manhattan Project selected one of the most experienced officer from the Construction Division of the US army, the one that was just finishing the construction of the Pentagon in 1942.. A strangely premonitory scenario of Engineering taking the lead over construction on Project Management practices.

As mentioned in the introduction of this part, in 1939, the discipline was just emerging (Morris 1988), Nevertheless it is important to highlight the contribution to early management innovators that developed organization theory. Fayol was mentioned earlier above as a forefather of project management. Later, Gulick especially (1937) contributed to the field, and started, due to the division of tasks, designing the role of a coordinator between all parties involved in subdivided work, the ancestor of the Project manager role. “*When one man builds a house alone he plans as he works; he decides what to do first and what next, that is, he "co-ordinates the work." When many men work together to build a house this part of the work, the coordinating, must not be lost sight of. In the "division of the work" among the various skilled specialists, a specialist in planning and co-ordination must be sought as well. Otherwise, a great deal of time may be lost, workers may get in each other's way, material may not be on hand when needed, things may be done in the wrong order, and there may even be a difference of opinion as to where the various doors and windows are to go. It is self-evident that the more the work is subdivided, the greater is the danger of confusion, and the greater is the need of overall supervision and co-ordination. Co-ordination is not something that develops by accident. It must be won by intelligent, vigorous, persistent and organized effort.* (Gulick pp 5-6).

In 1959, one of the first paper about project management was written by Paul O. Gaddis. In his paper, Gaddis came with the following definition of project: “*A project is an organization unit dedicated to the attainment of a goal – Generally the successful completion of a developmental product on time, within the budget, and in conformance with predetermined performance specifications.” (Gaddis, 1959)*
It is interesting to see that the famous iron triangle (Cost, schedule and Scope) was already the model to be used to measure project success. More importantly, in Gaddis’ definition, the notion of specific organization (“*unit dedicated”*), the notion of the uniqueness of the goal (“*attainment of a goal*”) are there.

2.3.3. *Attributes & Project Paradigm evolution*

Table 7: Project attributes status in the 30'-50's

<table>
<tr><td></td><td>Status</td><td>Comments</td></tr>
<tr><td rowspan="3">Temporality</td><td>Temporary</td><td>Project is considered as a time definite organization that will end when the purpose of the project has been achieved</td></tr>
<tr><td colspan="2">Data supporting interpretation</td></tr>
<tr><td colspan="2">• "Another unique aspect of the project manager's job is that his task is finite in duration" (Gaddis, 1959).
• "The critical path method was originally developed in 1957 by Joseph Kelley and MR Walker working at …/…they were attempting to find the optimum (minimal) cost duration of a project whose activity durations were treated as fixed" (Turner & al, 2010 p57)
• "this may be a year or less in some projects, and may run to five years for long range, high budget projects." (Gaddis, 1959)</td></tr>
<tr><td></td><td>Status</td><td>Comments</td></tr>
<tr><td rowspan="3">Object</td><td>specific</td><td>In the 30's-50's New specific organizations are set up to cope with complexity that "regular" organization cannot handle. (Kwak, 2003)</td></tr>
<tr><td colspan="2">Data supporting interpretation</td></tr>
<tr><td colspan="2">• "A project is an organization unit dedicated to the attainment of a goal" (Gaddis, 1959).
• "the scope of the Hoover Dam project precluded a single company to take it on and could only be done with a consortium of companies…/…" (Kozak-Holland , 2011)
• " … and a project structure, in this case based on a special organization just for this project, the famous Laboratory #2" (Morris 1987, p 315)</td></tr>
<tr><td></td><td>Status</td><td>Comments</td></tr>
<tr><td></td><td>Unique</td><td>Project scope is unique and project are set-up to cope with non-repetitive outcomes. Following the growing interest in Organization theories, initiated by Fayol and Taylor ,leading to strong tasks subdivisions fully suitable for repetitive tasks, permanent organization were in search for a new type of organization that would better fit to managing the exceptional such as innovation initiatives.</td></tr>
</table>

scope	Data supporting interpretation	
	• *"He is managing a specific group of specialists; the professional mix of his group is tailored specifically for the accomplishment of an assigned mission" (Gaddis 1959).* • *"Vannikov and Zaveniagin, the soviet equivalents of General Groves (head of Manhattan Project), one gets the impression of a very clear goal with all necessary resources being devoted to its achievement" (Morris 1988, p 314)* • *"First, we had a clearly defined, unmistakable, specific objective. Although at first there was considerable doubt whether we could attain this objective, there was never any doubt about what it was. Consequently the people in responsible positions were able to tailor their every action to its accomplishment." (Groves, 1962)*	
	Status	Comments
Processes	Specific	Processes are at a minimum adapted to the given organization but more often fully designed and customized to fit the project needs. There is no formal guidelines to refer to in term of best practices and Project execution processes.
	Data supporting interpretation	
	• *"Previously, in 1943, the Manhattan Atomic Bomb Project had shown that transversal developments, organized in the margins of traditional structures and procedures, freed from budgetary constraints and under strong time constraints could rapidly bring about innovations… radical.*[7] *»* Garel 2003 • *"The entrepreneur's model is a dominant configuration of industrial development in the 19th and 20th centuries. In this model, the project identifies itself with the birth and development of a company driven by the figure of its founder. Cooperation here is based less on instrumented processes than on trust, charisma and interpersonal networks*[8] *» (Garel, 2011)*	

[7] Free translation of : « *Auparavant, en 1943, le projet Manhattan de bombe atomique avait montré que les développements transversalités, organisés en marge des structures et des procédures traditionnelles, dégagés des contraintes budgétaires et sous contrainte de temps forte pouvaient faire éclore rapidement des innovations… radicales* » (Garel 2003)

[8] Free translation of « *Le modèle de l'entrepreneur constitue une configuration dominante du développement industriel des XIXe et XXe siècles. Dans ce modèle, le projet s'identifie à la naissance et au développement d'une entreprise portée par la figure de son fondateur. La coopération repose moins ici sur des processus instrumentés que sur la confiance, le charisme et les réseaux interpersonnels » (Garel ;2011)*

	Status	Comments
Resources	Dedicated	At that time, project were huge construction contract or System engineering Projects. All resources were dedicated to the project and did not share their time between several projects or other activities. Project team was identified as such in the permanent organization and the sense of belonging was quite strong.
	Data supporting interpretation	
	• *".. More than 5000 workers in all … / Six companies (JV) realized that this community could be there for years so Boulder City, Nevada was completed in 1932…"* (Kozak-Holland, 2011, p 470) about Hoover Dam project. 1931-1935 • *"In the summer and fall 1930, the contractors, organized 5 high class lunch counters on site (on the 3rd, 9th , 24th ,47th and 64th floors) operated at lower than average prices." (Kozak-Holland, 2011, p 477) about Empire State Building project. (1929-1931)* – Team were therefore more productive not having to take longer break and leave the project for lunch outside. • *"In 1941, the Office of Scientific Research and Development (ORSD) were established to coordinate government-sponsored projects, and the Manhattan project initiated in 1942. The OSRD coordinated universities and resources for the research and development of the atomic bomb."*(Kwak, 2003) • *"He (the Project Manager) is managing a specific group of advanced specialists; the professional mix of his group is tailored specifically for the accomplishment of an assigned mission"* (Gaddis, 1959)	
	Status	Comments
Budget	Not limited	In that period, budget is not the key driver of project execution. The hoover Dam project was notably within budget but for the Manhattan project and the first Ballistic Missile projects, time pressure was by far more important than budgetary constraints.

	Data supporting interpretation	
	• "*…achieved in less than three years, albeit at the cost of a large budget overrun the budget was the lowest priority*" (Lenfle & Al, 2010) • "*At a time when projects were conducted primarily at the initiative of public authorities, the problems of decision-making, formulation and achievement of objectives (almost at any cost) were more important than efficiency*. [9]» (Garel, 2003) • «*The result was a clear prioritization of schedule over cost and specifications, and, in addition, a willingness to experiment and change the specifications over the course we recognize this flexibility from the Manhattan and Atlas projects. Trial-and-error*" (Lenfle & Al, 2010)	
	Status	Comments
Schedule	Crafted	Before the sixties, project schedule were rather simple even if detailed. Intricate and relationship between tasks were not followed as such and tools for schedule monitoring were scarce (Gantt Chart, Adamiecki's Harmonygraph) and limited. (Morris, 1987)
	Data supporting interpretation	
	• *"When calendar times are set by management and accepted by contractors, a 'schedule' is created. Thus a schedule is defined as a plan with calendar times to reach selected events."* (D. G. Malcolm & al, 1959) • *"Both the Hoover Dam and the Empire State Building projects incorporated over-lapping phases and building ahead of schedule. This led projects coming in significantly under time."* (Kozak-Holland 2011) p 495 • *"The planning tool PERT served less for improving project control than for "offering technological pizzazz that was valuable in selling the program. . . . The image of managerial efficiency helped the project. It mattered not whether parts of the system functioned or even existed, it mattered only that certain people for a certain period of time believed that they did." .../... PERT advertised a managerial innovation with the goal to "provide resources without interference. In summary, the operational definitions, priorities, actions, and even "efficiency" itself were repeatedly changed and subordinated to the Navy's strategic organizational goal: securing resources in competition with the Air Force."* (Lenfle & all, 2010)	

[9]Free translation of : « *Dans cette période où les projets étaient menés essentiellement à l'initiative des autorités publiques, les problèmes de décision, de formulation et d'atteinte des objectifs (presque à n'importe quel prix) comptaient davantage que l'efficience » (Garel, 2003)*

	Status	Comments
quality	Stringent	Quality was already key to the success of the project as very often linked to security.
	Data supporting interpretation	
	• *"With the Hoover Dam project certain aspects had to have quality control like the laying of concrete …"* (Kozak-Holland 2011) • *" For the Empire State Building project, the rate of construction of one floor per day required due diligence in the assembly of the structure. The Key dependencies were with the suppliers supplying quality materials.." (Kozak-Holland 2011)*	
	Status	Comments
Execution Approach	Trial & Errors	In the Engineering projects were exploratory projects where the trials and errors approach was not seen as a waste of time and money but as a way to come up with innovative solution at a fastest paste due to already expressed time constraints.
	Data supporting interpretation	
	• *"Indeed, the Manhattan …/.. violated the phased project life cycle approach. Both applied a combination of trial-and-error and parallel trials in order to "push the envelope,..."* (Lenfle & Al, 2010) • *"Consistent with the Manhattan and missile projects, and with several other well-known projects of the period,20 decision theory in the 1950s advocated parallel trials and experimentation in certain situations."* (Lenfle & Al, 2010) • *"To do this McLean encouraged different groups to try different approaches. On June 10, 1949 a formal proposal was send to the Navy's Bureau of Ordonance*" (Lenfle 2014) • *"Again, like the Manhattan Project, the Atlas project was under time pressure and used concurrency, with a major overlap between the subsequent phases of research, development and construction. This finally led, albeit in fits and starts and with some intermediate failures, to the successful development of the first ICBMs and their deployment in the late 1950s. …/… what is important for us is that, again, the principles of parallel trials and experimentation were used, contravening the phased stage-gate approach."* (Lenfle & Al, 2010)	

In the first part of the 20st century, paradigm and definition were aligned; Project was defined and was seen as a temporary, autonomous organization dedicated to a unique outcome. The scarce literature from that period and post ante research confirm this full alignment.

Table 8: Comparison of Project attributes from Definition and Paradigm in the 30's-50's

	Definition 30's-50's	Paradigm 30's-50's
Temporality	Temporary	Temporary
Object	specific	specific
Scope	Unique	Unique
Processes	Specific	Specific
Resources	Dedicated	Dedicated
Budget	Not limited	Not limited
Schedule	Basic/Crafted	Basic/crafted
Quality	Stringent	Stringent
Approach	Trial & Errors	Trial & Errors

2.4. Project in the 60′s-70s

2.4.1. The 60's-70's: the Anglo-Saxon prevalence in Project Management Field.

Two major events had huge influence on the future of Project Management. The first one occurred in the early 60's . The President Kennedy nominated Robert S. Mc Namara as Secretary of Defense. Mc Namara was a former Executive of Ford where he successfully developed strong cost control and management culture. From 61 to 68, he made sure to organize the DOD in a centralized and controlled organization using the planning tools such as Planning - Programming – Budgeting system (PBBS) or Life Cycle costing method. As the US engineering industry was leading up the Project Management innovation, Mc Namara had a tremendous impact on Standardization and control in Project Management practices.

The second event is even more important as its influence is still significant in the Project management as of Today. In 1969, 5 senior project professionals from the engineering, Space and aviation field, signed the creation of a nonprofit, professional organization; The Project Management Institute (source PMI), which influence never stopped growing since then.

As already mentioned, during this period, the Anglo Saxon method of Engineering project Management became the world reference that is still today leading the field.

"*First, the existing literature on project history is biased toward large, US, military and space projects. Hence, we need to broaden the perspective to other industrial sectors and national contexts*" (Söderlund & Al, 2013).

2.4.2. Academic definition of Project

This is not a project definition per se but Galbraith (1971) emphasizes that project is seen as an autonomous project with dedicated resources: *"The product or project form of organization has exactly the opposite set of benefits and costs. It facilitates coordination among specialties to achieve on-time completion and to meet budget targets. It allows a quick reaction capability to tackle problems that develop in one specialty, thereby reducing the impact on other specialties. However, if the organization has two projects, each requiring one half-time electronics engineer and one half-time electromechanical engineer, the pure project organization must either hire two electrical engineers-and reduce specialization or hire four engineers (two electronics and two electromechanical)-and incur duplication costs. In addition, no one is responsible for long-run technical development of the specialties. Thus, each form of organization has its own set of advantages and disadvantages." (*Galbraith, 1971)

Galbraith compares the classical production form described by Fayol and Taylor and to the more recent production form that is the project organization. Galbraith highlights the need for dedicated resources aiming to achieve a unique goal while the other production mode are dedicated to large series productions.

Another definition from 1965, confirms the common understanding at that time of what a project is: *"Project management can be profitably applied, as a rule, to a one-time undertaking that is (1) definable in terms of a single, specific end result, and (2) bigger than the organization has previously. undertaken successfully. A project must, by definition, end at an objective point in time: the date the new plant achieves full production,"* (Stewart, 1965.)

Finally in 1971, Olsen, in a 2 pages discussion article tried to summarize several academic definitions from the 60's and came up with the following definition: " *On the contrary, there are many useful definitions; numerous authors in the field have addressed the problem of defining project management. J. S. Baumgartner in his book Project Management defines project management in terms of the efforts to produce end items within time, cost and quality constraints. David Cleland ("Why Project Management," Business Horizons, Winter 1964) and Paul Gaddis ("The Project Manager," Harvard Business Review, June 1959) describe project management in terms of the role of the project manager functioning as an integrator of the efforts of various functional and extra organizational groups, Desmond Cook (The Nature of Project Management, Working Paper, Ohio State University, 1968) summarizes the definitions of Baumgartner, Cleland, and Gaddis in terms of the project manager's role "to produce a product by integrating professional persons into a team operating within time, cost, and performance parameters with*

that team operating within some lines of organizational responsibilities and authority." Cook goes on to say that projects have four characteristics. They have a single objective, are usually complex in nature, consist of a series of unique tasks, and are normally a one-of-a-kind or non-repetitive activity." (Olsen 1971)

The above examples of project definition confirmed the historical pattern of project being defined as an autonomous, temporary organization dedicated to the delivery of a one kind outcome.

2.4.3. Attributes & Project Paradigm evolution

I guess the word that would best fit for Project Paradigm in the 60's-70's is Industrialization. The provocative use of such term to a word synonymous of uniqueness is imposed by:

- Industrialization from a technics standpoint with the wide spread of Networking scheduling method as well as controlling technics. (Morris 1988 p 31.)
- Industrialization from a domain standpoint. While Project was mainly used in the construction field prior to the 30's then in Large scale Defense Engineering Development in the 40's and 50's, Project organization and project management theories have been spread over most of the domain or field in the 60's/70's. In the late 70's Project in communication, educational fields as an example were quite common. "*With the growing emphasis on temporary organizations in our "temporary society," task force approaches to one-time projects are being applied in an increasing variety of areas. Though project management was once the domain of the construction industry and then defense-oriented R&D, it is now common in business and industry, government, health, and education" (*Bennigson 1971)
- Industrialization from a quantity stand point as the spread of such organization over many business fields increased exponentially the number of projects in the 60's/70's.

Needless to say that such industrialization in project paradigm would lead to some difference as compared to the traditional project definition.

Table 9: Project attributes status in the 60'-70's

	Status	Comments
Temp	**Temporary**	Project is considered as a temporary organization that will end when the purpose of the project has been achieved

	Data supporting interpretation	
	• *"In the aerospace and construction companies, complete responsibility for the task, as well as all the resources needed for its accomplishment, is usually assigned to one project manager. In very large projects, the organization he heads, which will be dissolved at the conclusion of the project, resembles a regular division, relatively independent of any other division or staff group"* (Stewart 1965) • *"The project manager's task is finite; after the project is completed, the personnel directly supporting the project can be as- signed to other activities"*(Cleland,1964) *"Once the project is complete, the team can be disbanded or a new project be assigned to it."(* Argyris*, 1967)* • *" What's important with regard to project situations is that the work is only temporary."* (Bennigson 1971)	
	Status	Comments
Object	**Specific**	In the 60's-70's the project organization in the academic literature is seen as an autonomous organization dedicated to the delivery of the project. In the late 70`s the notion of Projectized organization is started to appear in the literature (Thamhain, 1977)
	Data supporting interpretation	
	• *"As the project manager's responsibilities increase, and more operating facets of the project are centralized under his control, the organization takes on the appearance of a new company or division formed to manage each major program or project independently"* (Cleland, 1964) • *"Project organizational design must be tailored to the specific task and the environment, but higher degrees of projectization and higher levels of authority for the project manager result in less probability of cost and schedule overrun"* (Baker & al, 1977) • *"In the illustration of the aerospace division, the emphasis is on the completion of specific work projects, namely, Venus project, Mars project, and Saturn project. Additional projects may be added as new contracts are signed by the marketing group. As projects are completed or abolished, they are deleted from the organization; it is a fluid organization"* (Mee, 1964) • *"…That the project organization structure must be carefully matched to the nature of the task at hand in order to insure an optimal "fit.""* (White 1979)	

- *" There are various ways in which the design of a project management system can generate commitment. One is a "projectized" approach (where a separate project organization is created, often with autonomous funding and/or building facilities)"* Bennigson, 1971

	Status	Comments
Scope	Unique	As mentioned by Stewart (1965), project is to be set up when company face a one-time specific non repetitive end result. Scope of project is still seen as unique in the 60's-70's

Data supporting interpretation

- *"Project management can be profitably applied, as a rule, to a one-time undertaking that is (1) definable in terms of a single, specific end result, …:"* (Stewart 1965)
- *"An undertaking is not a project, in our sense of the term, unless it is a unique, or infrequent, effort by the existing management group."* (Stewart 1965)
- *"One of the recurring themes of the 1970 PMI Symposium was the question of how project management should be defined. What is it that makes a project management organization? Many attendees proposed answers to this question…/… Project management is the management of a unique one-time task.*
  These are but a few of the perceptions which were put forth." (Olsen 1971)
- *"The development of new products or systems gives rise to unique problems and demands on organizational resources and relationships. The traditional bureaucratic form of organization, with its formal specialization, fixed lines of communication, and standard procedures has seemingly failed to provide the desired efficiency in use of resources and has proved to be unresponsive to changing conditions. As a result, both the Department of Defense and industry have turned to a project form of organization in an effort to increase the efficiency with which total organizational resources are used in achieving the desired goal — a new product or system .It would be self-defeating to devise one single, universal project form of organization. In fact, the essence of project management involves tailoring the organization to the needs of a particular project"* (Barndt 1975)

	Status	Comments
Processes	Specific	During this period, practitioners and academics questioned the use of standard or not. While in 1961, the US- DOD published 375 rules (Morris, 1987) to develop large scale program, most of the literature still shows an adherence to specific rules over standards. In 1977 PMI was still questioning the need of standard and Project certification (cook 1977).
	Data supporting interpretation	
	• *"The charter of the project manager should be broad enough to enable his active participation in major managerial and technical activities. He should be given sufficient policy- making authority to integrate the functional contributions to the project goals*" (Cleland, 1964) • "*All these decisions vitally concern the project manager, and he must often forge his own guidelines for dealing with them."* (Stewart 1965) • "*Because of the great diversity of projects and the lack of common terminology for the relatively new techniques of project management, useful specific rules for project management are virtually impossible to formulate*." (Stewart, 1965) • "*There is a similar kind of matrix organization built around the temporary project in a development-oriented organization../…. The latter suggests a world in which change is a constant, a world in which fixed policies, rules, and group norms are destructive because each project is different*" (Sayles, 1976) • " *While these reports represent useful-in fact, essential-contributions to a growing body of knowledge, it is a question of happenstance whether any such report will be useful to another project manager in helping him decide how to manage his own project."* (Bennigson, 1971)	
	Status	Comments
Resources	Dedicated	In the academic literature resources are allocated to a project with clear leadership given to project Manager. Nevertheless, resources are scares and when several project compete for the same resources it can bring potential conflict between project. In their study, Thamhain & Wilemon (1975) ranked manpower as the third source of potential conflict. Even though resources are allocated to project, literature shows a growing concern on manpower allocation in matrix organization with functional department having to support several different projects.

	Data supporting interpretation	
	• *"His staff should be qualified to provide personal administrative and technical support. He should have sufficient authority to increase or decrease his staff as necessary throughout the life of the project. This authorization should include selective augmentation for varying periods of time from the supporting functional agencies" (Cleland 1964.)* • *"… the project manager is supplied with a team, often numbering no more than half a dozen men for a $10 million project. Team members, drawn from the various functional departments involved in the project, report directly to the project manager. For the duration of the project…" (Stewart 1965)* • *"The project manager is assigned the number of personnel with the essential qualifications from the functional departments for the duration of the project." (Mee J., 1964)* • *"Organizational forms typically are identified by work assignment and merit review considerations. For the purposes of this research, a project management form of organization was defined as one in which a project manager had the authority to supervise the work of engineers working on his project and also to perform the annual merit review of these engineers."* (*Goodman, 1968)*	
	Status	Comments
Budget	Constrained	The change in the early 60's from Performance to a cost effectiveness mindset is well explained by Lenfle and Loch (2010): " *From Performance to Control: The view of major projects began to change in the early 1960s. The deployment of the Atlas, Titan, and Polaris ballistic missiles diminished the fear of the "missile gap" with the USSR. Thereafter, the "national security*" Projects' sense of utmost urgency faded away. This trend was expressed and accelerated by the 1960 publication of The Economics of Defense in the Nuclear Age by Charles Hitch (who would become controller of the Department of Defense) and R. McKean. A book that introduced a broad audience to a view of defense as an economic problem of resource allocation to achieve a desired objective. This had major consequences for project management: the focus gradually changed from the performance at all costs" attitude of the first missiles projects to one of optimizing the cost/performance.

	Data supporting interpretation	
	• *"Cost Control Project cost control techniques, though not yet formalized to the same degree as time controls, are no harder to install if these steps are followed: (1) break the comprehensive cost summary into work packages, (2) devise commitment re- ports for "technical" decision makers, (3) act on early, approximate report data, and (4) concentrate talent on major problems and opportunities."* (Stewart 1965) • *"…/ as we will see, this change was a managerial and organizational decision (from concurrency to phased approach) response to a deeper restructuring of priorities within the United State government. Priorities shifted from an overriding concern with rapid development and deployment of large weapons systems to a primary concern with their cost."* (Johnson, 2000) • *" McNamara also installed RAND chief economist Charles Hitch as the DOD controller. Given McNamara's background as a ford financial manager and Hitch's qualifications as an economist, it was not surprising that they considered economic criteria to be the foremost in making decisions for weapons systems. Hitch's program Planning and Budgeting System required that life cycle cost estimates be performed before deciding whether to develop a new weapon system."* (Johnson, 2002)	
	Status	Comment
Schedule	Technically convoluted	The success of the Polaris project with the implementation of the PERT method in the late 50's would influence Project and Project management theories for decades until today in 2 main ways. First of all, since then no large project have been executed without the implementation of a schedule and control management tool, either PERT , CPM or any descendant from those methods. In the sixties PERT's Technic have been so successful that it almost became *"synonymous in some people's mind with Project Management itself (and of course it is still used by many people to describe network scheduling in general)"*(Morris 1988, p 31)
	Data supporting interpretation	
	• *" Almost invariably, some form of network scheduling provides the best time control of a project. A means of graphically planning a complex undertaking so that it can be scheduled for analysis and control,"* (Stewart 1965) • *" Certain questions are typically asked about project management systems: Should PERT, CPM, or something else be used?"* (Bennigson 1971)	

	• *"As interest in PERT and CPM skyrocketed in early 60's…."*(Wiest 1977) • *"One of the recurring themes of the 1970 PMI Symposium was the question of how project management should be defined. What is it that makes a project management organization? Many attendees proposed answers to this question…/...* *Project management is network scheduling and planning;* *These are but a few of the perceptions which were put forth."* (Olsen 1971)	
	Status	Comments
Quality	Stringent	Quality remains a concern for project execution. In a growing computerized environment, quality and Safety are at the heart of the project priorities. (MacKenzie 2000)
	Data supporting interpretation	
	• *"The project manager acts as a focal point for the concentration of attention on the major problems of the project. .../.... The project manager is personally involved in critical project decisions concerning organizational policy including: .../...; schedules; product performance (quality, reliability)…"* (Cleland 1964) • *"Experience with a wide variety of projects-new-product introductions, mergers, plant constructions, introduction of organizational changes, to name a few-indicates that effective quality control of results is a crucial dimension of project success."* (Stewart 1965) • *"Since the early 60's a systematic "safety Engineering" way of tackling the problem of safety has evolved, in part to meet the needs of such audiences, and the resultant analysis of risk has become a vital part of the modern systems approach. "* (MacKenzie 2000)	
	Status	Comments
Execution Approach	Phased	*"By the early 1970s, the phased approach had already become "natural" and was transferred to the product development field;31 it prescribed linear consecutive stages. Cooper pulled various stage templates together and subsequently coined the term "stage-gate process,"32 which over time became a widely used new product development project template, and it shaped the conceptual picture of new product projects over two generations"* (Lenfle & Al, 2010)

	Data supporting interpretation
	• *"We often think of a large project as made up of several phases, each representing a general class of work. For example, a typical project to develop and manufacture a new product (military or commercial) might be divided into phases such as development and test, production engineering, tool and facility procurement, production start-up and full-scale production.."* (Cochran & al 1978) • *"The kinds of problems and tasks facing the project management team tend to change as the project advances through its several phases. For example, as shown in Table 1, in the United States Air Force a new weapon system may proceed through five phases (conceptual, validation, full scale development, production, and deployment), each with its own peculiarities"* (Barndt, 1975) • *"This Chapter will discuss one significant change in the conceptions and processes of system Management: the change from the philosophy of "concurrency" to that of "phased planning" as we will see, this change was a managerial and organizational decision (response to a deeper restructuring of priorities within the United State government. Priorities shifted from an overriding concern with rapid development and deployment of large weapons systems to a primary concern with their cost."* (Johnson, 2011) • Morris 1987, in his book presents a summary of Main Countries phased program development (P 135) from the early 70's to demonstrate the phased approach deployment all around the world for military projects. ***(See Fig 5 below)***

The figure 5 hereafter is an illustration from Morris Book (1987) showing the phased approach principles used by the different countries or organization (NATO) in the 70's.

Figure 5: Phases and milestones for development and production of military equipment

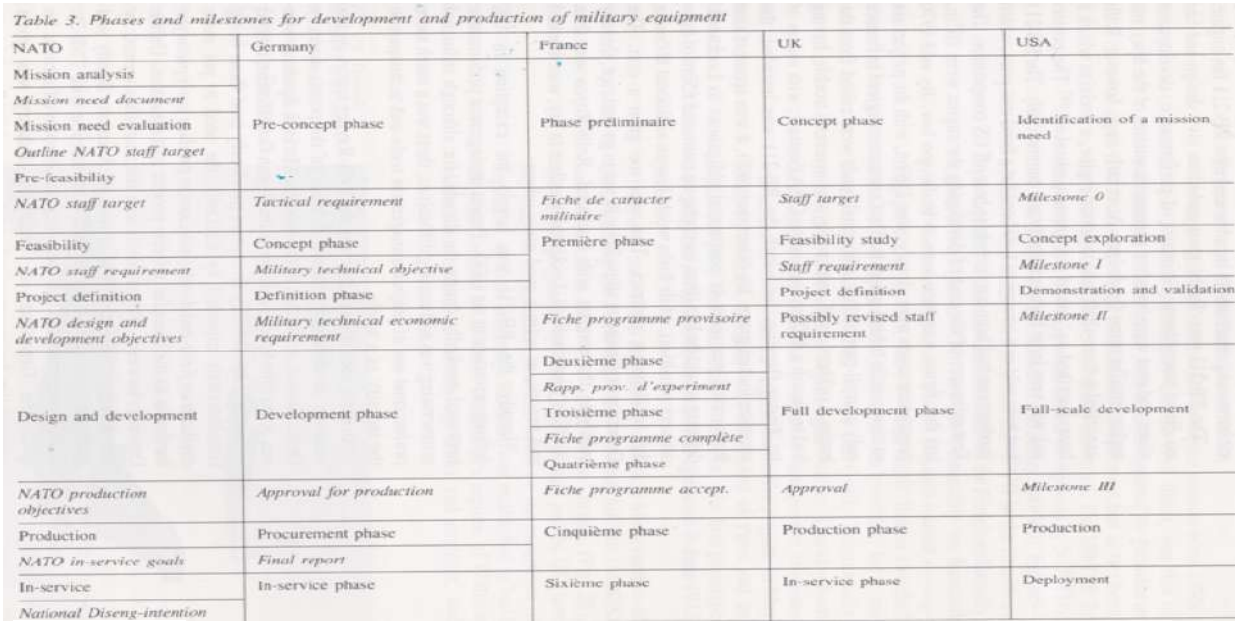


Table 3. Phases and milestones for development and production of military equipment

NATO	Germany	France	UK	USA
Mission analysis				
Mission need document				
Mission need evaluation	Pre-concept phase	Phase préliminaire	Concept phase	Identification of a mission need
Outline NATO staff target				
Pre-feasibility				
NATO staff target	*Tactical requirement*	*Fiche de caracter militaire*	*Staff target*	*Milestone 0*
Feasibility	Concept phase	Première phase	Feasibility study	Concept exploration
NATO staff requirement	*Military technical objective*		*Staff requirement*	*Milestone I*
Project definition	Definition phase		Project definition	Demonstration and validation
NATO design and development objectives	*Military technical economic requirement*	*Fiche programme provisoire*	Possibly revised staff requirement	*Milestone II*
Design and development	Development phase	Deuxième phase	Full development phase	Full-scale development
		Rapp. prov. d'experiment		
		Troisième phase		
		Fiche programme complète		
		Quatrième phase		
NATO production objectives	*Approval for production*	*Fiche programme accept.*	*Approval*	*Milestone III*
Production	Procurement phase	Cinquième phase	Production phase	Production
NATO in-service goals	*Final report*			
In-service	In-service phase	Sixième phase	In-service phase	Deployment
National Diseng-intention				

Source Morris

Two main changes occurred in the 60's – 70's. First of all, the arrival of strong cost manager sur as McNamara, changed the budgetary focus in the US programs. Financial constraints became more important in the project supervision starting from the 60's.

The second change is the emergence of new technology and new tools in term of scheduling such as the GANTT model. Scheduling and project organization became much more complex as the tool allowed the inclusion of complex environment in the scheduling and project management practices. This era is summarized in table 10

Table 10: Comparison of Project attributes from Definition and Paradigm in the 60's-70's

	Definition 30's-70's	Paradigm 30's-50's	Paradigm 60's-70's
Temporality	Temporary	Temporary	Temporary
Object	specific	specific	specific
Scope	Unique	Unique	Unique
Processes	Specific	Specific	Specific
Resources	Dedicated	Dedicated	Dedicated
Budget	Not limited	Not limited	***Constrained***
Schedule	Basic	Basic	***Technically convoluted***
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Trial & Errors	***Phased***

2.5. Project in the 80's-90s

2.5.1. The 80's-90's: Project massification; When exceptional becomes routine

Once again, there are several reasons to create a period comprising of the 80's. and the 90's. The first one is that from the beginning to the end 90's the number of projects increased exponentially. Boutinet (2015) gave the example of the number of references to project in the French national Library (table 11). From few units at the beginning of the 20st century, references multiplied exponentially over the second part of the century, highlighting therefore the importance of this new management stream and the interest over project management from the scientific community.

Table 11: Project references evolution at the French National Library

Period	# of reference to Project
1882-1959	4
1960-1969	395
1970-1979	575
1980-1999	3457

Source: Boutinet 2015

Associated to this growing number of projects, this is the period where we first read articles and contributions that mentions Project Oriented Company (Gareis, 1989) or Project Based Company, which will also influence Project management evolution. Antinomic wording such as Repetitive project appears in the literature (Gareis 1991).

Lastly, this period is also the computer tooling period. Many innovations on Project management tooling appeared at that time that I believe also change Project Management trajectory. In order to cope with the growing number of project and the new organizational trend towards Project based Organizations, some scholars such as Navarre and the "Montreal's club[10] proposed some "meta rules"[11] that would apply to portfolio of project instead of standalone projects (Garel,2018 p 59).

2.5.2. Academic definition of Project

Among others, we are presenting here below 4 different project definition that will help the characterization of the project definition of the decade.

In 1989, Gareis gave the following definition: "*A 'project' is an organization, which is established for a limited time period to solve a complex (relatively), unique problem.*" (Gareis, 1989). In one of their article about project success, Pinto and Slevin (1988) propose the following project definition:

[10] Free translation of "Le club de Montreal"
[11] Free translation of "meta règles"

"*For the purposes of this paper, a project can be defined as possessing the following characteristics:*

- *A defined beginning and end (specified time to completion)*
- *A specific, preordained goal or set of goals (performance expectations)*
- *A series of complex or interrelated activities*
- *A limited budget*" (Pinto & Al, 1988)

In the same article Pinto and Slevin are refering, according to them, to one of the best definition of project, provided by Tuman in 1983 who states:
"*A project is an organization of people dedicated to a specific purpose or objective. Projects generally involve large, expensive, unique, or high risk undertakings which have to be completed by a certain date, for a certain amount of money, within some expected level of performance. At a minimum, all projects need to have well defined objectives and sufficient resources to carry out all the required tasks."* Tuman [1983, p. 498],
Finally, when trying to better define project management success and project success, Munns and Bjeirmi (1996) gave the following project definition: *" A project can be considered to be the achievement of a specific objective, which involves a series of activities and tasks which consume resources. It has to be completed within a set specification, having definite start and end dates."*

Overall, those few examples of project definition demonstrate the continuity from the previous decades, of the project being considered by the scientific literature as a unique, temporary and autonomous organization.

In an article, Garel (2003, p. 77) highlights an interesting view coming from Declerck et al. (1980) where project is seen specific in opposition to standard operation: "*Mastering these unique and sometimes very complex processes that are projects requires the implementation of a specific management. The book by Roger Declerck, Pierre Eymery and Maxime Crener [1980] marks a stage in management literature, clearly distinguishing the concepts of operation and project and thus affirming the specificity of the project."*[12]
Once again, the above examples of project definition confirmed the already mentioned historical pattern of project being, an autonomous, temporary organization dedicated to the delivery of a one kind outcome. Despite the growing importance of projects it is demonstrated here that project

[12] Free translation of :" La maîtrise de ces processus uniques et parfois très complexes que sont les projets suppose la mise en œuvre d'un management spécifique. L'ouvrage de Roger Declerck, Pierre Eymery et Maxime Crener [1980] marque une étape dans la littérature en management, en distinguant clairement les notions d'opération et de projet"

definition remains the same over time and the 80's-90's did not contradict the other reference periods.

2.5.3. Attributes & Project Paradigm evolution

After an outrageous industrialization trend that defines the 60/70's where Project Management was more or less synonymous of scheduling and planification (Olsen 1971), the 80/90's as a succeeding period witnessed major changes in Project paradigm. Two of the key idiosyncratic determinants of Project would be questioned if not strongly challenged.

Project definition proposes the project as a specific organization dedicated and adequately set up to achieve a unique goal. I argue here that after standardization of the scheduling and costing method in the previous period, the growing influence of professional organization such as PMI, lead to a standardization of the project organization. The idea being that project management and associated tooling appliance are more important than the contextual environment of the project. Defense project or large IT project would have the same organization, the same set-up and project team would be required to follow the same guidelines. Project organization as a specific object designed to fit with project requirement is replaced over this period by a more generic, standardized project organization that would be implemented for any type of project.

Project temporality is also challenged to say the least during the course of the 80/90's. I am questioning with the growing implementation of Project Based Organization (Turner & al, 1999), or project-oriented companies (Gareis, 1989) the existence of project as a separate organization with a beginning and an end. Project management is now a department of the permanent entity. Project permanence as operational system is the new operational model that replace assembly line type of system to tackle growing complexity and tailored demands. Zarifian (1993), argue that Permanent organization tried, by creating permanent Project structure such as PBO or POC, to overcome the main weaknesses of project organization, that are best learning, best cultural and best practices transmission incapability.

Others changes described below in table 12 in the attribute evolution table occurred during this project transformation period.

Table 12: Project attributes status in the 80'-90's

	Status	Comments
Temporality	**Permanent**	This provocative questioning concept of permanence of the project organization is driven by the adding of a permanent layer in the parent entity. Is this new way of project execution closer to industrial organization? Talking about "project factory" and "repetitive project" is somehow a step towards full integration of project organization within the permanent organization. Another reason drives to question project temporality. How to define the beginning of a project and how to define the end of the project. Very often, project starts, for customer project, when the contract is signed with a contractual starting date. Project end after the achievement of the last milestone and the outcome delivery. But would you consider the Bid phase being part of the project? (Le Bissonais, 2012) This is not the case that often. Not having the bid being part of the project is, creating an artificial division of project design, one part being pre contract and the other one being post contract design and in our opinion, a real source of issues When an outcome will last for decades, is it correct to consider the end of the project at its delivery while the Life cycle has been fully considered and integrated in the project design and execution? Subjective temporality is a key concept that should be further study.
	Data supporting interpretation	
		• *"By project organization, we mean not only that each project is the subject of a team and a specific follow-up, but that the basic organization begins to change: whether it is synchronically at the level of piloting a plurality of projects at a given moment, or diachronically by the nesting of projects one after the other, the organization by project becomes an "ordinary" organization creating what can be expected from any organization: learning effects, structuring of frameworks and behavior, social acculturation, accumulation of efficiency acquired over time[13]"* (Zarifian, 1993)

[13] Free translation of : « *Par organisation par projet, nous n'entendons pas seulement le fait que chaque projet fasse l'objet du montage d'une équipe et d'un suivi spécifique, mais bien le fait que l'organisation de base commence à basculer: que ce soit synchroniquement au niveau du pilotage d'une pluralité de projets à un moment donné, ou diachroniquement par l'emboîtage des projets les uns à la suite des autres, l'organisation par projet devient une*

		• *"Once delivery is achieved the management, as it relates to planning and control of the development and delivery, will cease. A new, or different form of management, will then establish the operation and control of the project use from this point on. The focus, therefore, of project management is distinct from that of the project because it is short term, until delivery of the project for use. In contrast the project itself is long term, based on the whole life rather than just the development cycle."* (Munns & Bjeirmi, 1996). • *"We see now that several other project leadership and management role must be distinguished. It may, for example, be useful to note a Project Director function, particularly in the matrix form. The Project Director is the chief of Project manager, on a par with the other directors in the (project) organization. He acts as functional head of the project managers, ensuring that they follow proper practices and procedures, resolving resource disputes, and representing their case against other functional departments."* (Morris, 1987, p 257)
	Status	Comments
Object	**Generic**	– there is a tendency to standardized project organization as argued by Di Maggio(1983). Project organization is not set up to be optimized for the need of the project but established following most of the time the mandatory standardized set up imposed by theparent organization processes.
	Data supporting interpretation	
	• *"In this case, we draw an important consequence: Project management is much more like a project monitoring procedure than a new organization. To speak of organization by project is to the limit of the reasonable when it is no more than an ad hoc method of coordination between functions and power relations already existing[14]"* (Zarifian 1993)	

organisation "ordinaire" permettant de suscite ce que l'on peut attendre de toute organisation: des effets d'apprentissage, de structurations des cadres d'action et des comportement, d'acculturation sociale, de cumul d'efficience acquis dans la durée »

[14] Free translation of : « *Nous en tirons dans ce cas, une conséquence importante: La gestion par projet se présente beaucoup plus comme une procédure de suivi de projet que comme une nouvelle organisation. Parler d'organisation par projet est à la limite du raisonnable lorsqu'il ne s'agit pas davantage que d'une méthode ad hoc de coordination entre des fonctions et des rapports de pouvoirs déjà existants »*

	• *"Most organizations are looking for an MRP-like system based upon Bills of Materials where projects are treated in the same way as goods that can be ordered with a certain delivery time." (Hendriks & all, 1999)* • *"Projects, like any other human endeavor, are associated with conceptions of the nature of their own implementation, conceptions about the task to be solved or the very essence of the term "project." Such conceptions are usually based on previous experiences of a similar kind, and projects can thus be said to be institutions, incessantly being reproduced through actions based on these experiences. These conceptions are not usually specific to a single organization." (Packendorff, & al, 1995)*

	Status	Comments
Scope	Unique	In that period, the scope is still seen as unique, academics would argue that even for repetitive projects and therefore somehow repetitive outcome, the environment, the customization required by the customer would suffice to still qualify the outcome as unique
	Data supporting interpretation	
	• *"Project purpose .../... The project purpose provides the means toward the project goal and determines the required project outputs. .../.... Davis (1995) recommends that a project should only have one purpose, otherwise efforts become diffused and the project design weakened." (Baccarini 1999)* • *"In the literature, genuinely unique projects like military operations are treated in the same way as "repetitive" telecommunications projects, where the product is unique but the process is standardized in corporate project management handbooks."*(Packendorff, 1995)*"Project management (PM) is a particularly appropriate management approach for operations with a single, predetermined final product, such as building a stadium or a dam, completely changing an existing product implementing a computer system." (Fabi & All, 1992)* • *"project: A process for delivering a specific outcome"* (Pellegrinelli 1997) • *"One of the basic assumptions about projects is that the project task is clearly defined and unambiguous."* (Packendorff, 1995)	

	Status	Comments
Processes	Standard	Project processes are defined and imposed by the parent organization leaving very little room for tailoring and adapting the processes to the need, the complexity and the environment of the project.
	Data supporting interpretation	
	• "*The 'integration of a project refers to its incorporation into the overall company. Integrating projects requires balancing between the objectives and the autonomy of projects and the overall company's standards, policies and objectives*. " (Gareis, 1989) • "We identify three mechanisms through which institutional isomorphic change occurs, each. with its own antecedents:…/… 2) mimetic isomorphism resulting from standard responses to uncertainty; and 3) normative isomorphism, associated with professionalization" (DiMaggio & Al, 1983) • "*After having reconstructed the context in which the manager acted, with neutrality in the selection of subjects for inquiry, an evaluator should compare the manager's action with the processes generally followed by managers acting in comparable, contemporaneous circumstances*."(Fox, 1984) • "*A project management model becomes an important element in any project planning process. In development of such a model, it is very important to understand the pattern of implementation of project management techniques and tools in different industries. In other words, before questioning why people do things, the question of how people do things should be investigated*." (Bubshait, 1989) • "*It has previously been suggested that an organization undertaking several projects should adopt a common project management approach for all projects in the program, regardless of the type of project, its size, or the type of resource used. Advantages are said to be:* • *A consistent reporting mechanism can be adopted to give comparable progress reports across all projects in a program;* • *Resource requirements can be calculated on a consistent basis, facilitating the management of capacity constraints;* • *People can move between projects without having to relearn the management approach used project by project;*	

	• *Small projects can be used as a training ground for future managers of large projects*." (Payne & Al, 1999)	
	Status	Comments
Resources	Shared	First attribute to be challenged is related to the resources and more specifically to the people. While in the 60/70's dedicated people to a project was the reference and the use of shared resources within matrix organization was popping-up. The next two decades would see a reversed situation where project as a group of identified people that would conduct the realization of a specific output becomes the exception and Matrix organization and resources allocation by functional line are becoming the main stream.
	Data supporting interpretation	
	• *"Allocating people to projects in multi-project environments is difficult and often faces lots of problems. Important in this process is the coupling of day-to-day planning for each individual person to the long-term business plan" (Hendriks & Al, 1999)* • *"However, despite its merits, PM seems to generate undeniable management problems, some of which have a considerable effect on human resources: the kind of qualifications (technical versus managerial) required of project managers, the incongruence between authority and responsibility with which a project manager is often faced in the course of his work, human resources allocation and the many jurisdictional conflicts that result, integration of employees into new project teams, the double authority which project team members are often subjected, and the marked insecurity of project team members with respect to their career." (Fabi & al, 1992)* • *A final issue is whether an individual can be a core team member on more than one heavyweight team simultaneously. If the rule for a core team member is that 70% or more of their time must be spent on the heavyweight project, then the answer to this question is no. Frequently, however, a choice must be made between someone being on two core teams—for example, from the finance or human resource function" (Clark & Al, 1992)*	
	Status	Comments
Budget	Constrained	Since the 60's Project control has been continuously reinforced and the 2 referred decades did not escape to this trend. The economic and political environment did not create any sense of urgency that could have relieved such financial constraints

	Data supporting interpretation	
	• *"As expected, the result indicate that nearly all the participating R&D managers are familiar with the standard methods of financial analysis and the basic scheduling and control techniques. About 80% use at least one financial technique for project evaluation..."* (Liberatore & al, 1986) • *"Increasingly owners and managers of large, complex projects are challenged in law suits and regulatory proceedings to justify, their decisions. These challenges often question the prudence or reasonableness of management actions on a project costing substantially more than its original estimate. Frequently these attacks criticize decisions made years earlier by project owners or managers."* (Fox 1984) • *"PERT/COST is one of several techniques that has been developed to control project cost. The approach employed by PERT/COST is to integrate the data with the associated financial data of the project."* (Bubshait 1989) • *"As regards the continuous control and follow-up of projects, the conventional literature concentrates on methods of comparing plans and budgets on the one hand and outcomes on the other. Plans and budgets are often in need of updating during the initial phases of a project."* (Packendorff, 1995)	
	Status	Comments
Schedule	Technically convoluted	The confusion between the project management and the scheduling tool associated to project execution that popped up in the previous reference period did not disappear over time and is still noticeable in the 80'S-90's. Project scheduling has become an expert matter since. Early 60's and did not change since then.
	Data supporting interpretation	
	• *"Once prepared, a CPM network with durations and resource loadings includes all of this task and project management knowledge implicitly. However, only the end results of the initial schedule analysis—the activities, their durations, logical dependencies, and resource requirements—are represented and captured explicitly in the CPM network. The expert's knowledge about the task domain that was employed during schedule creation is unavailable subsequently for use by other members of the project team in interpreting interim project performance or in updating the project's schedule"* (Levitt & Al, 1985) • *"The implementation of the planning models -- i.e. how to make them useful to project managers -- has also been a subject of interest. It has been suggested that they will*	

	be more user friendly if they are presented in the shape of computer software, a development that might cause the role of the project manager to change from practitioner to administrator (Thamhain, 1987). • *"Research on project planning today is nowadays a highly sophisticated discipline, and further efforts will therefore have a limited impact on high threshold costs." (*Packendorff, 1995)	
	Status	Comments
quality	Stringent	As per Morris (1987) "*the imposition of Quality Assurance as a discipline was a valuable adjunct to the early engineering management discipline such as configuration management*" . In the mid 80's Total Quality management was adopted by western organizations coming from Japan. (Morris 1987)
	Data supporting interpretation	
	• *" Quality – Success can be measured in terms of conformance to functional and Technical specifications…/… in other words "The project must produce what it said it would produce" (PMI 1996)" (Baccarini, 1999)* • *"… many organizations order more testing of completed units to discover such possible flaws and have components and subassemblies reviewed by expert specialists. In some cases, the quality assurance function has expanded its role to make sure sufficient technical specialists review designs at appropriate points …" (Clark & al , 1992)* • *"The manufacturing industry has developed Total Quality Management (TQM) concepts, first applied in Japan and in recent years used in the United States, which have increased productivity, decreased product cost and improved product reliability…./… TQM is an effort that involves every organization in the industry in the effort to improve performance. It permeates every aspect of a company and makes quality a strategic objective. TQM is achieved through an integrated effort among personnel at all levels to increase customer sati faction by continuously improving performance." (Arditi & Al, 1997)*	
	Status	Comments
Execution	Phased/ Concurrent	In the 80's -90's staged gate approach was still the norm but Concurrent engineering was reintroduce first by the Japanese car industry followed by the US car industry as critics raised: *"Indeed, their landmark study of the automotive industry constituted a sharp criticism of the phased approach:*

		they found that it led to communication problems and a need for rework that in turn generated delays as well as increased costs and quality problems." (Lenfle & Al 2010)
	Data supporting interpretation	
	• *"Development, in its turn, is usually further divided into conceptualization and planning. In the traditional project management model, these stages are sequential; the implementation of a project is always assumed to be preceded by development and succeeded by termination"* (packendorff, 1995) • *"which today, is essential as a standard of good project management practice under the terms "anticipation", "simultaneous engineering" or "concurrence".[15]"* (Midler, 1993) • *"The control of the progress of the work requires a division into phases, very explicitly defined, and marked by milestones, which include both an expertise (the project review) and a decision.[16]"* (Bobroff & all, 1993)	

The table 13 provide below a summary of the positioning of each attributes in the decade. It is interesting to highlight the fact that over the decade, 4 attributes evolved as compared to the previous decade, demonstrating the importance of the decade in the project management evolution over time.

Table 13: Comparison of Project attributes from Definition and Paradigm in the 80's-90's

	Definition 30's-90's	Paradigm 30's-50's	Paradigm 60's-70's	Paradigm 80's-90's
Temporality	Temporary	Temporary	Temporary	***Permanent***
Object	specific	specific	specific	***Generic***
Scope	Unique	Unique	Unique	Unique
Processes	Specific	Specific	Specific	***Standard***
Resources	Dedicated	Dedicated	Dedicated	***shared***
Budget	Not limited	Not limited	*Constrained*	Constrained
Schedule	Basic	Basic	*Technically convoluted*	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent
Approach	Trial & Errors	Trial & Errors	Phased	**Phased Concurrent**

[15] Free translation of : « *... ce qui aujourd'hui, s'impose comme norme de bonne gestion des projets sous les termes "d' anticipation", "d'Ingénierie simultanée" ou de "concourance »*

[16] Free translation of : « *La maitrise du déroulement des travaux passe par un découpage en phases, très explicitement déterminées, et marquées par des jalons, qui comportent à la fois une expertise (la revue de projet) et une décision »*

2.6. Project in the 00's-10's

2.6.1. The 00's-10's: When project loose is innovative intrinsic capabilities

The last period is also key in a sense that 00's & 10's are the two first decades of the growing influence of Internet. This is a major change in all businesses and this revolution may also have an impact on Project management paradigm and project Management practices that I would like to evaluate and characterize.

Associated to the internet domination, a new organization type so called "startup" appeared. The Startup is a direct competitor to the project Organization and comparing those two would also help us to draw up some conclusions on Project organization evolution. Most of the new business models, recent major innovation came from Startups. I am therefore wondering whether Startup in the 10's are the Projects' of the 40's, giving large freedom and empowerment that is required for disruptive innovation. Crawford & al (2006) made a literature review over the last decade and referred to the similar studies over the last decades. While in the 80's innovation was clearly a growing theme addressed in the project literature, it is noticeable that in their own review , innovation was not even mentioned as a topic.

Finally, this period is also synonymous of project organizational changes. Portfolio, Project management office, Project based organization are new emerging wording appeared in the 90's that took a significant part in the 00's-10's literature (Aubry et al., 2018).

2.6.2. Academic definition of Project

Turner and Muller (2003) confirmed Turner's (1993) definition of project as "*An endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time to achieve beneficial change defined by quantitative & qualitative objectives*." In addition they strengthen the main idiosyncratic attributes of project which are project is time limited, project is unique in terms of Object, Scope and processes:

"A project is undertaken to deliver beneficial change, and thus has three essential features:

1. It is unique: no project before or after will be exactly the same.

2. It is undertaken using novel processes: no project before or after will use exactly the same approach.

3. It is transient: it has a beginning and an end." (Turner &Al 2003)

What I call main idiosyncratic attributes is called features by Turner & Müller (2003). For them Features creates pressures as describe in the Table 14.

Table 14: Features of projects by Turner & Muller

Aim	Features	Pressures	Processes
To deliver	Unique	Uncertainty	Flexible
Beneficial	Novel	Integration	Goal Oriented
Change	Transient	Transience	Staged

Source: Turner & Muller (2003)

Turner also suggests that those pressures are specific to projects ("Time, cost and quality is shared with routine operation management") and therefore before setting up such project organization practitioners should make sure all features are there otherwise routine operation would be more appropriate. On this basis, the authors propose an updated definition: "*A project is a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change."* Turner & Muller (2003). In other words but with the same confirmation: "*Essentially a project is defined as a specific, new action, which methodically and progressively structures a future reality for which there is no equivalent yet*[17]*»* (Le bissonnais, 2000, cited by Joffre & Al, 2006, p 67)

Finally, Shenhar, in 2007, also confirms project definition stability overtime by stating: "*For the purpose of this book we define a project as a temporary organization and process set up to achieve a specified goal under the constraints of time, budget, and other resources"* (Shenhar, 2007).

From a practitioners' stand point, International standards do not contradict such permanence of Project definition: The International standard ISO-10006 (2003) cited by Garel (2011, p15) defined project as *"unique process, which consists of a set of coordinated and controlled activities with start and end dates, undertaken with the aim of achieving an objective in line with specific requirements of which time, cost and cost constraints*[18] *»*

[17] Free translation of : « *Essentiellement un projet se définit comme une action spécifique, nouvelle, qui structure méthodiquement et progressivement une réalité à venir pour laquelle on a pas encore d'équivalent »*
[18] Free translation of : « *Processus unique, qui consiste en un ensemble d'activités coordonnées et maîtrisées comportant des dates de début et de fin, entrepris dans le but d'atteindre un objectif conforme à des exigences spécifiques telles que les contraintes de délais, de coûts »*

2.6.3. Attributes & Project Paradigm evolution

In the previous period, I saw that 2 of the main idiosyncratic attributes which is the temporality and the uniqueness of the project organization have evolved and have been questioned.

In addition to the exponential increase of Project-based organization set-up and its associated organizational and structural consequences, this period reinforces the evolution of the third idiosyncratic attribute of project, the uniqueness of the project's scope.

In the past the outcome of the project was considered unique. Repetitive projects, building block re-use, product policy and strategy are words commonly used by organization to reduce uncertainty by standardizing project outcome. Tailoring is still existing but the base of the project outcome are more and more standard and consequently would not require a project type of organizations to be produced. Only the Tailoring might require such organization and this therefore reinforce our questioning related to the project temporality.

The loss of the project scope uniqueness raised also some challenge for practitioners that have now to optimize and embed a new matrix organization made of a project axis and a product axis. Companies are now managing a 3D matrix made of Project, functions and Product.

Table 15: Project attributes status in the 00'-10's

	Status	Comments
Temporality	Permanent	Temporality of project remain a question as it has been in the previous period. Temporality due to its full integration to the permanent organization as well as temporality due to questioning and defining the right starting date and ending date of the project organization.
	Data supporting interpretation	
	• *"Temporality – all of the definitions above have the notion of a finite task. Where this task stretches over many years, the project no longer represents a 'temporary organization'. This does not distinguish them though from an ongoing operation, which from a process perspective, are thought to be markedly different. Very short projects would also question the notion of what constitutes 'temporary"* (Maylor et al., 2006) • "*The front-end is a crucial instance. The way the project front-end is managed has a disproportionately large influence on the project outcome. Should project management as a discipline cover the management of the front-end or is it limited to the execution phases, as PMBOK and many organizations now seem to imply?*" (Morris et. Al, 2006) • *"In contrast to the generic project life-cycle of four phases – concept, definition, execution, closeout – integrated solutions projects extend the timescale of the project*	

	backwards into pre-bid or pre-offer stages and forward beyond the handover stage into the operational life of the system" (Maylor & Al, 2006) • *"The interface between the domains, and between the temporary and the permanent organization is where stability is or should be established. Both the project team and the project-based firm are nested in a broader institutional context of the network or ecosystem to provide support. Projects are therefore also part of a relatively stable or permanent set of institutional arrangements. It is possible that too much significance has been ascribed to the temporal characteristic of the project and associated organizational forms."* (Smyth, 2018)	
	Status	Comments
Object	Generic	Project organization and structure is standardized and applied according to Professional standards regardless the idiosyncratic needs of the project.
	Data supporting interpretation	
	• *"The factors that have been shown to have lesser impact on project success from the same research were standardized project organization"* (Leybourne & Al, 2012) • *"The first version of the company's project methodology was developed to fulfil the specific needs in a certain type of product development projects. When the methodology spread, a more generic version was developed that could be used by different types of organizations in different kinds of projects. As a result, almost all units adopted the methodology…"* (Bergman & Al, 2013) • "*case study suggest that projects in PBOs tend to imitate each other's structures, strategies, and practices with little consideration of the potential performance effects."* (Miterev & Al, 2017) • "*which might lead to homogenization of project structures and approaches*" (Miterev & Al, 2017)	
	Status	Comments
Scope	Standard	The project scope evolution forces us to distinguish one/off project to repetitive project where scope is similar to other already executed or being executed in parallel. The one off project being nowadays the exception where project scope can still be seen as unique.
	Data supporting interpretation	
	• *« Uniqueness – the definitions present the idea that there is a central uniqueness or novelty about project work. This was demonstrated to be counter-productive in the insistence on unique processes to accompany unique products and indeed the level of*	

	concentration of firms on establishing basic processes for running projects seems to justify that there is an acceptance of this in practice. Consistent with this, Davies and Brady argue that although the outcomes of projects may be unique, the same sets of capabilities and routines are required for their repeated execution. » (Maylor & Al, 2006) • *"Situated between these two strands is a small but growing stream of descriptive research on project organizations and project-based management. The nature of the project phenomenon is a major theme within this discourse. Most scholars have emphasized the unique, uncertain, and complex features of projects and temporary systems (Lindkvist et al. 1998, Lundin and Söderholm 1995, Sapolsky 1972, Hobday 2000). Other contributions, however, illustrate the significance of repetition (Davies and Brady 2000), imitation (Pipan and Porsander 2000), standardization (Kadefors 1995), embeddedness (Grabher 2002), and path-dependency (Engwall 2003) in project-based businesses."*(Engwall & Al, 2004) • *"Repeatability is the measure of a company's progress in providing integrated solutions. Initially, there is a powerful incentive for suppliers to offer customized solutions by creating tacit knowledge and new organizational approaches tailored to the context of each customer's problem, since this capability distinguishes them from rivals. But offering expensive customized solutions for each new customer is not enough to guarantee long-term growth and profitability. The knowledge and experience gained from initial integrated solutions projects must be shared, codified into project manuals and business processes and reused in subsequent projects. The costs of developing initial solutions must be recovered by replicating the product and service components of solutions until they become standardized offerings, used repeatedly in many projects at lower costs. Success in integrated solutions depends on how quickly and easily a company can move from unique to repeatable solutions delivery"* (Davies & Al, 2006)

	Status	Comments
Processes	Standard	Influence of professional organization did not stop growing over these two decades. IPMA and PMI are stronger and stronger and impose their standard. In. 2020 PMI issued a recommendation (yet to be become a standard) providing tailoring guidelines. The little freedom that Such project organization was leaving is in the courses of being standardize as well.
	Data supporting interpretation	

	• *"Moreover, they comment that this is a 'new bureaucratization'' and that an effect is the standardization of PM practices. This is manifested in the formalization of processes through the establishment of process manuals and managerial controls, as typified by the stage-gate process and re bureaucratization. At a higher level, the rise in the influence of the professional institutes and the codification of accepted practice into bodies of knowledge is evidence of an increasing importance of process".* (Maylor & Al, 2006) • *"Knowledge strategy has an important effect on the organizational processes because high level of formalization and standardization of procedures can lead individuals to exchange, store, and retrieve their information in a more efficient manner"* (Akhavan & Al, 2014) • *"The associations coordinate the creation of the formal BOKs, register education providers, sponsor conferences for information dissemination, and fund research – the traditional role in fact of professional bodies. But a major, and surely regrettable, result of their efforts has been the standardization – even commodification – of project management discussed below."* (Morris & Al, 2006)

	Status	Comments
Resources	Shared	With the setting up of the project-based organization, resource allocation is the standard especially in the world of customer projects. Chasing scarce resource is one of the main challenge that project managers have to deal with.
	Data supporting interpretation	
	• *"The adoption of international competitive tendering has led to many significant advantages: transparency, fairness, and a more efficient allocation of resources and expertise."* (Chen & Al, 2005) • *"Expressions like resource allocation indicate a certain level of formality; however, people often come and go in and out of projects in rather uncontrolled ways as discussed."* (Söderlund, 2008) • *"The main advantage of the matrix based organization is the efficient allocation of all resources, especially scarce specialty skills that cannot be fully utilized by only one project. For instance, monitoring and evaluation specialists may not be utilized full-time on a project, but can be fully leveraged by working on multiple projects."* (Diaz, 2007) • *"The main source of tension lies in the fact that managers compete with other colleagues to obtain human, technological and financial resources from the parent*	

	firm. Tensions are crystallized through the resource allocation process when firms must decide to assign higher or lower priorities to activities within the organization." (Seran, 2014)	
	Status	Comments
Budget	Constrained	Project budget remains constrained during the period. Standardization of product (project outcome) is another stage to optimize costs and reduce risk and uncertainty.
	Data supporting interpretation	
	• *"Since ID projects are part of a broader context, they face serious problems that may be .../.. economic (resource constraints and macroeconomic policy concerns such as domestic price regulations and tight budgetary restrictions)…"*(Pitsis & Al, 2004) • *"The project director may play a role in providing support, through activities such as regular visits to the international project, although our interview data suggests that the number of visits is often limited by budgetary constraints"* (Welch & Al, 2008). • *"In particular, he was supported by a powerful and effective technostructure (finance and human resources directorates) that was described as 'centralizing' and 'controlling' but that had enabled the hospital to achieve budgetary equilibrium and stability despite pressures from unions, medical staff and government."* (Denis & Al, 2000)	
	Status	Comments
Schedule	Technically convoluted	Despite the fact that Project management literature less and less amalgamate Project management and Planning and scheduling technics, scheduling is still seen as of high importance in project execution. The complexity that projects face requires the use of more and more complex scheduling and planning tools where all sort of inter-dependency are being monitored.
	Data supporting interpretation	
	• *"Project scheduling in organizations has become increasingly difficult in today's multi-project and multi-tasking environment. Traditional project management approaches like PERT/CPM often do not work well in such environments. In the late 1990s, Eliyahu Goldratt brought about a paradigm shift in project management by proposing Critical Chain methodology which embodies direct application of his Theory of Constraints (TOC) to project management. Several vendors have since incorporated his ideas into software packages to address project management needs in multi-project environments. In spite of using such sophisticated project management*	

	scheduling systems companies continue to face the critical challenge of completing projects on-time and within budget." (Agarwal & Al, 2009) • *"The program office was established with full time project control managers, software engineers and analysts were also relocated. In addition, the project control managers utilized sophisticated project management software, Primavera Project Planner, to handle complex and inter-related project scheduling management."* (Kwak, 2003) • *"A number of writers seem to trace the intellectual roots of project management research and knowledge to various types of planning techniques, such as CPM, PERT, and the like. Some even say that the father of (modern) project management is the well-known Henry Gantt, who invented the Gantt chart, which has become something of a standard model in project management practice. A continuation on these lines would indicate project management as a specific problem-solving method, of delimiting and grouping activities by using various types of techniques and methods*." (Söderlund, 2004) • *"This view of the project manager is perhaps at odds with many people's view of them as a noncommissioned officer, planning plans using their PC based software, and distributing those plans."*(Turner & Al, 2003)

	Status	Comments
quality	Stringent	Quality is a given and relates now to security, risk avoidance and company responsibilities. High quality standard are nowadays expected in term of Process application and project outcomes.
	Data supporting interpretation	
	• *"In the 1980s, high quality was considered an important source of competitive advantage. Not anymore. Customers now take quality for granted, rather than view it as a unique advantage. High quality has become a must, and essentially a license to do business. A similar case can be made for organizational efficiency."* (Shenhar.2007) • *"Quality Management/Six Sigma/Process Improvement (QM/6SIGMA/PI) refers to the concepts of improving processes, minimizing defects, and reducing cost by implementing continual improvement principles and specific measures and metrics."* (Kwak & Al, 2009) • "*Therefore, a reduction in quality that has the effect of increasing operational costs, which are therefore significant compared to project capital costs. These on-costs may not be economic long-term in relation to the policy and market conditions in which the final operations are located".* (Smyth, 2018)	

	Status	Comments
Execution Approach	Phased Concourant	Stage-gate approach is the norm but using concurrent engineering is also seen as a better way for innovative project (the one off Project). The trial and error approach is still seen as too onerous and uncertain. The concurrent approach is then view as the best compromise to stimulate innovation
	Data supporting interpretation	
	• *Moreover, they comment that this is a 'new bureaucratization'' and that an effect is the standardization of PM practices. This is manifested in the formalization of processes through the establishment of process manuals and managerial controls, as typified by the stage-gate process and re-bureaucratization"* (Maylor & Al, 2006) • *"However, none of this survived in the professional "bibles" of today; the phased stage-gate approach has been internalized so thoroughly by the profession that any mention of "parallel trials" today is met by incredulous reactions of the "this is unprofessional" type. We now turn to the story of how this happened.* (Lenfle & Al, 2010) • *"During the past two decades, there has been a strong desire on the part of senior managers to control the new product development process in their firms. Such control has been considered important to bring discipline to "chaotic" new product development activity and to manage the process for improved new products, enhanced efficiency, and faster introduction of new products. This desire to control new product development is consistent with the continuing trend in firms toward improving efficiency and lowering costs through process management and control initiatives, such as reengineering, Six Sigma, ISO9000, and total quality management. A system that offers a methodology for exerting control on new product development is the Stage-Gate process, and consequently it has been widely embraced by firms."* (Sethi & Al 2008) • *"The theory is that this sequence will get you from one stage of a project to another (one stage-gate/milestone to another), which is indeed proper practice in the stage-gate process now commonly adopted as good governance practice"*(Morris & Al, 2006)	

Table 16 summarize the attributes evolution overtime leading to disconnect between Project definition and project paradigm.

Table 16: Comparison of Project attributes from Definition and Paradigm in the 00's-10's

	Definition 1930's-**2010's**	Paradigm 30's-50's	Paradigm 60's-70's	Paradigm 80's-90's	Paradigm 00's-10's
Temporality	Temporary	Temporary	Temporary	**Permanent**	Permanent
Object	specific	specific	specific	**Generic**	Generic
Scope	Unique	Unique	Unique	Unique	***Standard***
Processes	Specific	Specific	Specific	***Standard***	Standard
Resources	Dedicated	Dedicated	Dedicated	***Shared***	Shared
Budget	Not limited	Not limited	**Constrained**	Constrained	Constrained
Schedule	Basic	Basic	**Technically convoluted**	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent	Stringent
Approach	Trial & Errors	Trial & Errors	Phased	**Phased Concurrent**	Phased Concurrent

3. CONCLUSION

This literature review is not deemed to be exhaustive but with more than one hundred references I pretend having a good overview of Project paradigm and project definition evolution from the early 30's until very recently (00's). From this first Chronological literature review on project paradigm and project definition evolution, I can conclude on several interesting statements.

First of all, I can argue that such periods have porous border and one period is for a part the continuum of the previous period, a good ramp up for the next one and source of specific thinking that would be fully attached to the given period as a kind of reflection such era. Despite the porosity of the border, I argue that those proposed are meaningful to understand the project attributes evolution over time and correspond to the advent of one or several paradigm changes. I also argue that each attribute evolution would require a specific and detail research.

Secondly I demonstrated that Project definition stayed stable over the 80 years of academic literature, while I was also able to show the complete transformation of project paradigm and therefore the current disconnect between project Definition and Project paradigm. From the 9 attributes studied only one did not change overtime, the quality from the ancient times till now has been expected to be stringent.

3.1. Project Definition evolution over time: the uniqueness as a key word

The 80 years of academic literature review highlights and reinforces the 3 major idiosyncratic characteristics of the project.

Temporality: The Project is a temporary organization. It has a starting date and an ending date. The project organization will be dismantled either after the delivery of the expected project outcome either if project is cancelled for any reason.

Uniqueness*:* The project organization is unique for 2 reasons.

- Uniqueness of project Organization

the Project organization is a unique in a way that it is created for a unique purpose and set up in a specific way that will fit to project execution need.

- Uniqueness of the Project Scope

Uniqueness also in relation to the scope or the expected outcome of the project. Project deals with non-repetitive outcomes. Each project outcome is unique.

Autonomy: The project is autonomous, it created its own rules and processes and is composed of a specific teams, the project team members. This is in contradiction to how the project paradigm evolved over time.

3.2. Project Paradigm evolution over time: towards standardization

Our literature review demonstrated that overtime Project lost his decoupled characteristic thru a strong standardization process. From autonomy demonstrated in the first decades, project is considered fully standardized in the recent period. This standardization is not without any consequences and finally ended up to the questioning of the 3 major idiosyncratic project characteristics even tough confirmed over time in the project definition.

3.2.1. Temporality

Temporality of project is now questioned. While project start is very often the contractual date indicated in the customer contract in the case of the customer projects, standardization of the starting date and the ending date of the project drives some reasonable questioning whether the project standardized duration covers its real lifetime. Pre contract activities have a significant impact on Project execution but are most of the time not considered as being part of the project. The same happen to activities such as warranty or maintenance activities. Project can be considered ended as per standards while the permanent has to deal with its consequences for years after. Though those warranty or Lifetime cycle are most of the time anticipated during the project execution and may drive some strategic choices related to the project design. *" .., all of the definitions above have the notion of a finite task. Where this task stretches over many years, the project no longer represents a 'temporary organization' . This does not distinguish them though from an ongoing operation, which from a process perspective, are thought to be markedly*

different. Very short projects would also question the notion of what constitutes 'temporary" (Maylor & Al, 2006)

Temporality is also question with the growing implementation of project based organization where permanent set-up are created to support portfolios of projects. Those Project office take over some responsibilities and task that are then executed in a standard and repetitive way. Planning, reporting are example of tasks that are taken away from project and managed at the project office.
"The interface between the domains, and between the temporary and the permanent organization is where stability is or should be established. Both the project team and the project-based firm are nested in a broader institutional context of the network or ecosystem to provide support. Projects are therefore also part of a relatively stable or permanent set of institutional arrangements. It is possible that too much significance has been ascribed to the temporal characteristic of the project and associated organizational forms." (Smyth, 2018)

3.2.2. Uniqueness

By the same process, Project object and project scope uniqueness has been questioned. Professional organizations provide strong recommendations not to say impose on how a project should be organized and set-up with very little interest on the nature or the specificity of the project. Standard prevails to the project uniqueness characteristics.
Developing or producing unique outcome has also been rightfully questioned over the past periods. Tailormade outcome are costly, risky and do not benefit from the company learned experience. Companies tried to avoid such risk by reinforcing product policy, incentivize re use of already existing development partially or totally. Building block approach in developing products is quite a standard practice.

Very recently, the PMI demonstrated some willingness to tailoring standards practices (Processes and organizational) but very quickly issued their own tailoring guidance meaning standardizing the tailoring process. Another demonstration of the schizophrenic behaviors of professional institutions promoting autonomy of the project in their definition while actively promoting and spreading stringent standards.
"Uniqueness – the definitions present the idea that there is a central uniqueness or novelty about project work. This was demonstrated to be counter-productive in the insistence on unique processes to accompany unique products and indeed the level of concentration of firms on establishing basic processes for running projects seems to justify that there is an acceptance of this in practice. Consistent with this, Davies and Brady[52]argue that although the outcomes of

projects maybe unique, the same sets of capabilities and routines are required for their repeated execution…/….. Standardization of processes as part of early projectification will reduce this variety. Case 2 (amongst others) are now allowing a greater range of processes to be used by removing the constriction to use a highly prescriptive process in full on all projects..."(Maylor et Al, 2006)

3.2.3. Autonomy

Our literature review demonstrated that over time literature has move from an autonomy perspective of projects to a perspective in which projects are more repeatable, standardized. From autonomy demonstrated in the first decades, project is considered fully standardized in the recent period. This standardization is not without any consequences

3.3. A growing disconnect, source of management tensions?

As a conclusion, I argue that over time the main original attributes of the project organization have evolved so that from mainly the 70's until today, project is pulled between the increasing trend of standardization in project organization and the autonomy that such organization requires to be successful and therefore the necessity of decoupling the project organization to the permanent organization. I believe that this tension does not only lie in the definition / paradigm of project management, but also in the way project management is implemented in organizations.
In the next chapters, I will conduct a literature review on tension between standardization versus decoupling and then look at the managerial consequences of such tension in project executions.

CHAPTER 2: STANDARDIZATION VS DECOUPLING: A PARADOXICAL PERSPECTIVE

"The projectification history was found to be connected with two parallel movements: a push towards project decoupling countered by a pull towards standardization of project management practices to tighten the coupling. The direction of the movements was influenced from current project management trends." (Bergman et al, 2013).

In the previous chapter I have shown the growing disconnect between the project definition and the project paradigm. This phenomena being parallel and imbricated to the standardization taking over autonomy in project management and project execution. This phenomenon being also parallel to the growth of permanent organization influence over the project organization. I also argue this movement, among other identified tensions such as Temporary versus permanence and Uniqueness versus genericity of the organizations, has potential management impact as it accompanies the increasing standardization pressure in project management over autonomy. Among the 3 sus-mentioned idiosyncratic characteristics of projects, Uniqueness, Temporality and autonomy, our focus in this section will be on the latter.

The purpose in the following chapter is to look at the tension through the angle of paradox theory. Standardization and decoupling between the permanent and the project organization are paradoxical in the sense; "*contradictory yet interrelated element that exits simultaneously and persist over time.*" (Smith et al., 2011, p 382).

"A paradoxical perspective would make contradictory notions, like loose and tight coupling (Weick, 1976), *for example, explicit, and would consider their simultaneous presence and dynamic balance."* (Quinn et al., 1988, p 7)

Therefore, I believe that looking at this contradictory move thru a paradox theory is more relevant than applying the commonly use Contingency theory. "*Early contingency theory from the late 60's inspired decades of research exploring how contexts influence the effectiveness of opposing alternatives"* (Smith et al., 2011, p 381)

1. STANDARDIZATION

1.1. What is a standard

Bredillet (2003, p 464) introduces the genesis of Standard: *"As a starting point, it is important to introduce and define the word ''standard''. Standard has its roots in Middle English and from the Old French standard meaning rallying point. Standard, of Germanic origin is a kin to Old English standan meaning to stand and to the Old English ord or point dating from the twelfth century."*

Sometimes, the Academic literature also refers to standard using different names such a "*benchmark, criterion, measure, and touchstone*" (Bredillet 2003, p 464).

Bredillet (2003, p 465) also defines the different steps and principles that are used to develop standard. He raises the importance of consensus within all concerned parties and therefore the political aspect of standard as subject to negotiation that might have then future consequences when applied; *"Standards development rests on a few general principles. ISO standards are developed according to the following principles: consensus the views of all interested parties such as manufacturers, vendors and users, consumer groups, testing laboratories, governments, engineering professions and research organizations are taken into account. industry-wide global solutions to satisfy industries and customers worldwide. Voluntary- international standardization is market-driven and therefore based on voluntary involvement of all interests in the market-place. There are three main phases (incorporating six stages: Stage 1: Proposal stage, Stage 2: Preparatory stage, Stage 3: Committee stage, Stage 4: Enquiry stage, Stage 5: Approval stage, Stage : Publication stage in the process of developing standards."* (Bredillet, 2003 p 465).

Standard definition from Standardization Organization

The European committee for Standardization (CEN) defines a standard as *"a technical document designed to be used as a rule, guideline or definition. It is a consensus-built, repeatable way of doing something."* (https://www.cencenelec.eu/european-standardization/european-standards/).
In other words, standards are a set of instructions and guidelines, recognized and respected in a specific professional field to which everyone is referring to and is monitoring their achievement against. The International Organization for standardization (ISO) is flattered to refer to more than 23000 different standards covering almost if not all the aspect of industrial manufacturing.

On their website, ISO has a pragmatic way of defining Standards: *" Think of them as a formula that describes the best way of doing something. It could be about making a product, managing a process, delivering a service or supplying materials – standards cover a huge range of activities. Standards are the distilled wisdom of people with expertise in their subject matter and who know the needs of the organizations they represent…"* (https://www.iso.org/standards.html)

1.2. Standard(s) in Project Management

The PMI defines standards in project management as follow: *"A standard is a document, established by consensus and approved by a recognized body, which provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Developed under a process based on the concepts of consensus, openness, due process, and balance, PMI standards provide guidelines for achieving specific project, program and portfolio management results" (https://www.pmi.org/pmbok-guide-standards/about)*

Standardization in Project management has been a progressive process as demonstrated in the part related to project paradigm evolution. In this part, I look at this evolution in the academic literature, then try to collect the main reasons for project standardization. I found 4 main reasons that would explain the need for such standardization trend. Finally I will try to summarize the main critics I found about this trend in the academic literature.

The standardization in project management followed three consecutives steps, starting in the early 60's to end, in the beginning of the twentieth century. The first step toward standardization was initiated with the aim of rationalization (Garel 2013). The second one, after rationalization is related to sharing experience and the creation of a communities of practices (Chanal, 2000), then finally the standardization process has been completed when professional guidelines books have been recognized as standard by some of the influential standardization organization (Seymour et al., 2011)

1.2.1. A need for rationalization to tackle complexity

A rationalization need in program management came with the increasing complexity of tasks to be accomplished in project execution. (Joffre et al., p50). Prior to the 40's, Project organization and project management were primarily used in the construction industry. The use of project management in engineering activities having high level of complexity and therefore needing also significant effort in the designing phase to be understood in execution as well drove the trend toward rationalization of practices (Chiu, 2010). *" However, we agree to recognize a constant in this concept* (project)*: the increasing power to the complexity of the tasks and the resulting separation between design and implementation. This historical cause is not without posing a*

paradoxical problem for project management because the latter requires at the same time a very strong dialectical unification of the design and the realization[19]." (Joffre et al., p 50)

Managing complexity has been a strong push toward rationalization and standardization. Practitioners and industry were also in demand for such rationalization and having guidelines to execute complex tasks. "*Standards considered as socio- economical constructs, as we see later on; are viewed as the result of negotiations that enable complexity, ambiguity and uncertainty to be reduced within project stakeholder groups"* (Bredillet, 2003, p 466)

1.2.2. Creation of Communities of practices

Communities of practices (Chanal, 2000; Wendel, 1998) is an intermediate enabler toward standardization of a field. *"According to Mats Engwall (1998), the basis of project management theory includes, as is the case of many management theories, first of all, an "articulated collection of best practices", drawn for the most part from the study of major North American engineering projects."* (Garel, 2013, p 663).

Practices sharing creates at the beginning a common language (Chanal, 2000) where project management practices are seen as more important than the industrial field where they would be applied. "*Standards for managing projects developed alongside the diffusion of the practice itself. The main diffused elements are models, codified tools and general approaches to PM that are to be utilized later by those wanting to run projects"* (Hallgren et al., 2012). Naval project, aeronautic project and any other project have the same needs in term of project management technics and tools. *"Project management only became a management model in the 1950s and 1960s. At the time, it became independent and standardized, in particular because differences between business sectors were perceived as less important than common preoccupations in managing engineering projects".* (Garel, 2013, p 668).

The creation of international organization such as PMI and the IPMA, led the initiative of knowledge and best practices sharing that was required by the practitioners. "*standardization process .../… is driven primarily by the professional organizations working in the field. The two largest such organizations, the European-based IPMA and the North American-based PMI, have developed standards for PM, which should perhaps be referred to as standardized collections of knowledge areas that a project manager must master "* (Hallgren et al., 2012, p 462)

[19] Free translation of: "on s'accorde cependant à reconnaitre une constante dans ce concept (projet) : la montée en puissance de la complexité des taches et la séparation qui en découle entre conception et réalisation. Cette cause historique n'est pas sans poser un problème paradoxal a la gestion de projet car ce dernier requiert dans le même temps une très forte unification dialectique de la conception et de la réalisation"

Over time, PMI developed a Project Management body of Knowledge (PMBoK) concentrating all best practices and all guidelines that a project manager should use to successfully deliver his project. This PMBoK, since its creation in 1987, has been updated several times (Garel , 2013) and the 7th edition is expected to be released in early 2021 (https://www.pmi.org/about/blog/new-7th-edition-pmbok-guide)

The influential empowerment, in the late 70's after existing over ten years, of International organization such as the PMI and the IPMA contributed to the standardized practices within Project management. Thereafter those standardized projects have been widely accepted and diffused worldwide. "*In this way, projects are regulated, in terms of their definition and core areas of activities, through a process that spans countries, organizations and individuals. It is a transnational regulatory process"* (Hallfren et Al, 2012, p 462)

1.2.3. Toward a Project management as an institutionalized standard

Project management standardization has been a continuous process over the last decades. Standardization is now so institutionalized that some authors define 2 periods in Project management, the pre standardized period (degree 0 of project management) and the post standardized period of project management model (degree 1); "*Christian Navarre (1989, 1993) has graded the modern history of project management according to two degrees: "degree zero" that, at the start of the 20th century, rendered project management autonomous and "degree one" that, during the second half of the 20th century, rationalized and defined a standard model for it."* [20](Garel, 2013, p 78)

Despite evolution over time that will occur in the future, the cycle is complete in term of project standardization. As per Garel (2013, p 83) Three main reasons lead us for such conclusion. "*Little by little, with each annual conference, the PMI standardized professional practices in project management. The following three initiatives were taken at the beginning of the 1980s (Navarre, 1993) and contributed to definitively institutionalizing the standard model:*
– the introduction of a body of knowledge in project management with the PMBOK (Project Management Body of Knowledge)

[20] Free translation of :" De son côté, Christian Navarre [1989, 1993] a gradué l'histoire moderne de la gestion de projet en deux degrés : le « degré zéro » qui, au début du XXe siècle, autonomise la gestion de projet et le « degré un » qui, dans la seconde moitié du XXe, la rationalise et définit un modèle standard

– The development of a certification project. The certified project manager complies with a code of ethics, masters a standardized body of knowledge thanks to training and is subjected to an examination confirming his professional practices. PMI first began offering the Project Management Professional (PMP) certification exam.
– The adoption of an ethics charter and an oath with the aim of creating the profession of project manager, based on the model of chartered professions.."[21]
The implementation of the Project Management Body of Knowledge associated with the certification of project manager has been two key initiatives toward standardization of project management practices. Most importantly, it is now acknowledged the importance of the PMBoK such that The American National Standards Institute (ANSI) recognized *PMBOK® as a standard* (Seymour,2011).

As mentioned above the circle is complete. Project management standardization is therefore institutionalized and any project manager would be considered to run most of projects if and only if they referred to PMBoK practices and most preferably are certified from the PMI.

1.3. Why standardization in Project management

Standardization purpose can found in literature as well as in the International or National standard Organization which are giving wide and generic reasons for standardization. Thus Bredillet recognizes such purposes in the British standard general principles and conclude to their applicability to the project management; *"... These are: (a) to promote the quality of products, processes and services by defining those features and characteristics that govern their ability to satisfy given needs; i.e. their fitness for purpose;*
(b) to promote improvements in the quality of life, safety, health and protection of the environment;
(c) to promote the economic use of materials, energy, and human resources in the production and exchange of goods;
(d) to promote clear and unambiguous communication between all interested parties, in a form suitable for reference or quotation in legally binding documents;

[21] Free translation of : « Elles institutionnalisent définitivement le modèle standard :
– l'élaboration d'un corps de connaissances synthétique en gestion de projet dans le PMBOK dont la première édition remonte à 1987;
– le développement de la certification projet : le gestionnaire de projet certifié respecte un code éthique et maîtrise un corps de connaissances standardisées, via une formation et un examen qui sanctionne sa pratique professionnelle
– l'adoption d'une charte éthique et d'un serment visant à construire une profession de chef de projet sur le modèle des professions à charte : les bâtisseurs de cathédrales ne sont pas très loin.

(e) to promote international trade by the removal of barriers caused by differences in national practices;
(f) to promote industrial efficiency through variety control.
These aims are relevant and apply to project management." (Bredillet, 2003, p 464)

Nevertheless those are generic purpose, I therefore tried to find more specific reasons for Project management standardization and came with 5 different reasons:

The Influential power of such standards in the field's institutions

Standardization is seen as a mechanism to increase the influential power of the project management institutions and to give legitimacy to the field in one side and to their representatives (the PM organizations) on the other side. it, therefore, reinforces the sense of belonging for the practitioners and reinforce the professionalization of the field.

- Standard is a way to create a professional environment you will master and will therefore provide the associated power. (Crawford & Al, 2007 b). Being part of the definition of the standard is a source of power the professional organization are looking for. *(Bredillet, 2003)*
- Standards bring legitimacy to the profession. It provides to the project team, showing their good application, a recognition and a kind of practical qualification that will be seen positively within the professional field. Such qualification can therefore generate higher income and provide some career perspectives. (Crawford & Al, 2007 b). The legitimacy is a source of power.
- Standard reinforce the professional stance of the Project Manger role. By developing certification such as the PMP from the PMI, the role is duly recognize in the field and outside the project field as it does for lawyers or real estate agent. It also create a sense of belonging and a community that professional will appreciate to be part of. *(Hallgren et al., 2012)*

The need for a common language in a globalized world

Standard are still culturally driven, difficult to establish international standards despite PMBOK knowing the competition existing between different project management institution. Nevertheless, having standard to which professional can refer to is helping developing a common language ,a community of practices . In a more globalized environment with increasing international

cooperation, having a common language is more than a necessity, it is mandatory. Standard implementation also helps professionals to benchmark themselves to other practitioners.

- Standard generate a common language. Having its own standard is a way to spread this common language globally and reinforce its influence in the field as this language spread over different countries and different activities. (Bredillet, 2003) This common language might not overseed the local language and local practice but it will definitely be an enabler for a better communication within the professionals coming from different fields.

The controlling purpose of standard

Increasing Standards as well as strengthening certification of people is seen as a controlling process from institutions such PMI or IPMA towards practitioners using project management. Disseminating into organizations culture with a set of best practices is reinforcing the power of control of PM institutions and propose to organization a recognized set of tools to cope with complexity. Thus permanent organizations transfer the risk of managing complexity to institutions which therefore reinforce their influential power. Control from project management institutions over freedom of single project organization translate into a bureaucratization of project management where risk aversion is replacing the inherent nature of risk taker and uncertainty management that project where set up for.

- Imposing standard and execution working instructions is a way to increase the control of the parent organization while insuring a rational execution in project execution practices. (Räisänen et al., 2004)
- Standard is a way for the parent organization to transfer the risk of execution failure to external agent such as the professional institutions. Project Manager are constraint in their autonomy while the leadership of the parent unit rely on the proficiency of the qualified institutions. (Räisänen et al. , 2004)
- Standard is a way to uniformize practices a move towards a bureaucratization of project activities. This allow the organization to move towards standardized tasks and rationalization of organization. (Räisänen et al., 2004) The emergence of central PMO (Project management Office,) in the entities is a typical move towards project industrialization and organization of project factories. (Kwak, 2003)
- Standard and associated certification increase control over people. Nevertheless the institutions propose a set of. tools and practices but do not take any responsibility towards their effectiveness for a given project. The Project manager has limited autonomy in execution, the parent company mitigate its risk by adopting recognized standards and

practices (transferring the risk to an agent: the Professional institution)(Hallgren et al., 2012) and the agent does not provide any guarantee of successful execution. Overall responsibility is therefore totally diluted to several player and lead to lack of ownership in the overall project management.

The reassuring power of standard towards customers

The use of standard method is accepted as a proof of competence in many customer eyes. Professional association have been so convincing that we see more and more the certification as a must have that customers are requesting in their RFQ (request for Quotation/bidding processes). (Hallgren & Al, 2012). Drivers need to have their driving license, Project Manager need to be PMI or IPMA certified. This gives customers the reassurance that their project will be steer following standard processes and institutions' guidance. Once again we see a transfer of risk of coping with uncertainty from the end customer to the supplier who transfer it to the professional association. Interestingly is the fact that this process of transfer is free of risk as in case of mis management of the given project, Guidance and standard will never be questioned. External actors also promoted or imposed the use of standard in order to extend global trade by creating commonality of practices and common languages that would comfort the customers. The case of the North American Free trade agreement signed in 1993 required such standards. This leading to strengthen the power and the influence of North American companies in the global economy. (Crawford & Al, 2007)

The goal towards efficiency & competitiveness

It is believed that the use of standards is synonymous with efficiency (Bredillet, 2005) and competitiveness (Crawford & Al, 2007). Standard drive synergy and therefore organization optimization that will positively impact the permanent organization competitiveness on one end and improve organization efficiency by using well known, standardized, "industrialized" processes. *"Project management standards are being used extensively throughout the world in training and development, professional certification programs and corporate project management methodologies, based on the assumption that there is a positive relationship between standards and effective workplace performance."* (Crawford & Al, 2007 b, p87)

1.4. Critics of standardization in project literatures

From a professional association, a permanent organization and even from a project manager standpoint I demonstrated the obvious interest to develop and reinforce standards in the project management field. Nevertheless such a trend can still be questioned from a management science perspective as I demonstrated earlier that the increasing standardization of project management accompanies the loss of autonomy and the loss of project ability to cope with complexity and uncertainty. From an organization that was created to manage uncertainty, standardization weakened its intrinsic capabilities. Critics can be categorized among 3 different themes.

Project management Standards are disconnected from the field

The critic consists of two-fold. Theoretical and Consensual standard's attributes: standard propose guidelines and best practices either from a theoretical standpoint, an idealized view (Hallgren et al., 2007) that are difficult to apply as is. The increasing number of scholars involved in the project management field may drive such theorization of project management standards. *"His basic argument is that the founders of this field of inquiry and their immediate disciples are concerned with building knowledge that was relevant to managers and leaders, in fact, to anyone concerned with improving organizations. However, in the intervening years, in spite of, or maybe because of the growing number of scholars involved, their research has lost its relevance to practice".(Lorsch, 2009)*

Standards may also be driven by Professional association such as PMI or IPMA, where many members will be involved at defining the standards. The political influence in such organization will drive consensual agreement. In that case, standard are aiming to cover each and every situation, Though generalization is generating difficulties to be applied as such. *(Hallgren et al., 2012)*

Therefore having theoretical and/or consensual standards lead to direct applicability questioning et scholars are raising some convers.

- Standard are consensual as thoroughly negotiated but all moral or ethical concerns re removed from the standard which question therefore their applicability at all time. (Hodgson et al., 2006)
- Standard are focusing on past and present practices rather than future or pragmatic and improved practices. (Hodgson et al., 2006)
- Standards are written by practitioners, project managers. The lack of diversity in writers lead to 2 main problems. The project manager, can't be innovative as they otherwise may

be criticized and carry the risk of losing their certification. In addition this lack of diversity drive the lack of strategic. And contextual guidance that the standard would benefit f writers would come from outside the project management family. (Morris et al, 2006), (Hallgren et al., 2012)

Project Management Standards are decontextualized

Critic relates to the lack of contextual perspective in standards and the lack of recommendations to take into account the situation when applying standards. Morris et al. (2006) are asking how mechanistically should we apply standard. Standards are idealized and decontextualized which drives to potential application misuse.

- Standard needs to be understand with their context, with past experiences*(Hällgren et al, 2012)* If applied mechanistically, there will lead to execution issues *(*Engwall*, 2003;* Chanal, 2000). *"Reality is never free from context dependencies and situational factors that are of major importance for all projects" (Hallgren et al., 2012, p 460)*

Project Management Standards need sound foundation and project management field is not mature enough

Finally some scholars are claiming that standards need to be built on a sound ground base which is not the current status of the project management field. If not so, standard may not be applicable efficiently and may lead to management errors (Bredillet 2003).*"Research on projects is not only an immature field of research, but it is also insubstantial when it comes to understanding what occurs in projects*." (Blomquist et Al, 2010)

- Standard in Project management carry the risk of having project management field being fed by management theory that are constructed on the basis of the Standards practitioners wrote. This cycle may be very harmful to the project management field and the project execution practices. (Blomquist et Al, 2010)
- Standard need to be construct and reconstruct continuously to improve knowledge and practices. The model and standards need to be questioned systematically and dynamically (Bredillet, 2005)

2. DECOUPLING

2.1. What is Coupling-decoupling

Glassman (1973) described relationship between systems or subsystems as coupled with different degree depending of the number of variables that they are sharing: *"The degree of coupling, or interaction, between two systems depends on the activity of the variables which they share. To the extent that two systems either have few variables in common or if the common variables are weak compared to other variables which influence the system, they are independent of each other."*

Coupling-decoupling implies the existence of at least two different systems, sub systems or organizations. This seems obvious but the notion of coupling is related to the interaction and the relationship between two or more systems or organizations. They can be tight or Loosely coupled /decoupled depending on the strength of their interaction and the level of cross-influence .

Weick (1976) made the notion of loosely coupled very famous in management science when he described the educational organizations as loosely coupled looking at sub systems such as, administration, teachers, parents associations and their relationships. Despite the loosely coupling of all subsystems towards each other's, he concluded that educational organization could still be seen as a System of subsystem where inter actions might move from thigh to loose relationships. *"How can such loose assemblages retain sufficient similarity and permanence across time that they can be recognized, labeled, and dealt with? The prevailing ideas in organization theory do not shed much light on how such "soft" structures develop, persist, and impose crude orderliness among their elements."* (Weick 1976)

Weick (1976) also made an interesting remarks that due to their looseness some organizations were not seen as such in the past and would conduct to some wrong conclusion or management incorrectness. " *Organizations as loosely coupled systems may not have been seen before because nobody believed in them or could afford to believe in them."* In other words, Weick demonstrated and popularized the idea that it is not because the interrelation of two systems or subsystems is not obvious and demonstrated that there is no relation at all and therefore we might miss the coupling of those two elements. *"To assert that a system is loosely coupled is to predicate specific properties and a specific history to the system, rather than an absence of properties."* (Orton et al., 1990)

Orton et al., (1990) highlighted the importance of such concepts as the complexity in organization was growing and two opposite trend appeared. One towards control and standardization to master complexity and one towards autonomy to master uncertainty. *"Dialectical concepts are rare because they are difficult to build. Loose coupling, for example, is the product of many years of effort by organization theorists to combine the contradictory concepts of connection and autonomy."* (Orton et al., 1990)

This is therefore very logical that such concept have been used in project organization studies. The increasing number project associated to the high complexity of the environment and the ongoing necessity of controlling projects, since the project advent in the 1970's made the coupling concept, a perfect prism to look at project, its parent's company and their environment interrelations. "*An important finding is that the historical trajectory of the company and its way of organizing are linked to two parallel movements: a push towards project de-coupling and a counter-pull towards standardization of project management practices to tighten the coupling and re-assert control. This pendulum movement reflects project management trends over time as described in the different versions of the company's project methodology*" (Söderlund, et al., 2008)

2.2. Coupling-decoupling in the project organization field

Academic literature highlights two main reasons for which the Coupling concept (Orton et al., 1990) is an interesting concept for the project management field.

2.2.1. Project is embedded in an environment

The first reason has to do with the recognition of the embeddedness of project in an environment (Engwall, 2003). This environment can be internal to the company, such as the parent's organization (Cook, 1971) (Johansson et al., 2007) , the company history (Bergman et al. 2013);*"Analyzing projects by means of their patterns of loose and tight coupling to the parent organization revealed interdependencies of project-specific factors and of the parent company's processes and structures that have hitherto remained hidden. By highlighting these interdependencies the model provides support for the shift in focus from the project to its interplay with structure, people and processes in the company*." (Söderlund, et al.,2009).

The environment can also be external to the project and its parent company and is comprised of but not limited to the customer context , the external stakeholders (Bergman et al., 2013); *"The impact of the environment on an organization has been in focus since the emergence of the open-systems perspective in organization theory . It includes the organization's social, legislative,*

cultural, business and technological context, as well as its external stakeholders." (Söderlund, et al.,2009).

The coupling/decoupling concept forces academics to look at project not only as a standalone temporary organization but also as an organization embedded in an environment, a culture and a history and therefore, forced the academics to look at a project organization as a complex structure that has several layers and several axis of analysis. "*First, the authors demonstrate the significance of analyzing the nested levels of projects of engaging in a multiple-level analysis where projects are not always the most important one. This could be the individual, team, multi-team, project, organization, firm, industry, or even the organizational field. The authors therefore point out the importance of addressing and acknowledging "the embeddedness of projects"*. (Söderlund et al., 2014)

The concept highlights once again the contradictory trends of standardization of the project organization and the need for autonomy to integrate the contextual environment in the project organization set-up;. *"Originality/value – Adding the notion of coupling gives a new dimension to the transformation of project-oriented companies. The model for analyzing projects by means of their patterns of loose and tight coupling provides arguments for the shift in focus from the individual project to the interplay between structure, people and processes in the project-oriented company"* (Bergman et al, 2013).

2.2.2. Measuring the Project's level of coupling

The second reason, coupling concept is of interest in the project organization field has to do with balancing the level of autonomy of the project organization toward its parent organization. The parent organization is a key environmental element surrounding the project organization and its level of interlink with the project requires a specific attention; *"The underlying assumption of this article is that a projectified company is a loosely coupled system (Weick, 1976), and its projects are temporary organizations embedded in and partly de-coupled from the parent company. Each project will be characterized by its coupling pattern, which can be described as either loose or tight, depending on the perspective taken."* (Söderlund, et al.,2009).

2.2.3. From coupling to decoupling: a perpetual Balancing Movement

Project and its parent organization are endlessly trying to find the right level of coupling between each other that would allow the parent one's to exercise its control duty through standardized processes and standardized practices (toward a tight coupling) while providing enough autonomy to the project organization to optimize its organization taking into account, project deliverables

but also its environment; *"The need to achieve a balance between adapting to the specific situation and following standardized rules adds to the general managerial challenges of any project."* (Hällgren et al. ,2010).

This drive to questioning the static perspective of this loose/tight coupling between the parent company and the project organization. For academics, this status is not static and is continuously reassess over time and the project progress ; *"An important finding is that the historical trajectory of the company and its way of organizing are linked to two parallel movements: a push towards project de-coupling and a counter-pull towards standardization of project management practices to tighten the coupling and re-assert control. This pendulum movement reflects project management trends over time..."* (Söderlund, et al.,2009).

2.2.4. Coupling : an adaptable and dynamic concept

Academics refer to the coupling concept as an adaptable concept where all projects from the same parent organization should not have the same coupling, each and every project having a different context and different needs. Trying to apply the same coupling to each project would reduce the organizational efficiency and the autonomy level that each project specifically requires; *"The company (and its projects) benefits from being a loosely coupled system, where each project's pattern of loose and tight couplings may be adapted to best serve the need of the specific project in its specific organizational environment."* (Bergman et al., 2013). A development project might not need the same level of loose couplings with the parent company as compared to an internal project related to the implementation of a new ERP system which has to be closely and tightly monitored as an example (Engwall et al., 2004).

The concept is also describes as being evolutive dynamic meaning that each coupling states may evolve over time and adapt to the new project and environment status; *"The exchangeable and dynamic process of loose and tight coupling is natural."* (Hällgren et Al, 2010). At certain stage the project might need a tight coupling with its parent company (Project Kick-off for example) while in some other stage a more loosed coupling might be better.; *"This is a special case of boundary setting or spanning in time, and the purpose is to decouple the temporary organization from its general surroundings and then in due course, to reattach it when its termination point is reached."* (Lundin et al., 1995)

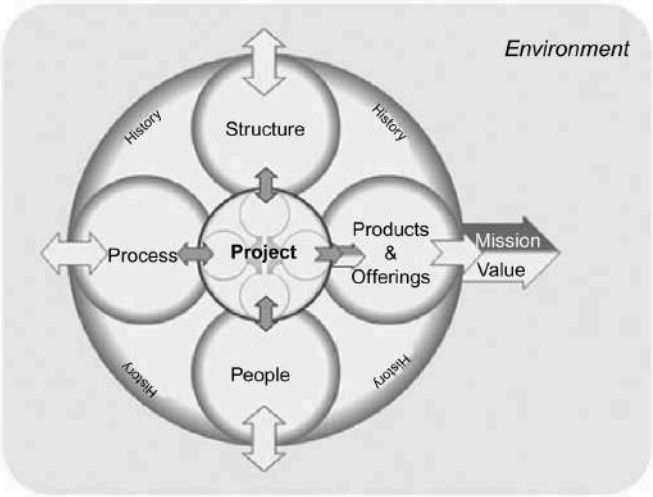
2.2.5. Coupling : a paradoxical concept

Finally academics also highlights the paradoxical perspective of Loose/tight coupling: One can't exist without the other: Weick and others refer to the loose/tight coupling concept as a paradoxical

concept (Smith et al., 2011); *"The rule of thumb would be that a tight coupling in one part of the system can occur only if there is loose coupling in another part of the system."* (Weick, 1976). Weick explains that two interrelated systems cannot be either fully tightly coupled or fully decoupled. According to Hällgren et al. (2010) looking at the project as either tightly coupled or decoupled from the parent organization is misleading; *"Rather than understanding the organization as either open or closed, the idea is that the organization is open and closed at the same time"…. "Orton and Weick (1990) write that attention should be paid to the condition that tight coupling in one part of the system requires loose coupling somewhere else,…*" (Hällgren et Al, 2010)

Using Bergman et al. (2013) 'model (figure 6) will be helpful to better understand Weick's statement.

Figure 6: Project as an embedded organization



Source: Bergman et al., (2013)

In their Article " Decoupling and standardization in the projectification of a company" (2013), Bergman, Gunnarson and Räisänen demonstrate that project organization in embedded in an environment, within its parent company that has his own culture and history. They also analysis project " *by means of their patterns of loose and tight coupling provides arguments for the shift in focus from the individual project to the interplay between structure, people and processes*…" (Bergman et al., 2013)

Each of the perspective might have different level of couplings between the parent organization or the environment and the sum of all those couplings will make the project unique and fully embedded in its environment. As an example, if the Project aim to deliver a standard product, the coupling towards the Product perspective will be very tight meaning that the control of the outcome

is driven by the company product policy. Looking at the product perspective could imply that project is tightly coupled with the parent organization. But what about the other perspectives…;
"If a person selectively attends to the openness, independence, and indeterminate links among some elements, he or she will describe what amounts to a decoupled system. That characterization, too, is incomplete and inaccurate because parts of the system remain coupled and closed" (Orton et Al, 1990). More importantly, as stated by Weick (cited by *Söderlund, et al* (2008)) this is the combination of the different couplings patterns that may explained the project outcome and looking only at the loose coupling elements or the tightly coupled element to understand project outcome would potentially drive wrong conclusions; "*Weick argues that in a loosely coupled system, "tight couplings in one place imply loose couplings elsewhere, and that it may be the pattern of couplings that produces the observed outcomes" (Weick, 1976, p. 8)."* (Söderlund, et al.,2008)
The coupling concept can also be looked thru different axis or organizational point of view; *"The mission of a project is to solve novel problems in a creative way and to perform task-specific activities that the traditional bureaucratic form of organization may not be suited for (Weber, 1947). In this respect projects are loosely coupled to the established traditions and standard operating procedures within an organization, but are tightly coupled to their own objectives and ends."* (Räisänen et al. , 2004).

2.3. Why & How Decoupling in Project management

Despite or maybe because of the Project paradigm evolution as demonstrated earlier, from a project defined as an autonomous, temporary, unique and goal specific entity to a Standardized and controlled organization embedded within its parent company. I see a dilemma and a long lasting balancing pattern between a push toward standardization and a contrary push toward project autonomy. Academics claim two coupled system such as the parent company and the project organization need to be partially decoupled in order to optimize the efficient use of the project organization; *"The company (and its projects) benefits from being a loosely coupled system, where each project's pattern of loose and tight couplings may be adapted to best serve the need of the specific project in its specific organizational environment."* (Bergman et al., 2013).
Academics, therefore, identified several advantages to a loosely coupled project organization with its parent company:

2.3.1. Decoupling allows Autonomy, Responsiveness. and adaptability

Self-determination (Bergman et al., 2013; Hällgren et al., 2010), autonomy (Smyth, 2018), adaptability (Weick, 1976); "*The company (and its projects) benefits from being a loosely coupled system, where each project's pattern of loose and tight couplings may be adapted to best serve the need of the specific project in its specific organizational environment."* (Bergman et al., 2013), responsiveness ; *"By being able to absorb changes, loosely coupled systems have a propensity to show responsiveness among their parts ...."* (Hällgren et al. 2010). Those are words commonly used by academics and practitioners to claim the need, for the project organization, of some freedom to execute the project. Decoupled project organization allows to recover partially the idiosyncratic attributes listed in the project definition.

2.3.2. Decoupling allows local specificities

In the same spirit as adaptability, Weick (1976) recognize to Decoupling the advantage of enabling the local adaptation. Bergman et al. (2013) also confirm this capability to the project organization field. A project decoupled to the parent organization will enable the project team to adapt to the local constraints without having to review the overall practices and processes of the parent company. This drives cost, time saving and complexity reduction; *"... a loosely coupled system may be a good system for localized adaptation. If all of the elements in a large system are loosely coupled to one another, then anyone element can adjust to and modify a local unique contingency without affecting the whole system. These local adaptations can be swift, relatively economical, and substantial" (Weick, 1976)*

Weick also see another advantage to the local adaptation potential of a decoupled organization. I would call it the firewall capability. Once something goes wrong and is localized, this decoupling capability will enable the team to con fine the issue to its localized area thus avoiding the propagation to the overall project organization or more importantly to the parent organization.

"If there is a breakdown in one portion of a loosely coupled system then this breakdown is sealed off and does not affect other portions of the organization. Previously we had noted that loosely coupled systems are an exquisite mechanism to adapt swiftly to local novelties and unique problems. Now we are carrying the analysis one step further, and arguing that when any element misfires or decays or deteriorates, the spread of this deterioration is checked in a loosely coupled system" (Weick, 1976).

2.3.3. Decoupling enables complexity management

In growing complex project environments (Baccarini, 1996), academics argue that a single tight coupled organization is less and less suitable to execute complex projects; *"Basically, because many organizations are too complex to be kept together as one tight entity, loose coupling enables organizational growth in terms of size and scope."* (Hällgren et al. 2010).

There has been a trend in project management studies about the use of smaller organization decoupled from each other where the key success would be their ability to interact together. Baccarini (1996) defines complexity primarily as the number of interconnected parts as well as their interdependence between each other and their capability to interact jointly in a coordinated way. As an example, In the early 00's the Actor Network Theory has been applied to Project management field (Blackburn, 2002) arguing that using a web of smaller decoupled organization to deal with project complexity and project uncertainty ; *"The variety of actors and the need to engage all of them, and the fact that projects emerge from the interplay of competing viewpoints around controversies may explain the success of agile or partnering practices."* (Floricel et al., 2014)

2.4. Critics of decoupling in project literature

Finally, Critics about decoupling in project management can be found. The first and more recurrent is the alleged link between decoupling and lack of control (Barker, 1993). Controlling project, would necessarily mean tightening the control of the parent organization toward the project organization. (Räisänen et al. , 2004) even though it has been demonstrated counterproductive (Engwall et al., 2004); *"members become occupied with 'red-tape' activities of reporting rather than trial-and-error learning about the technical issues at hand"* . The move towards critics is as old as the growing interest of the project organization. After few experiences in the early 50's where project freedom was not a concept, Control and tighten coupling has been the paradoxical counter movement of project autonomy since early 60's. (Morris 1987); Negative effects of project decoupling were considered more problematic than the potential benefits (Bergman et al., 2013).

Another critics come when considering the loose/tight coupling perspective as static. There is a fear that Project after having tasted "freedom" would reluctantly re-integrate the parent organization in term of standard and processes to be applied (Bresnen et al., 2004) (De Fillippi et al., 2016).

Lastly the long term benefit, for the parent organization, the one that will remain after project completion, of decoupled project organization has been questioned for several areas, such as

Knowledge transmission (Sydow et al., 2004), Innovation in the long run (Dubois et al., 2002), long term strategy (Engwall et al., 2004)

3. DECOUPLING VS STANDARDIZATION : A PARADOXICAL TENSION IN PROJECTS

In the precedent chapter we looked at the standardization phenomenon in the project organization field as well as the decoupling perspective synonymous of autonomy for the project organization towards its parent organization, one of the most important environmental perspective surrounding the project organization . I concluded that tight coupling and decoupling are two counter movement existing simultaneously in the project organization and are therefore source of potential tensions between the parent organization and the project organization. Coupling concept acknowledges the existence of an environment and therefore the need to have it embarked when looking at the Project management field, it also confirms the embeddedness of the project organization within its parent organization and help to measure the level of coupling between those two organizations. This coupling level needs to be monitored in order to avoid the full embeddedness of the project ; *Conversely, a project that is found to be tightly coupled regardless of the perspective used, cannot be regarded as an organization of its own, but should rather be seen as part of "business as usual" in its parent organization"* (Bergman et al., 2013) . At the extreme opposite, fully decoupled organization toward its parent organization might be a non-existing concept as there will also be a small interacting link between a parent and its children organization; *"The model suggests that the coupling – the dependency – between a project and its parent organization may be described as loose from one perspective, while it at the same time may be found tightly coupled from another perspective. The assumption here is that in order to be described as firm-based, a project must share some elements with its parent company and the coupling, at least from one perspective, considered to be tight. (Bergman et al., 2013)*

Project will have to cope with loose coupling and standardization at the same time and I chose to look at the tension created by those two counter movement from a paradoxical perspective:

3.1. The Paradox Theory

"A paradox, also called antinomy, is a real and apparent contradiction between equally well based assumptions or conclusions. When considered separately, the arguments supporting paradoxical propositions appear sound." (Van de Ven et al., 1988)

In the 60's Lawrence & Lorsch (1967) proposed a contingency approach that have been applied for decades in the way to resolve and anticipates tensions related to the adoption of the best alternatives among contradictory possibilities. In other words, between option A or B there is always one that is better suited for the current environment and the goal to achieve.

This approach has been since then questioned by academics that challenged the 0/1 approach; *The literature reveals difficulties accepting simultaneous opposites that are positively defined, mutually-causal relationships, functional incongruities, and paradigm shifts. In short authors have often not successfully tolerated paradoxical thinking."* (Quinn et al., 1988) and the paradox approach has become a strong alternative to the contingency theory; "*As an alternative to contingency theory, the paradox literature has become increasingly crowded."* (Smith et al., 2011).

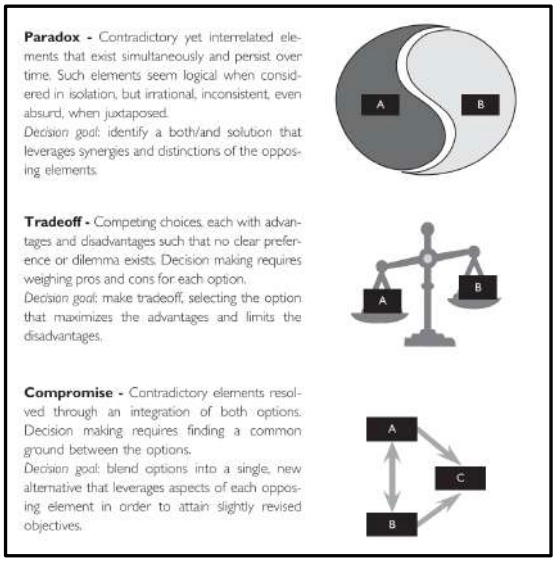
Van de Ven (1983) questioned the value of Contingency theory to solve Paradoxes in a more and more complex world with complex and changing organization. "*Contradictory demands intensify"* (Smith et al., 2011). Academic literature argues as well trying to achieve multi alternative yet contradictory leads to better performance in the short term and stronger sustainability over time (Cameron, 1985) ; (Peters & Waterman, 1982) (Garud et al. 2011; Smith et al., 2011).

Academic literature proposes 3 options to deal with tension in organization (Figure 7) . The Tradeoff option that corresponds to the contingency theory where between a and B, we will pick A or B that is best suited at the time of the decision. The Compromising option, where we will merge A and B to create C, that is supposed to take the best of both option to create a third one. Then the paradox option where the organization will look at using A &B simultaneously. *"Contingency approach explores conditions for selecting among competing demands…/... Paradox studies adopt an alternative approach to tensions, exploring how organizations can attend to competing demands simultaneously".* (Smith et al., 2011)

In the first chapter of their Book, "Paradox and Transformation" (1988), Cameron & Quinn differentiate paradox versus dilemmas, inconsistencies or ambivalence by the fact that both of the paradoxical elements are accepted, present and operates simultaneously. "*The key characteristic in paradox is the simultaneous presence of contradictory, even mutually exclusive elements".* (Quinn et al., 1988). Smith & Lewis also define in 2011 "*paradox as contradictory yet interrelated elements that exists simultaneously and persist over time*" (Smith et al,. 2011).

Figure 7 describes the 3 methodologies as per Lewis & al. (2014) to cope with tensions

Figure 7: Tensions as Paradox, Tradeoff, and Compromise



Source: Lewis et al., (2014)

In the case of the relationship between the parent organization and the project organization I believe a tension exists between the push from the project organization towards decoupling that provides autonomy and agility and a push from the parent organization towards Standardization in project execution that provides control, (Söderlund, et al.,2009).

3.2. The coupling paradox in project management

At this stage it appears. Important to clarify the link between my view of the standardization as a vector of tight coupling between the parent organization and the project organization. The use of standard is in my view an opportunity for the parent organization to better control and reduce the autonomy given to the project organization. By imposing a standard organization, standard reporting practices, standard project execution, the project organization has de facto a reduced autonomy and limited ownership of the project execution. In that sense, I see the standardization has a tight coupling enabler and freedom restrictor to the project organization

"The arbitration between the standardization of project management processes and the autonomy of projects is a question that some practitioners question in these terms: "if the projects are unique, the standardization of project management practices and business processes is a barrier to performance. There is therefore a danger in engaging, in particular through the application of ISO 9000 standards or re-engineering approaches, towards standardization of processes in the company. " (Jolivet, 1995, p. 66)".[22] (Chanal, 2000)

[22] Free translation of « L'arbitrage entre la standardisation des procédures de gestion de projet et l'autonomie des projets est une question que certains praticiens posent en ces termes : « si les projets sont singuliers, la standardisation des processus de conduite de projet ou des processus métiers et fonctions

I believe that a paradoxical approach to tension resolution related to Standardization vs decoupling in project organization and project execution is more suited. In fact the standardization from the parent organization and the need for autonomy for the Project organization are contradictory but neither one or the other as an organization would disappear therefore a 0/1 approach is quite unrealistic. Project management team will have to cope with both organization and from their ability to resolve tensions arise between the two and their contradictory attributes will determine the ability of the project team to perform. I argue in our case a paradoxical approach is more appropriate as very difficult, to choose between standardization driven by the parent organization and the decoupling that by definition a project execution would require.

As long as interrelation between the parent organization and the project organization is acknowledged, tensions exist between loose coupling (decoupling) and standardization (tight coupling). De Fillipi and Sydow (2016) identified it among five other paradox in project network management, as the difference paradox: the difference paradox is the paradox that projects experience between using standardized execution practices (routine task) and the unique tailormade solutions that some project challenges may require; "*Standardizing policies provide economies of repetition and repeatable solutions (Davies & Brady, 2000). However, these standardizing policies can become dysfunctional when a project or a series of projects contains unique (innovative) requirements.*" (De Fillippi et al., 2016)

Chanal (2000) covers the coupling paradox through 4 different paradoxical tensions: The Reification/Participation paradox, the Global/Local paradox, the identification/tradability paradox and the Emerging/Designed paradox. (figure 8)

The reification/participation paradox refers to the balanced equilibrium to be found between what need or should be standardized (reification) and the level of autonomy that need to be left to the project actors (participation) to execute and deliver successfully the project.

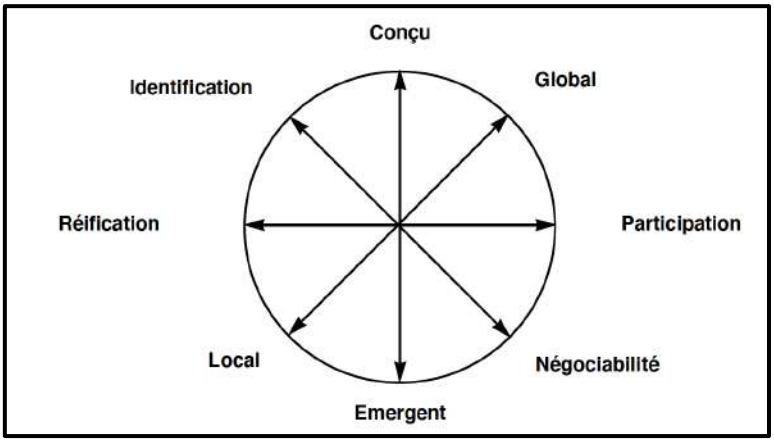
The emerging/designed paradox refers to the compromise the entity needs to manage when allocating its resources between innovative and risky project and operational, well-structured operations.

est un frein à la performance. Il y a donc un danger à s'engager, en particulier à travers l'application des normes ISO 9000 ou les démarches de re-engineering, vers une standardisation des processus dans l'entreprise. »

The identification/tradability paradox refers to the need for organizations to quickly identify project actors via the development of project culture or Professional institutions and the opposite need for to leave some areas of uncertainty in the role and attributes of the project actors. This ambiguity would generate innovation and adaptation capability the project needs.

The global/Local paradox refers to the question of the interrelation between the project and the parent organization. As define by De Fillippi and Sydow (2016) it questions the arbitration between the principle of economy and knowledge build-up (standardization of practices) and a principle of creativity and local efficiency (autonomy).

Figure 8: Management by Project : A paradoxical management



Source Chanal (2000)

Chanal present this tension in the frame of an organizational learning frame. Is the project team consider as a community of practices. Shall we standardize our practice to create commonalities of practices within the unit so that all project organization would operate the same way allowing resources haring and faster training of new comers or should we leave each and every project. Organization the freedom to create their own practices. The unit would then risk not to benefit from those individual initiatives. I did not look at this tension in the frame of standardization being an enabler to create a common knowledge and common practices.

I look at the standardization (global) versus local as a barrier of the autonomy the project needs for its execution. The project organization need flexibility, adaptability and agility in order to react at the right pace when execution issues arise and the use of standard is in my opinion an obstacle to autonomy and agility.

3.3. How to deal with paradox

Academic literature recognize several method for dealing with paradox .We are presenting hereafter 3 different approaches that can be used in management research when confronted with a paradoxical situation.

Sequencing or use the time

This method has been presented by Van de Ven et al., 1988). The method is to create two sequential project organization. The first one will cope with customize/ innovative solutions. This organize might need a strong loose coupling from the parent organization and then a second project organization would learn and integrate knowledge from the first steps and would standardized the new practices in order to re-use them similar project would arise. This second organization would need not need to be too decoupled from the parent organization. Tightening the coupling would then help the repetition mode of execution.

In this case the use of time and the temporal sequencing of actions would help resolving the coupling paradox. This is one of the 2 resolving proposed by De Fillippi and Sydow (2016).

Method also studied by Brady and Davies (2004); *"This paper presents a model of project capability-building consisting of two interacting levels of learning. First, it describes the bottom-up, 'project-led' phases of learning that occur when a firm moves into a new technology/market base: an exploratory 'vanguard project' phase; a 'project-to-project' phase to capture lessons learned; and a 'project-to-organization' phase when an organization increases its capabilities to deliver many projects"*

Split the activities (De Fillippi et al. 2016) or use of new concept

The second method is similar to the first one but the sequencing of the task are not temporal and will be run in parallel. The Parent organization and the project organization will have to jointly organize themselves in order to manage routines and repetitive practices while in the same time a tailormade set of processes will be created to manage the uniqueness of some requested practices. This requires as qualified by Tushman & O'Reilly, (1996) some ambidexterity; "*Ambidextrous organizations are needed if the success paradox is to be overcome. The ability to* ***simultaneously*** *pursue both incremental and discontinuous innovation and change results from hosting multiple contradictory structures, processes, and cultures within the same firm."* (Tushman et al., 1996)

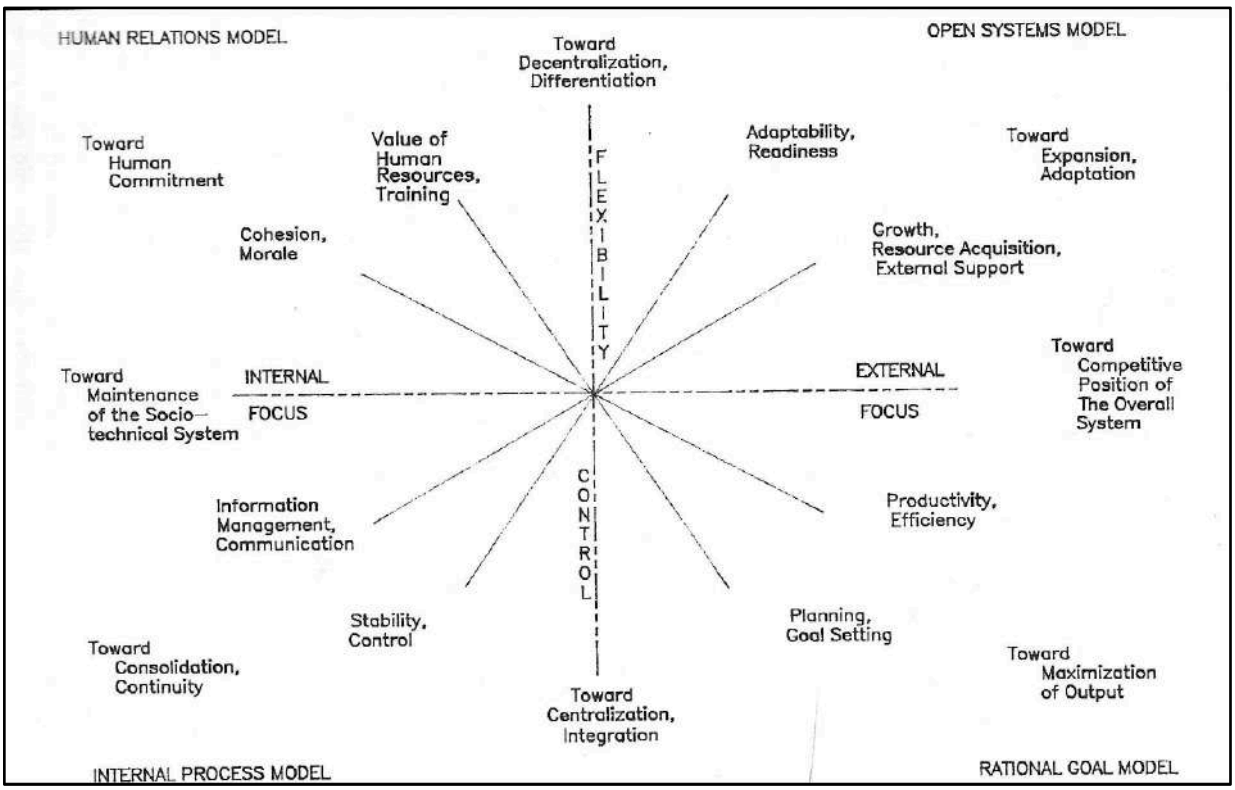
Live with the paradox

The two methods above aim to resolve the paradoxical tension, unlike the third one below that propose an approach with living with the paradox.

Some research argue that achieving several contradictory objectives lead the sustainability of the organization while increasing its current performance. *"The logic of paradox gives rise to a virtuous circle in which a commitment to two opposing propositions leads to dynamic and creative opportunity"* (Lewis, 2000). Cameron and Quinn (1988) highlight the interest and the beneficial effect of acknowledging the paradoxical status of the organization; *"More and more writers recognize that paradoxes are indigenous to effective organizational functioning …"*

"However, neither the separation nor the sequentialization strategy makes full use of the paradox theory and other dialectical approaches that prescribe accepting and managing rather than suppressing or circumventing the underlying tensions (Farjoun, 2010; Lewis, 2000)." De Fillippi et al., 2016). In 1983, Quinn and Rohrbaugh (cited in Quinn et al. 1988 p 10) developed an organization effectiveness model listing simultaneous effectiveness judgment criteria. (Figure 9). Several subsequent research using that model demonstrated that successful organization were aiming to achieve use and perform toward several criteria simultaneously.

Figure 9: The competing value framework: Effectiveness



Source Quinn et Cameron (1988, p 11)

The coupling paradox in project management is inherent to the relationship between the parent unit and the project organization and the level of. autonomy one leave to the other. This paradoxical tension is permanent in the sense that it can't be solved and will remain all along the life of the project organization. Our research about the adequacy of the project supervision practices and the coupling level between the 2 organization fall into the third method "live with the paradox". In fact adapting the adequacy of supervision practices and the coupling level between organizations is a good example of living with the tension while trying to reduce their negative impacts to the execution of a given project. Both organization need to understand and acknowledge their coupling level and adapt their supervision practices accordingly.

4. CONCLUSION ON THEORITICAL FRAMEWORK

The management literature acknowledges the paradoxical positioning of the project organization being on one side considered unique, autonomous and limited in duration and on the other side its heavily "production like" standardized guidelines and under the influence of powerful international professional organization promoting standardized processes & tools*; "This raises the question: How can one thing, at the same time, be both fundamentally unique and standardized? Atkinson (1999, p. 338) asked a similar question in relation to the definition of the whole field of project management. "Is there a paradox however in even attempting to define project management? Can a subject which deals with a unique, one-off complex task ... be defined?""* (Crawford et al., 2007 b).

"For a project to be unique does not mean that it is completely dissimilar to all other projects. If this were truly the case, and projects were not just unique, but also incomparable, then it is likely the field of project management would not exist." (Crawford et al., 2007 b)

The intent is not to question the need for standardization nor to question the paradoxical positioning of the project organization towards the coupling level towards the parent unit. More importantly the intent is to acknowledge such fact and look at the management consequences and provide some recommendation how therefore, Management should integrate it in the monitoring and the supervising or projects. *"The model for analyzing projects by means of their patterns of loose and tight coupling provides arguments for the shift in focus from the individual project to the interplay between structure, people and processes in the project-oriented company."* (Bergman et al., 2013).

Parent organization may deny the lack of project autonomy and therefore may be too project centric that the reality of the organization would require. My intent is not once again to question

the lack of autonomy of the project organization but to have their parent units recognizing it and therefore putting in place the right supervision tools and develop some less project centric of supervision practices. I strongly believe in standardization in for most of the project that do not require a high level of autonomy but I would like to urge the projects centric organizations to align their supervising practices to this highly standardized environment and convince them of the benefit the organization would benefit from such realignment.

PART III: EMPIRICAL RESEARCH

"In the field of management and organizational science, it is clear that unexpected and noteworthy events are apt to disrupt any program, and that the real question is not one of compliance with the program, but one of how to intelligently seize the opportunities for observation that the circumstances offer.[23]*"* (Girin 1989)

"Indeed, it becomes clear from these accounts that a case study is a product that emerges from the interaction between a researcher and a research site and that both contribute in unique ways to that project" (Langley et al., 2006)

[23] Free translation of : "*Dans le domaine de la recherche sur la gestion et les organisations, il est clair que les événements inattendus et dignes d'intérêt sont propres à bouleverser n'importe quel programme, et que la vraie question n'est pas celle du respect du programme, mais celle de la manière de saisir intelligemment les possibilités d'observation qu'offrent les circonstances*." using Deepl.com

In order to answer to my research question I presented in the first part of this thesis, I am conducting an empirical research presented in the 2 following chapter. The. Frist Chapter, chapter 3, presents the research methodology used. The second chapter, chapter 4, presents the results to the research.

CHAPTER 3: METHODOLOGY

In this chapter, I am first presenting the research methodology used, from the choice to an epistemological positioning to the choice of the embedded case study as an empirical method. In the second section I am describing in detail Thales group the embedded case, from the general organization and presentation of the group, the presentation of the two units that are studied to the 6 projects that are analyzed for this research. The third section is dedicated to the presentation of the data collection methodology. How did we collect and select the data that will be analyzed. Finally the fourth section, presents the data analysis process that has been used for this research.

1. RESEARCH DESIGN

1.1. the use of an open positivism epistemology

One of the first seminar when I started this Executive PhD journey in 2016 was a seminar on epistemology. To be very honest I first did not understand the passion of the professor about the necessity of positioning yourself as a researcher in one of the tenth of epistemological stances.
Being far from the academic world, all those words that I did not even understand were not the reason why I was sitting for the first time in a doctoral seminar. What a shock!
Then after few months and after few additional seminars and lectures I better understood the interest and the value added of understand an epistemological positioning. These positioning reveals the inherent and idiosyncratic beliefs of the researchers and such belief will influence their research approach.
As a practitioner, I have the humility to declare that I am far from being an expert and that I do not master all nuances that you can find all along your academic readings. Nevertheless in the main principle I believe that my epistemological approach is open positivist as per Pierre Romelaer definition (epistemology seminar, EDBA Dauphine Fall 2016). – The definition is based on 24 principles that are presented in the figure 10 . I recognize my beliefs within those 24 principles.
I also adhere and recognize my beliefs in Garreau's (2009, p 109) epistemological positioning that I found particularly inspiring; "*While we seek to strive for objectivity and believe in the probable veracity of our research results, in the sense that the reality they describe seems plausible to us, we are also convinced that we cannot grasp the totality of the reality of the external world without*

distorting it, and that reality is thus imperfectly apprehensible by the researcher. Our analyses can therefore only be incomplete in the face of the set of elements to be collected in order to understand the reality of the actors.../…. To do so, we have tried to reach a high level of reflexivity on our research practices and our analyses. We tried to take into consideration our values and our affects at different moments of the research and then to repress them afterwards[24]"

The epistemological stance that I am adopting is in my opinion well aligned with the definition and the use of an attributes frameworks to analysis the autonomous level of project that permanent organization are according to the project organization. On the other end, the use of the paradoxical theory to understand the contradictory and simultaneous standardization and decoupling trends in Project management reveals an open positivist approach by rejecting a "black or white" positioning. More importantly I tried in the research to have à distanced perspective towards the case I know very well. I looked at the Actors' behaviors, feelings or acts as a data being part of the case rather than considering those behaviors, feelings, acts as any form of interpretation of a phenomenon. Positioning myself with a detached point of view allow me, despite my supervisory role to distanciate myself from the case and allowed me to assess and judge objectively actors behaviors, acts or feelings. From this perspective I believe my approach in general and for this research in particular is an open positivist approach.

Figure 10 : The 24 principles of Open positivism by P. Romelaer (2016)[25]

1. models ± validated/confirmed/supported by empirical data; research models research methods and research actions can influence the problems and the solutions
2.all scientific knowledge is imperfect (social processes are more complex than we can handle at present).
3. research aims for precision, rigor, and coherence
4. scientific models are fungible: a model is usable as long as a better model has not been found. Models can be considered as tools.
5.the confrontation of models with data leads to a notion of objectivity
6. open positivism recognizes the influence of the observer on what is observed, and the influence of research results on what has been observed
7. open positivist science can take objectives, beliefs and values into account

[24] Free translation of " *Si nous cherchons à tendre vers l'objectivité et croyons en la véracité probable des résultats de notre recherche, au sens où la réalité qu'ils décrivent nous semble plausible, nous sommes aussi convaincu que nous ne pouvons pas saisir la totalité de la réalité du monde externe sans la déformer et que la réalité est ainsi imparfaitement appréhendable par le chercheur. Nos analyses ne peuvent dès lors qu'être incomplètes face à l'ensemble d'éléments à recueillir pour comprendre la réalité des acteurs Pour cela, nous avons tenté d'atteindre un haut niveau de réflexivité sur nos pratiques de recherches et nos analyses. Nous avons essayé de prendre en considération nos valeurs et nos affects à différents moments de la recherche puis de les refouler a posteriori*" using Deepl.com

[25] EDBA seminar Fall 2016

8. open positivism recognizes the importance of beauty and special values
9. open positivism recognizes that it is the developing of knowledge by people holding beliefs, values and objectives
10. open positivism holds that there can exist scientific laws in a changing world
11. open positivism is concerned by human understanding; but not only by this
12. open positivist view is that science progress is not always linear
13. within open positivism, science per se has no objectives
14. within open positivism, science must relate with "outside" objectives and values
15. in open positivist research, the epistemologies, processes, methods and models rarely have consequences that are all positive or negative
16. open positivism holds that the possibility to predict is an important element that is linked to the utilitarian side of science
17. within open positivism, science can be linked to applications
18. within open positivism, science is responsible
19. open positivism recognizes the existence of political issues;
20. within open positivism, scientific principles and values are recursive
21. open positivism considers that in research it is good to accept to try before condemning
22. open positivism considers that other epistemologies can exist.
23. we can say that open positivism rejects the four dogmas of empiricism provided we attach a precise meaning to the rejecting of these principles
24. besides all this, open positivism holds that the real world exists.

1.2. The use of a Qualitative Approach

We are using a qualitative approach for the following reasons.

- Most of the data we collected are non-numerable data such as verbatim, written processes. Nevertheless the qualitative nature of the collected data is not sufficient to qualify an approach as a qualitative approach (Baumard et al. 2014, p 120)
- In data analysis we won't use any quantitative method such as statistics. Once again this statement by itself is not enough as per Baumard et al. (2014, p121)
- Our research is more an exploratory search where we want to assess whether or not the supervision practices in the case studied are in adequacy of the level of coupling of the project organization towards the permanent organization it belongs to, as opposed to constructivist search where we try to demonstrate the validity of a presupposed assumption or theory.

- The use of the case study does not allow us a generalization of the findings or the creation of a theory as the case study is a specific field and context. Baumard (2014) : "The limitation of the qualitative approach lies in the fact that it is part of a study of a particular context" [26]
- Due to my positioning in the case study, there is a subjectivity inherent to my prior supervisor role and therefore I can't adopt a neutral stance in the research I'm conducting.

Each of the statement might not be enough to qualify by itself our approach as a qualitative approach but the sum of all the statement together definitely does.

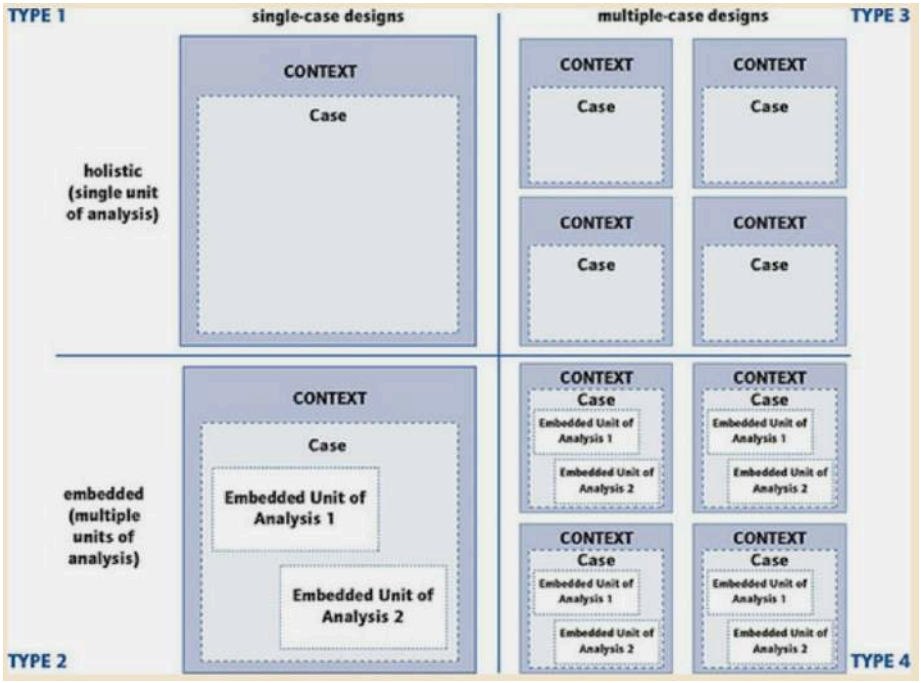
1.3. The use of the embedded single case study

The idea of the research topic came from my practitioner experience being confronted daily to the issues of project execution difficulties as well as the difficult inter relation management between parent organization and project organization. Therefore it seemed to me that studying those phenomena through a well-defined, structured case study of which the case is very well known by the researcher would make a lot of sense. It would help understanding the observed phenomena as well as contributing to the better understanding of the project organization within its environment. I want to investigate the project organization/parent organization interrelationship in a real world context as mentioned by Yin (2018) in its case study definition: *"A case study is an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident. In other words, you would want to do a case study because you want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case"(Yin, 2018, p. 15)*
In addition to this intuitive acquaintance to the case study and the opportunity effect (Girin, 1989), there are more formal academic ground to choose the embedded single case study

Yin (2003) proposes 4 basic types of designs (figure 11) based on 2 design axis. The first axis differentiates between designs based on whether the study involves a single case or multiple cases. (type #1 and type #3). The second axis differentiates the design type on whether the study includes one or more units of analysis within those cases (holistic vs. embedded perspective),

[26] Free translation of La limite de l'approche qualitative réside dans le fait qu'elle s'inscrit dans une démarche d'étude d'un contexte particulier" using Deepl.com

Figure 11: Basics types of designs for case study



Source: Yin (2018)

I chose the type 2 design as per Ying basic designs; "the embedded single case study" as I believe this is a methodology that is very well suited with our research topic for several reasons that will be developed in the next following sub-sections.

Nevertheless the intrinsic aim of my research lead naturally to the choice of the embedded case study. My research consists of the study of the level of standardization , project organization are facing and the level of autonomy project organization are given. once those level assessed, I want to measure the adequacy of the supervision practices the mother unit apply to monitor its project. I believe that having an embedded case study will allow me to better understand and better determine the origin of the standardization, the level of autonomy given from the group to the unit as well. So this multi-layer case helps me to better understand the interrelation at different level of. the organization and at the end, measure the consequences on the project organization. In other words, the embedded case study will determine the verticality of the standardization process and the coupling level process at every layer of the group organization.

1.3.1. Holistic vs Embedded Design type?

While the Holistic case study design may drive to an "unduly abstract level"[27] (Musca, 2006, p 156), the embedded case study by its structure will allow me to reach a detailed level of information and therefore provide sense of reality to the conducted case. By nature the embedded case study

[27] Free translation using Deepl.com

allows the researchers to make comparison between the events; between the units but also between the different level of the case (Company, legal entity, project, individuals) enabling a large set of inter-connections analysis that would help the researcher to better understand the complexity of the case reality and to better provide meaningful conclusions and analysis.

To take into account the expected diversity of the case to be studied, I decided to choose the embedded case study. Studying in the same Group (the case), different projects (the events) in 2 different entity (Units). This allows me to compare practices of 2 different units applying the same Group instructions and processes. Embedded case study is an adequate method for such comparison (Musca, 2006). " *The systematic comparison of detailed data, of micro events, makes it possible to gradually build theoretical understandings rooted in reality*."(Musca, 2006, p 157)[28]

The second reason for the choice of the embedded case study is the potential evolving nature of such a case. The embedded case study will enable me to adapt the case to the key event, findings or disruptions that could occurs during the research execution. I believe I need this flexibility being novice in research.

This adaptivity would not question the overall design of the study but allows slight adaptation that the research will benefit from, such as, adding events or additional units to confirm or infirm some of the findings. This is also highlighted in Musca (2006, p 158) reference article *The confrontation of the analyzes of these data can make the researcher discover new visions and lead him to seek alternative explanations, which prompts the collection of new data, at another time or in another unit, until theoretical saturation."*[29].

It also allow the researcher to adapt the number of interconnexion that would remain acceptable and manageable by a single team member.; "*A further problem with the holistic design is that the entire nature of the case study may shift, unbeknownst to the researcher, during the course of the study. The initial study questions may have reflected one orientation, but as the data collection proceeds, the original case study unwittingly assumes a different orientation, with the evidence gradually addressing different research questions (e.g., what started as a study of the "good" organization shifts to being a study of the "promising" organization).*" (Ying, 2018, p 52)

Ying's (2018, p 53) conclusion of one of the chapter of his reference book comfort us in the right choice of using the embedded case study method for our research as I believe the chosen case fall under the common revelatory case (d case); *" Overall, the single-case design is eminently*

[28] Free translation of *« La comparaison systématique de données détaillées, de micro événements, permet en effet de construire peu à peu des compréhensions théoriques enracinées dans le réel »*

[29] Free translation (google translation) of *« La confrontation des analyses de ces données peut faire découvrir au chercheur de nouvelles visions et l'amener à rechercher des explications alternatives, ce qui suscite la collecte de nouvelles données, à un autre moment ou dans une autre unité, jusqu'à la saturation théorique »*

justifiable under certain conditions—where the case represents (a) a critical test of existing theory, (b) an extreme or unusual circumstance, or (c) a common case, or where the case serves a (d) revelatory or (e) longitudinal purpose… Subunits of analyses may be incorporated within the single-case study, thereby creating a more complex (or embedded) design. The subunits can often add significant opportunities for extensive analysis, enhancing the insights into the single-case."

1.3.2. Building Rigorous research design processes to avoid potential traps in Embedded simple case study

1.3.2.1. Reflexivity

One of the first highlighted trap not to fall into is the subjective approach of the researcher that knows very well the case being an actor of the case. This risk has been mentioned by Van de Ven (2007, p 64) *"Postmodern and hermeneutic scholars have emphasized the interests, values, and biases that are served by researchers. No inquiry can be objective in the sense of being impartial and comprehensive by including a balanced representation of all stakeholders' viewpoints. ../.. That being the case, engaged scholars need to be far more reflexive in their studies than positivists and empiricists have admitted. Reflexivity is characterized by different types of recursive turns each providing different insights and perspectives (Alvesson and Skoldberg 2000)."* I claimed an open positivism that might seem contradictory to Van de Van statement but as stated by P. Romelaer (Figure 10, p 114) "*open positivism recognizes the influence of the observer on what is observed, and the influence of research results on what has been observed*" . *Therefore I made sure to step back and took regularly an higher view stance to bring back objectivity in the analysis of the case.* This shortfall is also mention by Langley et al. (2006, p 86); *"When researchers turn the spotlight onto themselves and their relationships with the field, their analysis can never be entirely free from the needs for positive self-representation that undoubtedly affect all research writing and that stimulate exercises of self-examination in the first place"* (Langley et al., 2006, p 86)

I believe the first action to avoid misunderstanding related to my role is to define myself right at the beginning as a participant observer (Musca, 2006, p 164). This declaration and the posture itself as participant observer is very beneficial to our embedded case study. *"In a case study, the researcher may adopt four postures in the field (Baumard, Donada, Ibert, & Xuereb, 1999): he may be a full participant, an observer-participant, a participating observer, and a full observer. To conduct a long-term study of embedded cases, the positioning of the participant observer is*

particularly successful." (Musca, 2006, p 164) [30]. By the function I occupied being in the supervision area of the unit of analysis without having direct responsibilities on the projects studied (the events) provided me almost by definition an observer-participant postures that I use all along the research. Therefore, I use this position as an observer having easy access to people and documents either at project level, unit level for the supervising documentation or at gourp level having access the the group quality system and the intranet publications. As such I tried as much as I could to position myself as an observer and did not use my participant role to influence the reseqch or the data analysis.

1.3.2.2. Rigor

One main critique arises from the academic literature on case study in particular but that also applies to the specific case of the embedded single case study. Are case studies are scientifically grounded enough to be considered in management science research? Are they rigorous enough? (Musca, 2006). Yin (2018) argues that this critic can be overcome by defining at the beginning a rigorous protocol and methodic procedures that would have to be strictly followed by the research team. Yin (2018) claims also for a full transparency about the biases and limitations encountered during the research.

Our aim in the following third and fourth section is to present our protocol and convince it is strong and rigorous enough to overcome the potential lack of scientific ground of our research. We demonstrate the quality and the interest of the data collected as well as the rigorous process applied to our data analysis.

I would also argue that being an active actor of the case gave me access to data that most likely no academic would have had access to.

1.3.2.3. Leveraging Data

Another critique is related to the potential excess of data and the consequent difficulty to analyze them and the time constraint that this excess would generate. (Musca, 2006; Petigrew, 1990; Yin, 2018) If not manage carefully, excess of information might be detrimental to the case study outcomes and the way it would be therefore reported.

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[30] Free translation (Reverso.com translation) *of « Dans une étude de cas, le chercheur peut adopter quatre postures sur le terrain (Baumard, Donada, Ibert et Xuereb, 1999) : il peut être un participant complet, un participant-observateur, un observateur qui participe et un observateur complet. Pour mener une étude longitudinale de cas enchâssés, le positionnement d'observateur-participant est particulièrement fructueux. »*

To overcome this risk, I reduced to two units of analysis and three events (project) per unit therefore limiting the potential interrelations to be studied. The Units being disconnected apart from being part of the same company also reduce the number of possible inter-event analysis;
We limited our research to four different level in order to reduce the potential inter event analysis. The first level is at project level. The second level is at unit level where the 3 project belonging to the unit are discussed and integrated to the unit analysis. The third level is a unit comparison that we enable us to draw some case outcome which will be the fourth level.

1.3.2.4. Considering the case in his entirety

A shortfall to avoid as well, is the inherent risk of concentrating the research and analysis to the units of analysis while neglecting the case in his entirety. The case would then become the contextual environment of the unit of analysis and not the targeted case (Yin 2018, p 53) ; *"An embedded design, however, also has its pitfalls. A major one occurs when the case study focuses only on the subunit level and fails to return to the larger unit of analysis, or the original "case."*
To avoid such pitfall, I made sure to organize the collect of data at each level. From the case to the event. Gathered information should allow us to look at the overall case and not at the event or unit level. The conclusion part of the chapter 4:"findings" is also at the case level so that the entirety of the case is addressed and is not missed.

1.3.3. Single embedded case study vs Multiple embedded case study

This section might not be a key driver for the design choice but I have 2 reasons to choose the single case study instead of a more preferable multi-cases design (Musca, 2006 ;Ying 2018). First of all, being a single part time researcher, and fulltime practitioner, it would be almost impossible to conduct a multi case study (Ying, 2018). "*However, conducting multiple case studies requires time and resources that are often beyond the means of an independent researcher*"[31] (Musca, 2006, p 155). The second reason for the choice of a single case study lies to the sensitive fields where I'm involved as practitioner. The defense field would not easily get me access to comparable cases. As a pure academic it might be possible to compare two defense organization. As a practitioner employed by one of the unit make it almost impossible.

[31] Translation of « Cependant, la conduite des études de cas multiples requiert du temps et des ressources qui vont souvent au-delà des moyens d'un chercheur indépendant » using Deepl.com

1.3.4. Relevance of the chosen case.

The case is a large international corporation (described in the second section of this chapter) present in more than 60 different countries with over 85 000 employees and large customer project portfolio. Therefore the choice for the subunit is quite delicate and require further thinking. Among several units I decided to choose the units with a strong history in Project organization having different approach of using the same group instructions and best practices so that we potentially may expect some difference in the finding. I also chose the 2 unit for their history. Both unit have not always been part of the group but have been long enough for Group standard and process adoption. I want to see what remain from of their pre-group culture and practices and define whether or not it still influence the unit

2. PRESENTATION OF THALES

2.1. Thales (the case studied)

2.1.1. Group ID card

The case studied is an international group named Thales with representation in more than 60 different countries worldwide. The group as it stands today is the most current emanation of a more than a century old company initially dedicated in the electricity field. The group is now very diverse aiming to be a leader in different filed such as transportation, defense and security activities. Thales currently report more than 80 000 employees all around the world out of which 35 000 are located in France. Thales is a public company listed in Paris part of the CAC40 since June 2019. Due to the specific and strategic activities of Thales, the French government (~26 %)[32] and Dassault (~25%)[33] an industrial partner are holding a majority of the shares and the votes rights (~65%)[34] to ensure proper and full control of Thales destiny as well as French sovereignty. The rest of the floating capital are publicly traded. The Table 17 provides the financial performance of the group from 2016 to 2020.

Table 17 : Some key figures to complete the Group ID card.

In € millions	2016	2017	2018	2019	2020
Order intake	16,514	14,92	16,034	19,142	18,476
Sales	14,885	15,795	15,855	18,401	16,989
EBIT	1,354	1,543	1,685	2,008	1,352
Free operating cash-flow (1)	954	1,365	811	1,372	1057
Net cash position (debt) at end of period	2,366	2,971	3,181	-3,311	-2,549
Self-funded R&D	731	797	879	1,097	1,025
Consolidated headcount at year-end	64,071	64,86	66,135	82,605	80,702

Source Thales [35]

Thales is one of the few French companies regularly ranked amongst the most innovative companies worldwide. Due the complexity of the solution they design and deliver, due to the continuous focus on innovation and SFRD, it appears that Project Management is a key process for the group and reinforce our initial choice for Thales being a meaningful case study.

2.1.2. A brief history to better understand Thales today

This part is inspired by the group history proposed by the group in their website.

[27 to 35] Source Thales website as of Dec 2020 and 2020 official financial publication

The origins

Like many other centenarian companies, Thales is the result of several merger but also spin offs and carved out activities. The group itself is not very precise of the official date of its creation: *"Born with the advent of electricity which launched the second industrial revolution at the end of the 19th century, the Group has been involved in all the major technological breakthroughs since then, often as a pioneer. After electricity, electronics and IT, today the revolution is digital. Tomorrow it will be quantum."* (Thales, 2020). The most recent former name of Thales is Thomson-CSF, still named that way or "la Thomson" 20 years after by former nostalgic employees. Thomson-CSF is the merge in 1968 of the B to B electronic division of Thomson Brandt previously named (CFTH) - (The B to C part would become later Thomson. The Thomson name is now owned by Technicolor group.) and the Compagnie Générale de Télégraphie sans fil (CSF). Both companies having their own decades of history. It is interesting to note that PSL university owns the project of agreement dated 1923, between CFTH (created in 1893) and Paul Langevin, professor at "the college de France" and key contributor of Physic progress over the first part of the 20th century. (https://bibnum.explore.psl.eu/s/psl/ark:/18469/293k4) . This may seem anecdotical but this also confirms, the group statement of Innovation and most recent technology interest being part of its DNA.

From the 70`s to the late 90`s : International Development and Industrial rationalization

The seventies were the frame of export growth for the company especially in the Middle east, and a diversification period specifically into telephone switchgear, silicon semiconductors and medical imaging. Nevertheless as many other company the oil crisis drove the company in financial difficulties that ended up with the nationalization of the group in 1982 that opened a new area of Strategic refocusing in Defense and Professional electronics, and divestments to reduce an highly diversified portfolio *("Telecommunications 1983 agreement with CGE) and medical imaging (sold to General Electric in 1987). The semiconductor businesses are merged with those of the Italian group IRIFinmeccanica in 1987 to form SGS-Thomson"),(Thales website)*

Shortly after this strategic move, Thomson-CSF took benefit of the positive cash-flows of its recently signed export contracts in the Middle-east to develop an in house expertise in Financing that was later taken over by the Credit Lyonnais (1993) against a share of the bank. This glorious period also resulted in new area of external & International growth so that by 1997, the company International footprint mainly in Europe rose from 5% to 25% (Percentage of Revenue generated out of France): *"As early as 1987, Thomson-CSF anticipates the inevitable cutbacks in defence*

spending and, as its major ongoing export contracts draw to a close, starts to radically restructure its businesses in order to maintain margins. A proactive policy of external growth is adopted, mainly in Europe, with the acquisition of the defence electronics businesses of the Philips group in 1989".(Source Thales) (formely named Signaal BV, now being Thales Netherland, one of the unit studied in the case study)

The group at the same time enlarged its investment in non-defense activities, especially in the aerospace business with the acquisition of Sextant Avionique, while rationalizing its portfolio. (SGS-Thomson now ST Microelectronics as well as the participation in Credit Lyonnais were divested in 1996)

The early 00's, a new name for a new Area – The multi domestic and dual Technology principles

In 1998, after 16 years of nationalization, a new Industrial scheme between major French Defense Actors is concluded and endorsed by the French government leading to the privatization of the Group (The French State's interest is reduced from 58% to 40%, and Alcatel and Dassault Industries are shareholders) enabling Thomson-CSF *"to strengthen its scope of business, consolidate its market positions in defence and industrial electronics, and expand its industrial presence in Europe"* (Thales website)

In 2000, Thomson-CSF becomes Thales. Meanwhile, the multi domestic strategy mainly in Europe initiated in the 90's is expanding to South Africa, Australia, South Korea and Singapore with a major step with the acquisition of a major UK player Player: Racal Electronics. UK becoming thereafter the *"second largest domestic industrial Base"* for the Group.

At the same time Thales initiates a new organization by business (defense, aerospace and information technology and services (IT&S)) to strengthen the recently developed Strategic principle still leading the group Strategy today even though not expressed as is: The Dual Technology. *"The new structure is designed above all to leverage the Group's "dual technology" expertise, focus its strategic development in civil markets on businesses with real synergies with the Group's proven defense and aerospace competencies, and enable the Group to gain leadership positions in those markets."* (Thales website). The Dual technology is a principle set up to leverage the use of some technologies acquired over time in the civil business and in parallel in the Defense activities. In other world how defense tech could successfully be used in Civil business and vice-versa.

This principle gave some clarity after several decades of unclear civil investments (Medical, telephone, semi-conductors) followed by not much clearer divestments in civil activities. To be fair some of those activities being inherited from the several perimeter change the group was confronted over its life. The dual technology approach gave nevertheless guidelines to the group to rationalize its portfolio of civil activities. This rationalization would last until 2004 as per the Group. *"With refocusing of the civil businesses almost complete, Thales announces a new organization based on six divisions, each defined according to its respective markets, to facilitate implementation of common technologies."*(Thales website)

In the mid 00`s Thales focused on deploying its multi domestic and dual technology strategy while consolidating its security capabilities to help its governmental customers to answer the emerging new geopolitical, internal security and financial challenges. One of the change occurred at that time that is in relation of our study, is the growing complexity of the project Thales was taking over. The group expand its prime contractor role becoming an integrator of complex multi system. Thales is still today recognize in this role of integrator of complex sub system. The uniqueness, the complexity of the project delivered by Thales reinforced the Project organization as a key sub-element of the Group structure. This is the time where Thales definitively became a project-based organization.

In 2007 & 2009 the capital of the group changed once again following a large reorganization of the French defense industry. Thales took participation in DCNS (Naval Group); The group inherited the Transportation, security and space activities of Alcatel. *"The New Thales is bigger and stronger than before with increased revenues, more employees and the arrival of new and complementary skills, making Thales a major world player with exceptional technological capabilities and leader in mission-critical information systems serving three markets: Defence, Aerospace, and Security."* (Thales website)

At the end of 2009, the group perimeter was once again renewed as well as it's capital structure where Dassault-Aviation replaced Alcatel in the role of French Industrial Partner to the French state and being the main Private shareholder of the Group. Dassault-Aviation and the French state signing a shareholder agreement that would project the Ownership of the group, Thales being a key player of French Sovereignty in the French Defense and Security Industry.

From 2009 to 2019, with a solid and stable shareholders pact, with a clear comprehensive strategy based on multi domestic development and leveraging dual technologies, in 2019, To serve its

markets, Thales group is organized in 6 different Global Business Unit in charge of the worldwide development of their dedicated activities.

The most recent and not the least one occurred in 2019 when Thales acquired Gemalto, "*a world-renowned, international digital security company serving businesses and governments in more than 180 countries"* (Thales website). With the acquisition of Gemalto, Thales expands its capabilities in Digital identity and Security, expands its international footprint (180 countries served). Thales is now aiming to become a world leader in Cyber security and overall in Digital security. To support its customer in a more and more digital environment, Thales develops its expertise mainly in four main technology of the digital world: The big Data (acquisition of Vometrics and Guavus), The Artificial Intelligence, The cyber security and the connectivity.

2021 last update

During Summer 2021 Thales announced entering in negotiation with Hitachi group for the sales of its Transportation activities, one of the group division. This last information is interesting for our study as 1 of the unit studied and 3 projects studied, are belonging the transportation activity of the group and therefore will be part of the sales process.

2.1.3. The group Organization

Over the past decade, the Group experienced 3 different matrix organization. The first one, was country centric (2010-2013). Country were leading the business while the division were in charge of the overall strategy and the product policy for their activities. The Saudi experience described earlier in this paper relates to this time of the Group organization. The purpose of this document is not to analyze each and every group organization but when it relates to project execution and project organization, I noticed that during that period each country tried to create his own competence center for some dedicated activities without overall worldwide strategy and this generated subsequent restructuring, footprint harmonization that project execution suffered from. Another effect of this country oriented set up was the difficulty faced by the Division to found and their R&D and their Innovation each country being responsible of their P&L generated tough funding discussions once subject to long term strategy and development.

Following the change of the CEO, a new matrix organization was put in place for several years. (2013-2020)- Lesson learnt from the recent past experience led to a more balance organization

with a Balance responsibility between the geographical axis and the business axis. The Dual P&L responsibility enabled worldwide organization optimization, and rationalization of the overall footprint while maintaining country incentives to perform and develop the local business. The healthy competition between countries, although sometime time consuming and too self-centric enabled the seeing up of adequate project organization with a good mix of local knowledge associated to the global expertise. Nevertheless, maintain such balance required a lot of efforts, a lot of internal strife and a costly monitoring process. From a project execution standpoint, we noticed mix outcomes. When units were able to collaborate and behave in the interest of the overall company, as a team, unprecedent performances were recognized. When local rivalry and local interest were prevailing, the underperformance and the failing rate were aggravated.

It is a little bit too soon to draw any conclusion with the most current organization set up in 2020. To avoid the heavy and costly monitoring and reporting process of the balanced matrix organization, role and responsibilities have been re allocated between the business axis and the geographical axis of the organization. Business have now a clear P&L responsibility while Countries will host the support functions and help the local footprint development as well as enabling the export market. They nevertheless have no full P&L responsibilities. First feedback received are quite negative obviously from the country perspective while Business see it as an opportunity to harmonize and develop faster a Global Strategy. It is anyhow way to soon to measure the impact on Group Performance of this new organization,

From a project management perspective, such organization a change influenced a lot the project team set up and changed also the relationship between the permanent unit and the project organizations. Nevertheless without data to corroborate , the verbatim from the different CEOs related to project execution performance over the last 2 last organization set-up, do not show any preferred or higher performing organization when it related to project delivery.

The Group organization in detail

In the Group's General organization memo, the group highlight the following Organization principle :

"The Group's organization is based on a two-dimensional matrix structure: Global Activities, corresponding to the 7 major strategic areas of activity, and Countries. Each one of these two axes is a major operational axis of the organization." (Thales internal General Organization Memo).

In addition it clarifies the role of the support functions vis a vis the operational activities:

"Functions provide the support necessary to Global Activities and Countries. In addition, the Regulatory Functions ensure a check and balance between operational needs and observance of compliance rules." (Thales internal General Organization Memo).

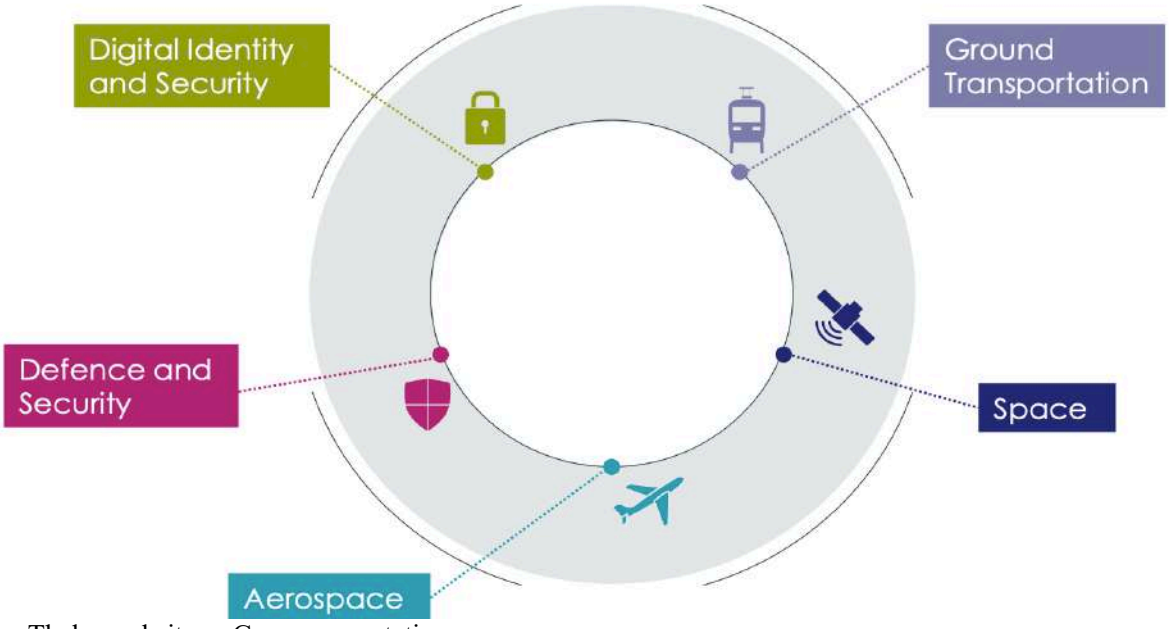
The activities

Up to very recently, the Group operates in 5 key sectors (Figures 12):

- Aerospace
- Space
- Ground Transportation
- Digital Identity and Security
- Defence and Security

The group, recently announce an upcoming divestment of the Ground Transportation Sector. The Group entered early August 2021 in exclusive negotiation with Hitachi Rail on the sale of "Ground Transportation Systems" business. Nevertheless, in the frame of this document, Ground transportation is part of the Strategic sectors where the Group operates and 3 projects out of six are belonging to the transportation activity.

Figure 12: Thales Group Key sectors



Source: Thales website - Group presentation

In order to operate and serve those key sectors, Thales defined and is organized in Seven Global activities.

Digital Identity & Security (DIS).

Formerly known as Gemalto, DIS is the most recent Group acquisition. *"From secure software to biometrics and encryption, DIS GBU technologies and services enable businesses and governments to authenticate identities and protect data so they stay safe and enable services in personal devices, connected objects, the cloud and in between."* (Thales intranet ,2021)

DIS is a dual activity serving the Defense & Security sector as well as the Digital identity and Security sector.

Secure Communications and Information Systems (SIX)

"SIX supplies defense and security customers with secure communications and resilient network, intelligence and surveillance systems, command and control systems and information systems security solutions." (Thales intranet ,2021).

SIX covers several key sectors where Cybersecurity, secured communication are required. SIX is also a dual activity covering both the defense market and the civil market.

Land and Air Systems (LAS)

"LAS supplies systems, equipment, sensors and services for civil and military air traffic control, air defense and land combat." (Thales intranet ,2021)

LAS is mainly serving Defense and Security sector but it also cover the civilian field within the Aerospace sector, being a key player in Air Traffic control player. LAS is currently deploying OneSky the new generation of Air traffic management in Australia for Defense and civil aviation. LAS is also developing and delivering High End radars, Ground radars, naval and Air radars.

Two of the project studied in the Dutch unit of this Case study are belonging to the LAS activity.

Defense Mission Systems (DMS)

"DMS supplies products, solutions and services in the field of electronic combat systems, airborne surveillance and reconnaissance systems, above water and under water combat systems." (Thales intranet ,2021)

DMS is a Defense pure player, covering Defense and aerospace sectors, delivering equipment to platform such as Mirage or Rafale the well-known Combat fighter.

The third project studied of the Dutch unit belongs to the DMS activity. It consisted of delivering a full command and control system for a South American Navy.

Avionics (AVS)

"AVS supplies flight avionics, electrical power generation and conversion, and in-flight entertainment and connectivity systems. It encompasses training and simulation solutions for air, land and joint forces as well as microwave and imaging subsystems" (Thales intranet ,2021)

Space (TAS)

"TAS supplies satellites, payloads, equipment, systems and services for telecommunications, observation, navigation and exploration programmes, as well as orbital Infrastructures and space transportation systems". (Thales intranet ,2021)

The space activity is mostly managed by Thales Alenia Space, a joint venture between Thales and Leonardo, an Italian defense player. 67% of TAS is owned by Thales while the remaining is owned by Leonardo.

Ground Transportation Systems (GTS)

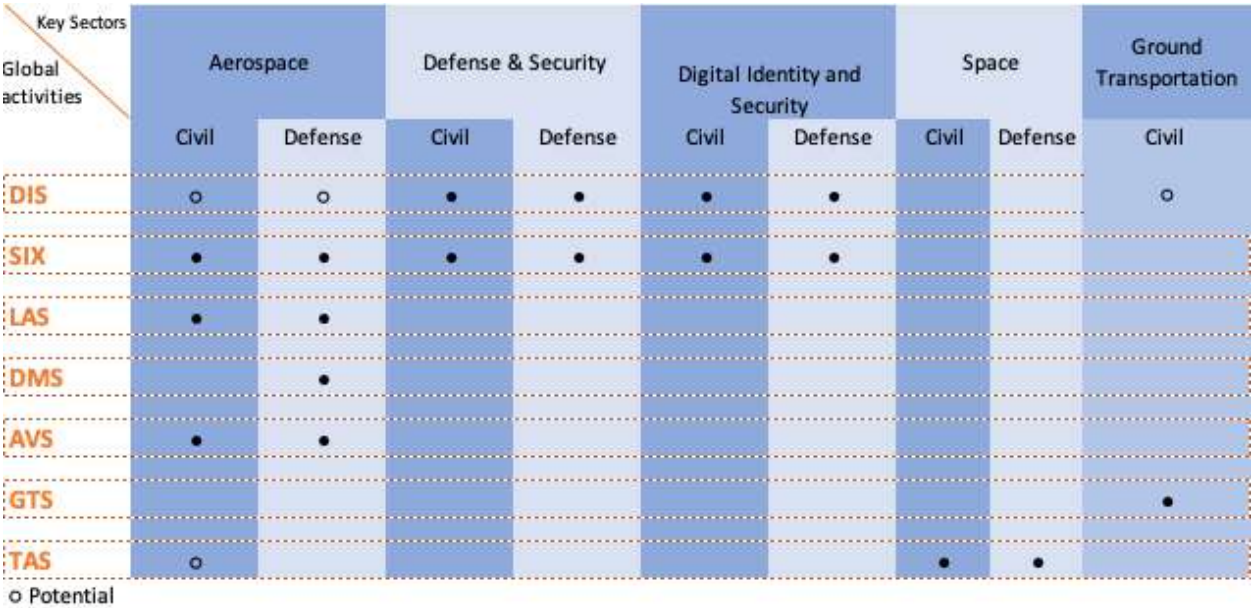
"GTS supplies signalling solutions for main line and urban rail systems, integrated communications and supervision systems, revenue collection systems and associated services." (Thales intranet ,2021)

Each Global Activity is organized into Business Lines (BLs). A business Line is a coherent sub set of the activity. As an example the ticketing activity of the ground transportation is a subset of the GTS global activity. The Business line is the basic strategic and operational unit of the group. Each BL is managed as a profit center. The Group is currently composed of 31 business lines. Each activity is composed of 4 to 6 different Business Line.

- The Business Line is responsible for market segments or product/solution/service segments on a global basis.
- The Business Line is responsible for defining its marketing strategy and product policy
- The Business Line is responsible for its industrial policy and R&D management on a global basis.
- The Business Line focuses on end-to-end operational performance: growth, profitability (and cash) as well as conducting bids and projects end-to-end flow.
- The Business Line is the ultimate guarantor of customer satisfaction.

The figure 13 provides a mapping between Thales' key sectors and the Global Business Unit (GBU)

Figure 13: Link between Key sectors and Global activities



The support functions

Among the support functions, 3 of them are characterized as "régaliennes" in French translated into Regulatory functions. Finance, legal & contract and Human resources are the 3 regulatory functions. With this specific status, some right and responsibilities are attached. Those function will always keep a dual reporting (units, BL, country operational director) as well as the Function line of reporting to allow right of alerts and provide some freedom to conduct their Alert and regulatory responsibilities. This dual reporting is important in the governance set up of the group and is deemed to provide a better balance between the business decision and the regulatory the group has to comply to.

Another set of key functions are falling under the Global operation function (DGOP). Engineering, Real estate, HSE, Industry, Continuous improvement and more importantly for our case study the Bid and Project Organization. The DGOP is in charge of coordinating all the resources needed to ensure projects delivery and contract fulfillments. It defines, coordinates and monitors the overall performance of the group:

2.1.4. Project management and Thales: A long history

As mentioned earlier in the group presentation, Thales as a long-lasting history of project execution and project management. The increasing complexity and the prime role of Thales in projects execution, over the last 15 years, significantly increased the importance of project management in the Group . The group structured its governance around 9 main processes. 4 steering processes, 4

operational processes and 1 process related to the support of operational Processes. The table 18 below presents those 9 processes.

Table 18: Govern and Organize – Thales key processes

Steering	Define the strategy	Manage & Control	Manage competences	Continuous improvement
Operational	• **Manage Bids and Projects**			
	• Define Develop and qualify the solution			
	• Source and make			
	• Prepare and deliver customer services			
Support	Support operational processes			

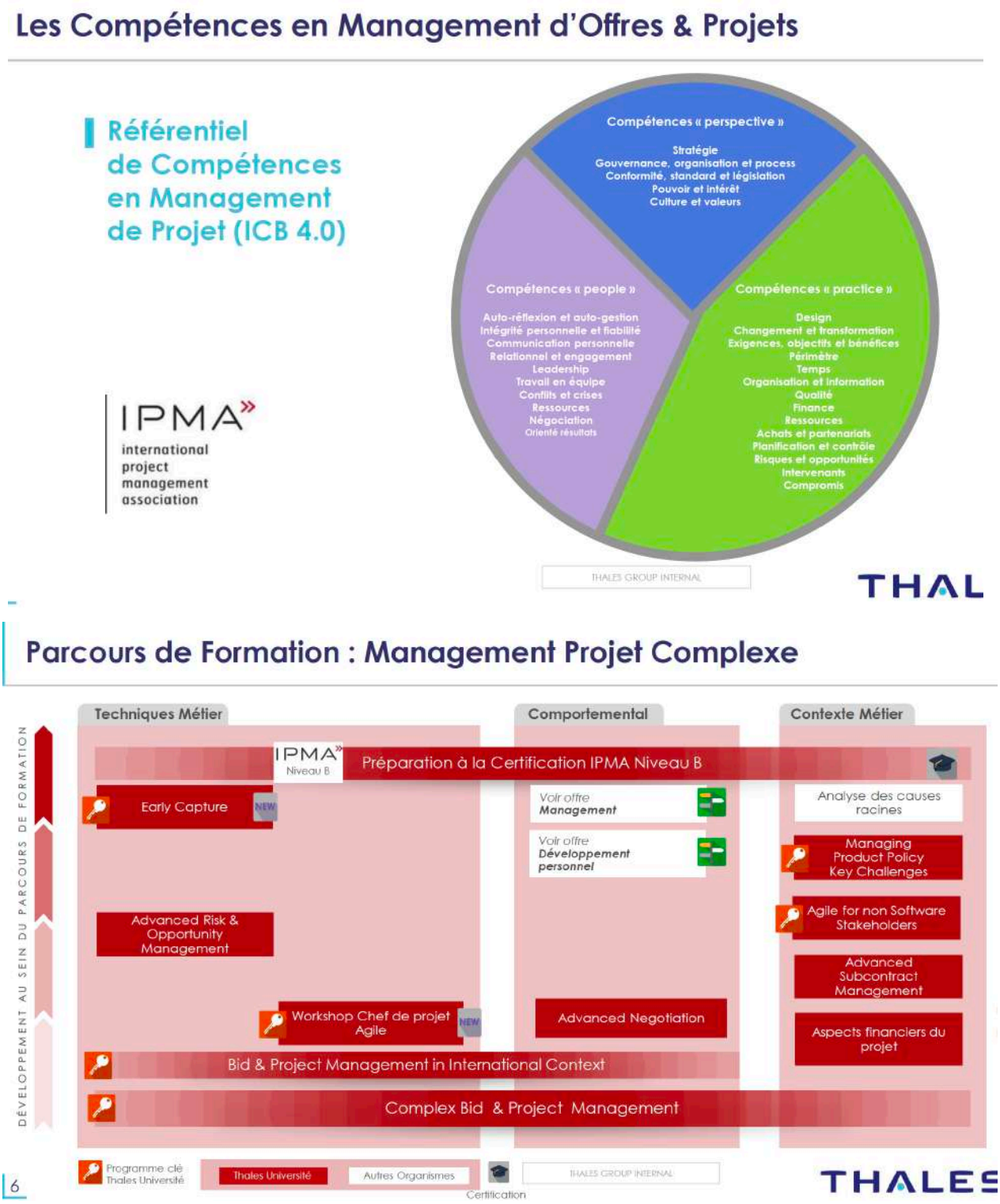
Source: Thales quality system

One of the Main Operational process is "Manage Bids and Projects" confirming the central role of Project Management and confirming Thales being a Project Based organization.

The group provides a set of processes that can be tailored and adapted depending on the complexity of the project. This complexity is measured following a Group instructions where project are classified in 4 categories. From a level 0 to a level 2 and then Critical level for the one with the highest potential impact to the Group. The category will then drive the processes to be applied and also the level of the organization up to which the project will be monitored. The ones classified level 0 will be monitored in the unit only while the level 2 will be monitored at GBU (Global Business unit) and the critical level at the Group COO and Group CFO level.
The complexity can be of different kind. Technical, contractual, organizational, scheduled, financials …
Over the life of the project, its characterization can evolve depending of the difficulties the project is facing. A project can start level 1 for example and reach the critical status at one time. Once the project is deemed on track, it will recover its level 1 status.

Project management standards have been developed over time and a dedicated team at corporate level is making sure that standards and recommendation are evolving at the same pace and along the evolution of International standards from the IPMA.
Most of Project Manager are strongly encouraged to prepare IPMA certification and Thales University developed a set of courses to prepare and present the IPMA certification. (Figure 14)

Figure 14: Project Management Training Path at Thales (Extract)



Thales Internal source 2017/2018

I had the opportunity to interview the Former Group VP Bids & Projects and he presented the group strategy towards the Project Manager standards in 2 folds.

- Certification is very often a requirement from the customers. In their RFP (Request for Purchase) it is very often required the Project Manager would be IPMA or PMI certified. Therefore, Thales needs to certify its project manager to be able to answer to RFPs. This is Imposed by the market. He did not comment on the choice of IPMA vs PMI;
- The second reason for implementing a set of standards at Thales was to offer the Project manager a set of tools that would enable the Project manager to deliver and execute his project efficiently. For the former VP Bids and Projects, standard are not seen as constraints and boundaries therefore reducing the Project manager autonomy, but as proven tools that would help and support the Project team to execute a given project. The issue, according to him was the way those tools were used. Mainly the intent is good, the execution derived from the original intent of those international organizations.

Nevertheless, as many other companies (cf. Standish group report), Thales always faced project execution issues. These execution issues, although recurring, have been an area of great concern up to the top executive of the group. In an internal document (2018), related to Project execution issues (Figure 15). Several successive CEO's verbatims Highlighted the issue and their direct involvement to limit their impact.

- *" Failure to manage overruns– poor estimation of costs and insufficient management"* Alain Gomez (1993) – Group CEO from 1982 to 1996.
- **"***Better manage programs - best practices not on paper & use of best resources across Thales"* Denis Ranque (2003)-Group CEO from 1998 to 2009.
- *"It is essential to keep a strong focus on project execution, bid preparation and new improvement initiatives"* Jean Bernard Levy (2013) – Group CEO from 2012-2014
- *"Programs overruns have become a serious issue, we have regressed, we need to become best in class in project execution"* Patrice Caine (2017) – Group CEO since 2014.

Figure 15: CEOs verbatims on project variances

Source Thales Internal presentation (Oct 2019)

In 2018, the group launched an audit on project execution and interviewed many stockholders from the customers, the projects members to the member of the Group executive committee. This led to the identification of 5 main root causes:

- A lack of anticipation prior to the project Start
- A lack of empowerment of the Project management organization
- A lack of support from the leadership but a lot of control
- A lack of feedback and inability to learn from previous experience
- A lack of long term politic of the attractiveness of the Project manager role

Those five main root causes are presented in more detail in the table 19 hereafter:

Table 19: Main Root cause for Project Variances. (2019)

#	Summary & Quote	Description

1	**Anticipation & Alignment**
	"Execution suffers from 'hazardous' bid assumptions" Anonymous Comex member
		• **Complexity underestimated**
		• Compliance stated when **solutions not mature**
		• **Product line instability**
		• **Solution strategy** not clarified early enough in the life cycle
		• **Risks underestimated** and insufficient mitigation
		• **Unrealistic pressure on costs**
		• **Lack of anticipation**
		  ◦ in understanding customer needs and shaping the offer
		  ◦ in anticipating Bid & Project workload
		• **Baseline deliverables of poor quality**

2	**Organisational dynamics and empowerment** *"PMs are operating at the wrong level in the organization to influence project delivery"* Anonymous Comex member	• **Lack of empowerment of the BMs / PMs** • **PMs not properly positioned : low LR grades and/or too deep in the organization to have the required level of impact** • **Misalignment of objectives, particularly on Multi Entity Projects**
3	**Leadership style and culture** *"Need for alignment, trust, actual empowerment from the management chain rather than control, questioning & doubt"* Anonymous Comex member	• **Pace setting leadership style dominates** • **Too much monitoring and controlling** • **Not enough of a supportive approach**
#	Summary & Quote	Description
4	**We are not a learning company** *"Why is it, that in Thales, with such a low level of staff turnover, we are unable to learn from our mistakes – it must be something linked to the DNA?"* Anonymous Comex member	• **Negative variances: the same root causes for negative PE over many years** • **Knowledge sharing is not in the DNA**
5	Recognition and attractiveness *"PM promotion towards LRX and LRY[36] positions is rare, which does not motivate key PMs to remain in the job family"* *"PM exposure is high, but risk taking is not rewarded appropriately"* Anonymous Comex member	• **B&PM is not widely seen as a true career and is considered to generate more risks and fewer opportunities for evolution and promotion**

[36] LR: Level or Responsibility. Group tool to harmonize Position and Job repsonsabilities. The LR count 14 different levels

Over the past decades, The group launched several initiatives to improve project execution and reduce variances against scope, schedule and budget. The last one have been launched in 2018. Unfortunately as many other companies, it is still trying to find the right recipe and project variances were, are and will remain a concern that affect the financial performance of the Group.

2.2. Presentation of the case study perimeter: The units studied

The perimeter of the research has evolved over time. Originally, the units to be studied and the associated projects were limited to the transportation business. When I started the research, I was supervising one business line of the transportation activity. I was initially planning therefore to limit the study to this business line perimeter as there was already many examples of project failures to study. I had received all the approvals from the management of the activity to access the data and to conduct interviews within this given perimeter.

"In the area of management and organizational research, it is clear that unexpected and newsworthy events are likely to upset any program, and that the real question is not that of respecting the program, but that of how to intelligently seize the possibilities of observation offered by circumstances.[37]"(Girin, 1989, p 1). After few month designing our research and our case study, I showed methodical opportunism as defined[38] by What Girin (1989) when I was proposed a new assignment in the Dutch unit of the Group.

At the beginning I was still planning to stick to the initial perimeter of the case but within the group, the Dutch unit is famous for its independency of view and the uniqueness character claimed by the unit and after sometimes I witnessed this uniqueness and therefore considered adapting the perimeter of the case study. Having a unit being able to transgress group organization and group standards was very interesting to see to which extent this independence would apply also to the Dutch projects towards the Dutch unit.

As a contrary, the French unit studied is an add-on from the transportation acquisition from Alcatel in 2006 to a larger Thales legal entity mostly dedicated to the defense market where the group culture, the group processes and standards are part of the company DNA. Quickly after their acquisition, the recently acquired transportation domain adopted the same "good soldier" type of behaviors and respectfully followed Group standards.

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[37] Google translation of : « Dans le domaine de la recherche sur la gestion et les organisations, il est clair que les événements inattendus et dignes d'intérêt sont propres à bouleverser n'importe quel programme, et que la vraie question n'est pas celle du respect du programme, mais celle de la manière de saisir intelligemment les possibilités d'observation qu'offrent les circonstances. »

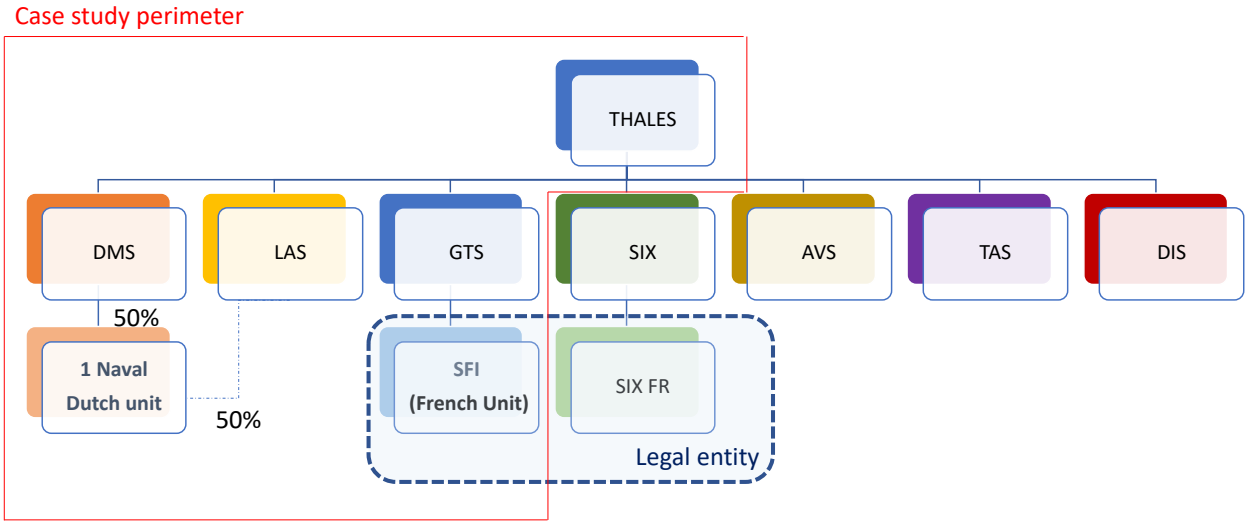
[38] Free translation of « L'opportunisme méthodique »

I found therefore an interest to the research to use 2 different units, having different DNA in term of culture and group belonging feeling might provide some meaningful outcomes and insightful information in regard to the level of freedom that units leave to the projects. After getting the local approvals to access the data and conduct the proper interview, the case study was upgraded and the second unit was added to the research perimeter.

Less importantly I also decided to add the second unit as my role as supervising the projects execution, not having a direct responsibility to their delivery was identical within both units. This continuity between the 2 units in term of role would also limit the bias in term of interpretation or analysis of the data and events. My role would not influence the conduct of the interviews nor the analysis of the data received.

The proposed chart (figure 16) tries to better picturize the positioning of both unit in the overall organization as described earlier.

Figure 16: Case study Perimeter



2.2.1. The French Unit: The good soldier

Although, the older history of this transportation activity is quite difficult to gather, it is interesting to notice, a large part of it has been outside the Thales group perimeter. Its origin is definitively Canadian, where in the 70's a company called UTDC (Urban Transportation Development Corporation) developed a new signaling system "Intermediate Capacity Transit System (ICTS)" for the Metro of Toronto and Vancouver. The company was sold to Lavalin, a Canadian company from who Bombardier acquired it in 1991. The transfer from Bombardier to Alcatel is not clear in term of scope and timing. Very little information are available on this part of the activity history.

Fortunately, the recent history is easier to track. In late 2006, Thales acquired among other businesses, Alcatel transport and systems, from Alcatel Group, a French conglomerate that was willing to concentrate on telecommunication. The acquired business was composed of the signaling activities of the Alcatel Group as well as the system integration activities. (Source EU, 2006), The integration activity was also providing command and control system to the transportation industry. Lastly, the Transportation activity had also a ticketing activity. Around 2010, After several organizational change within Thales, the signaling activities, the ticketing and the Transport System integration activity were merged into one division in charge of developing the Ground transportation activities for the Group. The footprint which is inherited from the Alcatel Period is composed of 2 main facilities in Toronto, Canada, for the urban transportation and in Ditzingen, Germany for the Rails signaling. The head office of the worldwide activity is nevertheless based in France in the Paris area. Other facilities in Asia (Hong Long and Singapore) in Europe (Italy, Spain and Portugal) are also supporting the worldwide footprint and the global transportation activity. In France, in addition to the head office, the transportation activity is specialized in the rail signaling, in the Integrated communications and in the ticketing activities.

In the 10's the Group merged several legal entity and the French unit of the transportation was merged with one of the biggest French Security and Defense unit of the Group. This legal entity has a long history within the Group and operates in the very formalized and process oriented Defense environment with a quite conservative approach on project execution. The French Ground transportation activity, soon adopted the adapted to the absorbing units process and operating modes. Since then, despite its history, the unit strongly stick to group standard organization where project is at the heart of the organization and where the business is steered through one main axis which is the project.
In 2015, faced a significant economic downturn and the diminishing backlog of the unit forced them to re allocate resource elsewhere within the Group. This drove some significant organizational challenges especially in the engineering department.

In addition to the commercial challenged faced by the unit, the Signaling activity was facing the competition of the Germain unit for the main line signaling and the solution developed by the French unit was seen by the business line as a secondary offering solution. In the System integration, the product strategy was not facing internal competition but the solution was not mature. At the time of the study, the product is not fully define, the development is facing delay due to recent staff reduction and the priority given to project execution versus product development in the allocation of the engineering resources.

The interesting fact on the choice of the 2 units is that there is some similitude between the French unit and the Dutch unit but they both reacted differently to each of those similar experiences.

Both units have a long history outside the Group. From this history, the Dutch unit kept its independence of view despite its full alignment to the group core processes while the French unit was forced by the successive organization adjustment and its backing to biggest French Defense unit of the group, to be much more conventional in its operating principles.
In 2015, the unit was also facing difficulties but no major restructuring nor new organization were implemented

Both units faced an economic downturn in the mid 10's. Once again, both unit reacted differently. The Dutch unit, acted in a survival mode in a very quick manner. There was no other Thales units in the Netherland that could have helped to absorb the impact. The unit did then re-invent itself to increase its competitiveness, proposed a new and unconventional organization to the Group and reinforced her Business development efforts to re built a strong backlog. The company took this economical accident as an opportunity to optimize its structure, re initiate profitable growth and develop a new set of innovative product policies.
As a contrary, the French unit, took considerable time to react to the situation and the action and decisions taken were not as strong as the ones taken but the Dutch unit. With a lighter medicine, the units took a longer time to recover from its illness. The unit also did not consider this as an opportunity. The Transportation activity was embedded in a much larger unit that was easily capable to compensate for this unfortunate business difficulties.

2.2.2. The Dutch Unit: Beyond compliance to group standards

The Dutch unit based in Hengelo, very close to the German border, is a major unit for the group. Before being part of the group, the Dutch unit build its culture and knowledge across several companies during almost a century. The company initially named Hazemeijer's,(figure 17) will celebrate is 100th anniversary in 2022. The company was created to produce the fire control equipment for two new ships of the Royal Netherlands Navy.

Figure 17: First premises of Hazemeijer's that would become Thales Netherland few decades later.

(https://web.archive.org/web/20061007231147/http://www.thales-nederland.nl/nl/about-us/about-us.htm)

In 1940 the factory was captured by the German army. The large number of staff that were able to migrate to the UK shortly before the Netherland was invaded, were shocked to found the factory pillaged when they came back soon after the war. The Dutch government took then the decision to nationalized the company as defense industry was then considered as key strategic asset for the country. The company was renamed Hollandsche Signaalapparaten. The shorter version "Signaal" crossed over the decades and traces of the importance of the company and it s name can be found all around Hengelo. Although now closed, the Signaal Café is still ericted as a symbol of the old good days. Former employees, older citizen and also current employees are still referring to the Name Signaal. A school and a museum also testimony of the glorious past. The company welcomed up to 5000 employees at the end of the Eighties.

In 1956, Phillips bought to the Dutch government the biggest part of the shares. Over the decades the company developed a strong export capabilities delivering more than 40 different navies all around the world.

In 1990, Philipps divested from the Defense Market and sold its shares to Thomson CSF that would later become Thales. The Dutch government still own one share that enables to still control the the company destiny. This share allows 2 seat of government representative at the board of the company.

Since then The Dutch unit is renowned worldwide in the naval field for the delivery of ship Combat Management Systems as well as developing high end radars.

In 2015, the unit went through a painful restructuring and proposed to the group a new organization that was not fully in line with the group matrix organization. System business and radar business

which belonged to 2 different Business Lines from 2 different business activities were merged to become one single organization. The goal was to simplify the organization in order to reduce costs but also to enable agility and faster decision making within the unit.

This is remarkable in the sense that the Dutch unit is the only large organization that does not fully respect the group organization and the group governance. By merging those two activities within a single unit reporting to one business activity only was not a given when the proposal was made and it took a lot of energy and a strong power of persuasion to the local management to get the approval for such setup. This is still regularly questioned by one business activity or the others and it requires a lot of soft power to maintain it as is.

Another remarkable proof of the liberty of thought in the unit's DNA, is the internal organizational change the company initiated at the same time of the merging of the 2 activities. During the change, the unit also took the opportunity to organized differently as compared to other group units and decided to steer the operation along 3 different axis; One axis would focus on the geographical and customer location. This organization would be call a customer account Team (CAT). The second axis would focus as the other Group units on Projects and finally the third axes would focus on product. During the monthly review, each customer project would then be reviewed through those 3 different angles given a better opportunity to detect similitude or synergy available among the overall portfolio of the company. The unit also developed a set of reporting enabling the steering and supervision of the business through those 3-different axis.

Within the group, the unit organization is quite unique and faces strong adversity among the business activities that would prefer to come back to a more standard organization.

From the early 40's and its reconstruction till today, the spirit of uniqueness and independence never quit the company DNA. The company, is loyal to the group, it has no spin off ambitions, the company comply and follow the group main principle but it has this special mindset that will enable it to propose innovative form of organization or innovative steering proposal that in my opinion makes it unique.

At the time of the study, the unit is facing a significant ramp up issue. The recent commercial successes after several years of economic downturn leaves the units with a workload way above the current resources available. The experienced and skilled engineering resources are scarce and overloaded which do not enable the company to embark and properly train the younger and new comers.

The unit has to make some trade off that would impact some of the projects the unit is currently executing.

2.3. The different projects studied

The choice of the studied projects has been made by selecting 3 projects from each unit. For each unit, I have selected projects that are typical of the unit activity, that we could not argue their exception, in term of size, in term of scope complexity as well in term of difficulties encountered during execution. I also chose project with a level of completion that is significant enough to characterize the successfulness of the project and would enable us to better trace all execution issues that projects were confronted to.

The French Cases: The French units is specialized in Communication system for Ground transportation system. It can be for Trams, Metro or Main line such as HST (High Speed Train) or conventional main lines. The selected projects are related to Metro and Trams. No major Main Line project has been deemed interesting in the frame of the study. Most of them being mainly managed by Portuguese or Spanish units where the French unit would act as internal subcontractors for those units while delivering building blocks of their solution.

The Dutch Cases: The K project, The D-X Project and the South American Project are projets that reflect the different segment of activities of the unit: Naval radar development and Ship command and control systems. Choosing two domestic projects and one export project provides also a good overview of the global footprint of the unit at the time of the start of the study. The Dutch unit get a strong support from the Dutch navy that helped to overcome the crisis of 2015. Nevertheless, the Dutch unit has also a long lasting export appetite and is very well recognized by many foreign navies. 2/3 of export projects is about the right ratio for this unit

To avoid confidentiality issue due to the sensitivity of the field of some of those projects, Names and figures of the project have been anonymized.

2.3.1. The DML

Short Description :

The DML has been awarded in 2015 and consists of delivering a full range of control and communication system to a new Metro in a middle east fast growing city. The customer maturity is low in this important but limited weight field as regard to the overall Metro construction project. The project studied is limited to the control and communication systems. This is the part of a larger contract that will be executed by the French unit we are studying. Another unit of the group has

also been awarded the signaling system part has also been awarded to the group and will be executed by another unit of the group. The signaling part is outside of our case study and will not be reviewed. Nevertheless, this part of the scope is definitively part of the environment of the project studied and the multi-unit management is a source of complexity a the unit needs to monitor and address

Project ID card:

The contract value for this project is above 100 M€ with an initial level of margin considered as low as compared to the unit and group standard due to its regional strategic status. The duration of the contract is around 56 months with the last planned milestone in October 2019.

the contract includes penalties for delay that could potentially reach 10% of the contract value and 20% of the contract value if the unit is deemed responsible of the overall project delay.

The new metro line is around 80 km long with more than 30 stations and more 70 trains to be equipped. As of Dec 2020, the unit booked 30 different variation orders that impacted, the contract value, the schedule as well as the scope of the project.

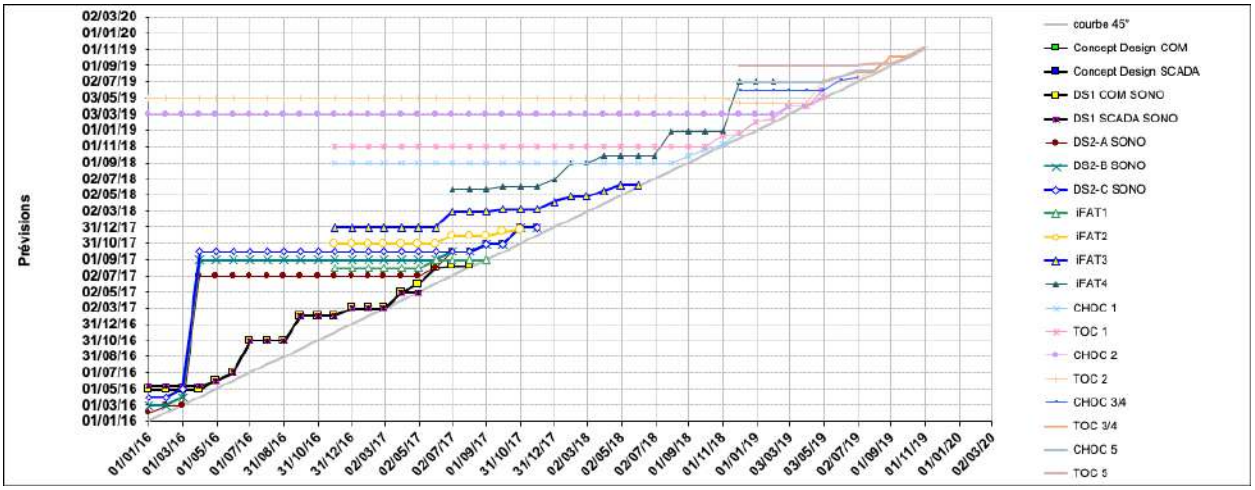
Context summary:

At the time of the study the project is facing extreme difficulties and customer is willing to look at alternatives in order to open the metro as per the initial schedule. the political pressure around the project is huge. The customer is using the hierarchical escalation method to increase pressure and the Group CEO has already been involved by the customer leading to additional internal pressure. Internal issues between units is also source of issues and the financial economy of the project is a disaster. The unit is suffering to finalize the development of the product to be implemented which causes delay on the project delivery.

Key Project execution facts

notwithstanding significant delays and issues all along the project execution, the project achieved the last technical milestones with only 1 month delay as compared to the initial schedule. This happened at the expense of significant costs increase and schedule delays on other projects the unit had to execute. All resources and management focus has been dedicated to recover the schedule delay of the project and deliver on time. The chart below (figure 18) shows the Contractual milestone achievement date prediction all along the duration of the project.

Figure 18: Project contractual milestone achievement prediction evolution overtime



Source Thales Internal project Dashboard

2.3.2. The WC Corridor (WCC)

Short Description :

This project is also located in the middle east and has also been awarded in 2015. It consists of delivering a new tramway system for a brand-new city. The city, the tramway and many other infrastructure are built in parallel and for political reasons the schedule is very tight. The unit will deliver all the control and communication system as well as the signaling system under development by the Italian unit. The project requires as the DML project a careful multi-unit management. The control and communication system that will be implemented in the WCC project is the same as the DML project. The WCC execution is then tightly associated with the DML execution.

Project ID card:

The contract is below 80M€. As the DML project, the initial margin of the WCC project is lower than the standard group expectation. The communication scope will be executed by the unit studied and partially subcontracted to the Portuguese unit. Awarded in 2015, the system is planned to be fully executed and delivered to the customer by January 2020. The project consists of the delivery of 4 different Tramway lines, with around 40 stations spread over 40kms. The lines will be operated by 30 different trains. All the lines will be supervised by 1 Operation Control Center (OCC) and 1 back up OCC also to be delivered by the French unit.

Context summary:

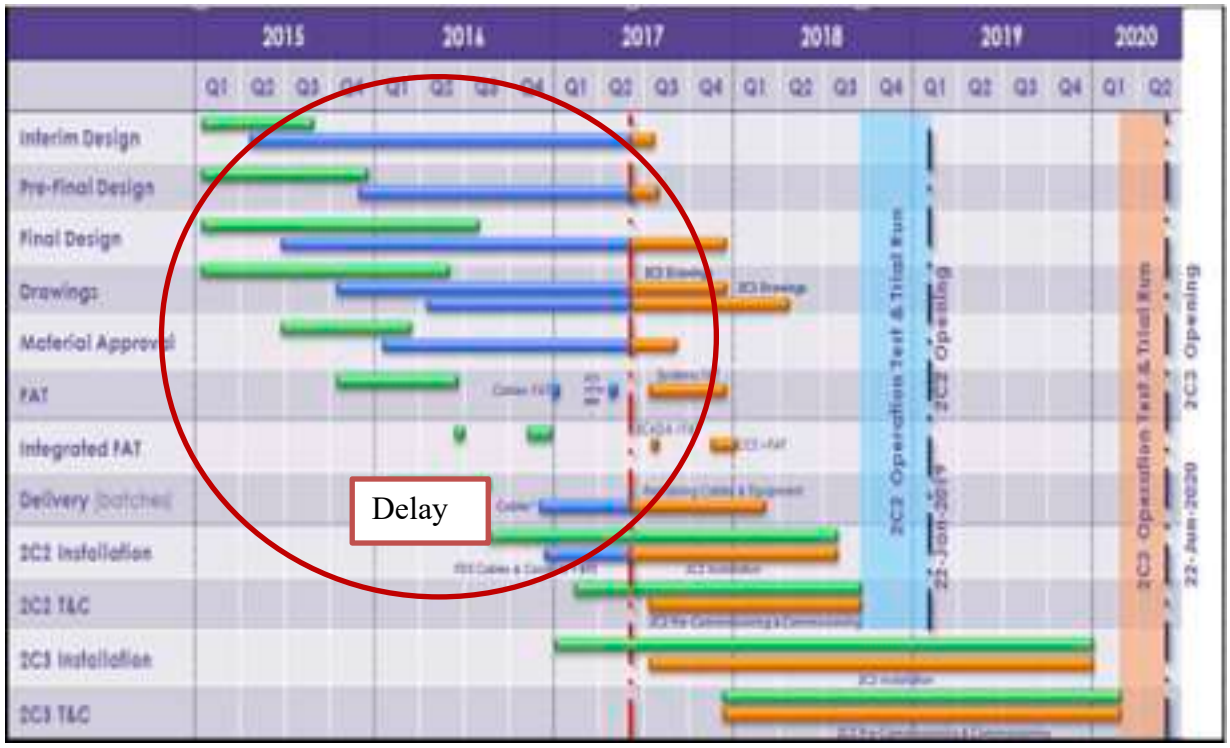
At the time of the study the project is not yet finalized and has significant delay that drives strong political pressure all along the Group. The project faces limited technical issues but is suffering lack of resources that would enable it to recover partially the delay. Despite more than 30 change orders, the project has lost money and the costs estimate is way above what was initially estimated. The scope changed slightly but the unit is struggling to develop and finalize the Control and Communication system they are aiming to install for this project. The project is linked to the DML project and some stations will be share by the two systems. Stronger coordination at the unit level is therefore mandatory between the 2 projects.

Key Project execution facts

The project suffered from the weight and the neighborhood of the DML project. The schedule of the WCC is less stretched than the DML project and the unit management team focus on the DML. From a product, the WCC will be delivered a system that is over featured that it would require but the product roadmap is focusing on the DML delivery and once again the similarity of system between the 2 projects is seen as positive although not contractually required.

In 2017, the program shows significant delay as shown in the following high level schedule

Figure 19: The WCC high level schedule (2017)



Approved Baseline Program.
Actual Progress
Remaining (Forecast)

2.3.3. The Caribbean Project

Short Description :

The Caribbean Project was awarded in 2015 and consists of delivering control and communication systems to a Caribbean city for their second metro line. The first line was as well executed by the unit that has a long-lasting relationship with the customer. The scope is very similar to what has already been delivered for the first metro line. The project is seen internally as a repeat of the metro Line #1. The project will be delivered by the French unit but all local activities is subcontracted to a partner that was also involved in the first metro line. The Product to be delivered are standard products and no significant customer specific is requested. The project consists of. delivering a control and communication system for this second line.

Project ID card:

The Contract value is less than 50M€ with a level of profitability that is in line with the unit standard and lower than group expectation for the Transportation business. The expected duration is 49 month. The metro line will be 21km long serving 16 different stations. 21 trains will operate on the line #2. In 2020, the line #2 extension has been awarded to the unit and this extension is intended to be delivered after 31 month in 2023.

In 2021 the maintenance of the Line 1, the Line #2 project and its maintenance contract as well as the metro line #2 extension have been merged by the French unit to become a single project and is monitored as such. The new scope of the project is now above 80M€.

Context summary:

At the time of the study the project is half way. The project is considered successful and is delivered as planned. The project is facing some delays and the customer complained about it but actions are ongoing to recover and the project is not considered at risk by the unit. From a technical standpoint, the technical solution delivered is mature and is already operating in the metro line#1. The unit considers the project as less critical as the 2 projects mentioned above and rely a lot on the local partner so that internal resource can focus on the middle east projects that are suffering.

Key Project execution facts

There is no major fact to be mentioned about the project is considered as being executed smoothly and does not worry the unit management. in 2017, the project is not on the management watchlist

and his escalated to the business line for reporting purpose only due to the contract value. Quality chart (figure 20) confirms the low risk trend of the project as reported.

Figure 20: Project quality assessment 2017

Current Assessment, Findings and Recommendations cells are filled automatically from the Assessment Grid (TIMS tool)

Previous Review	Thèmes	Evaluation	Findings:	Recommendations :
	1. Relation client	Monitored	La situation reste difficile mais pas de nouvelle plainte client	
	2. Structuration et plans	Monitored	Plans à jour, PGD signé et en cont mais pas de HEMP approuvé	
	3. Planning et Ressources	Confident	Suituation suivie, présentée et discutée en revue DT	
	4. Finances	Confident	Suivi financier réalisé - EAC/ETC estimés régulièrement Gestion sous Primavera à jour	
	5. Gestion des exigences	At Risk	Traçabilité sous excel entre SSS et HRS et sous DOORS entre SSS et STD faite, sauf les exigences Safety (en cours)	Finaliser la traçbilité des exigences safety pour les TQR à suivre
	6. Maîtrise de la solution	Monitored	Manque de suivi des actions issues des revues DDQS	Lever les reserves identifiées lors des revues
	7. Fournisseurs et sous-traitants	Monitored	Un plan d'action a été initié pour résoudre les problèmes levés lors de le FAT Nokia	Préparer de façon générale les FAT clients avec une pré-FAT sous-traitants/fournisseurs
	8. Gestion des risques et des opportunités	Monitored	Revues R&O tenues régulièrement - réunion faite le 14/09	
	9. Gestion des non conformités	Confident		
	10. Esprit d'équipe	Confident	réunion d'avancement regulières, réunions d'informations projet, reunion core Team	
	11. Livraison et Réception	Not Assessed		
	12. Gestion des données	Monitored	La gestion des documents sous TOL est ... Importance de savoir les documents applicables a un instant T.	Maintenir la CDRL à jour régulièrement. Clarifier les modalité du remplacement du PGDM. Mise à jour de L'OBS
	13. Gestion de configuration et des changements	Monitored	CCB inititées sur le projet	Maintenir les CCB avec les intervenants nécessaires

Confident	Monitored	At Risk	Critical	Not Assessed
KMA Objectives are achieved . No issues or effective actions implemented	Issues with minor impact or Major impact and actions in progress with first results. Under Monitoring	Issues with major impact. Actions might be defined but their efficiency is questionable	KMA objectives are not achieved. Issues with major impact - Actions required	Not assessed

2.3.4. The South American Project

Short Description :

The South American Project was awarded early 2015 and consists of delivering a combat management system (CMS) associated with several sensors (material or subsystems) such as guns, radars, communication systems and data link for a new Long Range oceanic patrol vessel under construction by a Dutch shipbuilder for a Foreign Naval Army. The project requires a lot of integration and a significant level of coordination with the suppliers providing many of the material. Some of those suppliers are internal to the group, some are outside the group and are most of the time competitors.

Project ID card:

The contract value for this project is above 100 M€ with an initial level of margin considered as low as compared to the unit standard. The duration of the contract is around 56 months with the

last planned milestone in July 2019. As many contract such as the South American Project, the contract includes penalties for delay that could potentially reach 10% of the contract value.

Context summary:

The project is important for the unit as it is the first large project and the first system delivery since the 2015 restructuring period. It's seen as a good test to monitor the unit's integration capabilities and the unit's ability to execute and deliver large export project. The Combat management system as well as all internal sensors to be delivered are part of the product roadmap and therefore should not require any specific customer development. At the beginning of the project, the company do not face any resource issue and is looking for activities his engineering squads.

Key Project execution facts

The project has been delivered with only one month delay (Aug 19) while maintaining the level of expected margin. Nevertheless the Project although considered successful faced several crisis towards the end, due the scarce level of resources available and some Product roadmap strategic changes.

The table 20 below, extracted from the project Dashboard, provides an interesting evolution over time of the KPI monitored :

Table 20: South American Project KPIs evolution

	PROJECT PERFORMANCE																	
	FINANCE					CUST.	PROJECT DELIVERY								Business specifics			
Date of Project Review	CBB-EAC	Revenues vs budget	Cash-in vs budget	UPC vs OPC	Contigencies vs Risks impacts	Customer Feedback	On Time Delivery (OTD)	Conformity On Delivery (COD)	Workload indicators	Engineering indicators	Suppliers indicators	Industry indicators	Services indicators	HSE	Airworthiness	Safety (solution)	NA	NA
03/10/2017	G →	G →	G →	NA ↑	G →	NA →	G →	G →	Y →	NA	G →	NA	NA	A →	NA	NA	NA	NA
05/12/2017	G →	G →	G →	NA ↑	G →	NA →	G →	G →	Y →	NA	G →	NA	NA	A →	NA	NA	NA	NA
06/02/2018	G →	G →	G →	NA ↑	G →	NA →	G →	G →	G →	NA	G →	NA	NA	A →	NA	NA	NA	NA
07/03/2018	G →	G →	G →	NA ↑	G →	NA →	G →	G →	G →	NA	G →	NA	NA	A →	NA	NA	NA	NA
03/04/2018	G →	G →	G →	NA ↑	G →	NA →	G →	G →	G →	NA	G →	NA	NA	A ↗	NA	NA	NA	NA
07/06/2018	G →	R →	G →	NA ↑	G →	NA →	G →	G →	G →	G →	G →	NA	NA	A ↗	NA	NA	NA	NA
04/07/2018	G →	R →	G →	NA ↑	G →	NA →	G →	G →	G →	G →	G →	NA	NA	A ↗	NA	NA	NA	NA
03/09/2018	G →	R →	G →	NA ↑	G →	NA →	G →	Y →	Y →	G →	G →	NA	NA	G →	NA	NA	NA	NA
05/12/2018	G →	Y →	G →	NA ↑	G →	NA →	G →	G →	A ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
06/02/2019	G →	G →	G →	NA ↑	G →	NA →	G →	G →	A ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
04/03/2019	G →	A →	G →	NA ↑	G →	NA →	G →	G →	A ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
02/04/2019	G →	A →	G →	NA ↑	G →	NA →	G →	G →	R ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
06/05/2019	G →	A →	G →	NA ↑	G →	NA →	G →	G →	R ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
07/06/2019	G →	G →	G →	NA ↑	G →	NA →	G →	G →	R ↗	A →	G →	NA	NA	G →	NA	NA	NA	NA
03/07/2019	G →	G →	Y ↗	NA ↑	G →	NA →	G →	G →	A →	A →	G →	NA	NA	G →	NA	NA	NA	NA
10/09/2019	G →	G →	Y ↗	NA ↑	G →	NA →	G →	G →	A →	A →	G →	NA	NA	G →	NA	NA	NA	NA

Source Thales Internal project Dashboard

In table 20, the arrows show the future trend historized), the color provide a current status Green when it is considered with no issues, Amber when the project team see some risk or difficulties and Red when execution issues are there.

2.3.5. The K Project

Short Description :

The K project consist of a second batch of delivery of 5 additional corvettes for one of the European navy. The first batch of five corvettes project were delivered in the mid 00's. This is important to notice as this 2 batch was seen as a repeat project. Later on we would negatively understand this was a wrong assumption. The project though would consist of the delivery of a Combat management system which is country specific and not part of the product roadmap associated with the delivery new sensors which are under development at the time of the award.. As a summary, the project requires an extensive amount of specific development as well a consequent amount of integration.

Project ID card:

The contract value of the initial contract is above the 200 M€ and the expected profitability of the project is within the standard of the unit profitability expectation. The project is expected to around 60 month for Thales reaching 2025 for the last corvette delivery. The project is not fully delivered yet but significant delay are expected due to resources and development issues.

Context summary:

The contractual scheme of the project is very complex and very political in a way that there are several consortium involved grouping competitors. The cooperation is difficult to say the least and external considerations like major future business opportunities for the involved stakeholders are damaging the project interest. Thales is part of a second tier consortium. After difficult years in the mid 10's the Dutch unit rebuild his backlog and is sitting on several billions to be delivered. Resources are scarce and priorities have to be escalated and decided on the regular basis.

Key Project execution facts

At the current stage of the project execution, the project suffers, Schedule, budget and resources issues.

In table 21, the arrows show the future trend historized), the color provide a current status Green when it is considered with no issues, Amber when the project team see some risk or difficulties and Red when execution issues are there.

Table 21: The K Project KPIs evolution

	PROJECT PERFORMANCE																	
	FINANCE					CUST.	PROJECT DELIVERY								Business specifics			
Date of Project Review	CBB-EAC	Revenues vs budget	Cash-in vs budget	UPC vs OPC	Contigencies vs Risks impacts	Customer Feedback	On Time Delivery (OTD)	Conformity On Delivery (COD)	Workload indicators	Engineering indicators	Suppliers indicators	Industry indicators	Services indicators	HSE	Airworthiness	Safety (solution)	Deployment	NA
3-Mar-2020	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
9-Feb-2021	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
21-Apr-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
13-May-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
29-May-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
14-Jul-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
1-Aug-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
14-Sep-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
17-Nov-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
16-Dec-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
18-Jan-2021	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
9-Feb-2021	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
30-Mar-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y →	Y →	A →	A →	A ↗	NA →	Y →	NA →	NA →	Y →	NA →
4-May-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y ↘	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →
8-Jun-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y ↘	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →
14-Jul-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	R →	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →

Source Thales Internal project Dashboard

2.3.6. The D-X Project :

Short Description :

The D-X Project consists of developing and delivering high end radars to a European Navy. This radar is a new version of an already developed system. This would extend consequently its range capabilities. This project is important for the unit as the technical capabilities developed for the D-X radar are recognized as state of the art. The project was organized in a first phase related to the radar development and a second phase related to radar production of a limited series. Each of the phase having their own area of risks. The Development phase could have been a project on his own and the production phase another one. The unit decided to merge the 2 phases into one project to align with the contract.

Project ID card:

The contract has been awarded in 2012 for an amount comprised between 50 and 200M€.

At the end of July 2020 (our latest data) the project was 95% complete. The project faced costs overrun above 10% of the initial cost estimate. The initial development phase did face schedule delays to which industrial delays were added: The unit was struggling with material quality and was having hard time to reach the noise limitation as per contractual Technical requirement. This was quite a concern as the project was subject to late penalties as well as liquidated damages. The unit was able at this time to avoid the contractual application of such clauses.

Context summary:

At the time of the study the first phase is complete despite several months of delay that could lead to substantial penalties. In parallel several radars have been produced. Nevertheless, a recent technical issue has been detected that could lead to significant delay and significant cost overrun depending on the need or not of additional development and re-engineering to fix the issue. The context around the project is therefore tense and under close scrutiny. In 2019 the resources are limited and the expert required to fix those technical problems are overloaded and therefore barely available. The. Unit once again has to manage priority settings.

Project execution key fact.

It is interesting to note that a simple issue of glue and the issue of this glue to fix the tiles of the radar may have caused month and consequent overrun. The high complexity of the system was suddenly reduced to a problem of glue…

In table 22, the arrows show the future trend historized), the color provide a current status Green when it is considered with no issues, Amber when the project team see some risk or difficulties and Red when execution issues are there.

Table 22: The D-X Project KPIs evolution

	PROJECT PERFORMANCE																	
	FINANCE					CUST.	PROJECT DELIVERY								Business specifics			
Date of Project Review	CBB-EAC	Revenues vs budget	Cash-In vs budget	UPC vs OPC	Contigencies vs Risks impacts	Customer Feedback	On Time Delivery (OTD)	Conformity On Delivery (COD)	Workload indicators	Engineering indicators	Suppliers indicators	Industry indicators	Services indicators	HSE	Airworthiness	Safety (solution)	Deployment	NA
3-Mar-2020	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
9-Feb-2021	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
21-Apr-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
13-May-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
29-May-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
14-Jul-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
1-Aug-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
14-Sep-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
17-Nov-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
16-Dec-2020	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
18-Jan-2021	R →	G →	A →	A →	G →	G ↗	A ↗	G →	G →	A →	A →	NA →	NA →	G →	Y →	Y →	Y →	NA →
9-Feb-2021	R →	G →	A →	A →	G ↘	R →	R →	G →	R →	A →	A →	NA →	NA →	G →	NA →	Y →	Y →	NA →
30-Mar-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y →	Y →	A →	A →	A ↗	NA →	Y →	NA →	NA →	Y →	NA →
4-May-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y ↘	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →
8-Jun-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	Y ↘	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →
14-Jul-2021	R →	0 →	0 →	0 →	G →	R ↗	R →	R →	Y →	A →	A →	A →	NA →	Y →	NA →	NA →	Y →	NA →

Source Thales Internal project Dashboard

3. DATA COLLECTION METHOD

Stablein (2006) proposes a data definition: *"Data in Organizational study are representations which maintain a two-way correspondence between empirical reality and a symbol system*." I believe on a two way connections between data and what they represents the symbolistic attribute of the data is to be considered when analyzing collected data.

As already mentioned in the part 1 of this chapter, one of the shortfall in embedded case study is the excess of data to analyze that may lead to overwhelming and being counterproductive. As a practitioner being part of the case having access to a large set and a large quantity of data I made sure to carefully select a limited data set in order to avoid such excessive data processing.

I therefore limited my collection to a set of 4 different nature of data. "*Data collection can be broken down into four main elements: the nature of the data collected, the method of data collection, the nature of the field of observation and the sample, and the data sources. Each of these elements must be justified with regard to the problem and the chosen method of analysis, in order to show the coherence of the whole, taking into account, moreover, the feasibility of the choices.*[39]*"*. The following table 23 above inspired by Royer et al. (2014) presents the different data that are used for the research with a synthetic explanation of the interest of the selected data type for the case:

Table 23: Data collection Overview

Nature of data	Method of data collection	Field of observation	Data sources	Interest for the case	Number of documents
General information	Mainly documents	The. Field for this nature of data is mainly the Case (The Group), and the 2 units	thales Website Thales Intranet	The undertanding and its influences on the case is an important element of the research therefore extensive information	10 to 20 documents (including Web pages)
Process & standard	Written & formal documentation	Processes and standards collected are collecteed at group level, at GBU level, at unit level and when available at project level	Chorus is the tool used by the group to monitor , manage and disclose all Processes and standard	We want to measure the level of autonomy given to the project. Standardization is à key potential contributor to the tight coupling of the permanent organization and its projets.	70 documents
Project specific docmentaiton	-Power point presentation - Excel files	Within the 2 units embedded in the Case we chose 3 representatives projets. With 3 different level of issues and complexity	Projects repository My emails	Our research is also about the supervision pratice of the project therefore having data related to Project execution, project monitoring is à major contributor to the research	45 documents
Interview	- Open interviews	Particpant have been chosen for their role eiher at project level, at unit supervision, at business line supervision or at Group level	Particpants at different level of the case's organization	the interview is an important data provider for the understanding of the projects environement, the project execution and supervision thrue the eyes of the key actors of the case	17 Interviews

[39] Free translation of : "*On peut décomposer le recueil de données en quatre éléments principaux : la nature des données collectées, le mode de collecte de données, la nature du terrain d'observation et de l'échantillon et les sources de données. Chacun de ces éléments doit pouvoir être justifié au regard de la problématique et de la méthode d'analyse choisie, de manière à montrer la cohérence de l'ensemble, en tenant compte, de plus, de la faisabilité des choix effectués" using Deepl.com*

Our data collection is a blend of primary (the interviews) and secondary data (most of the documentations) as per Baumard et al.'s (2014, p 112) definition as both of them are important in the understanding of the environment around the projects as well as for the understanding of the different social interaction, the execution and supervision practices within the group and within the units. and also are necessary to better define and present our empirical findings. In the following paragraph I will present in more details each of the data collected and the reason for the use of such data.

3.1. The interviews

The interview is one of the data collection method among others recommended for the Case study as qualitative approach (Royer et al. 2014,p 177). For our research subject I believe the interview is a very well-suited source of data. My goal is in addition to my own view of each project that I was supervising, I wanted to have better understanding of the view and feeling of some key project team members. I also wanted to discuss questioning on the project organization and our project supervision practices with some of my colleague with whom I was managing the Business Line.
In that sense I am aligned with Hesse-Biber & Leavy, 2006; "*As is clear from the definition, a qualitative interview takes place in a reciprocal relationship. Interviews provide an opportunity for researchers to learn about social life through the perspective, experience and language of those living it. Participants are given the opportunity to share their story, pass on their knowledge, and provide their own perspective on a range of topics*"

3.1.1. Interviews overview

I conducted interviews at all level of the organization trying to cover also different position within each organization..
The sampling of the participants has been straightforward. We interviewed by project the 2 project team leaders, being the project manager and the project controller. We then also interviewed the key stakeholder of the 2 units that were involved in the project supervision and for some of them in the project execution. Finally we were able to interview the owner of the process 5 manage Bids & Projects at group level to receive his views and thinking on the group project organization. The set of interview that were conducted by position. The table 24 & 25 present the number of interviews. The difference between the 2 tables is linked on some participants holding several positions. By positions we conducted 22 interviews but in reality we interviewed only 17 Participants.

Table 24: Interviews synthesis by roles, Projects an Units

	# position interviewed	Project		Units				Group	
		PM (a)	PC (b)	PD (c)	VP Domain (d)	Domain FC (e)	COO (f)	SVP Bid & Projects (g)	∑
French unit	DML	1	1						
	WCC	1	1	1	1	1	1		10
	Caribbean	1	1						
Dutch unit	South American	2	1						
	The K	1	1	1	1	1	1		11
	THE D-X	1	1						
Group								1	1
∑		7	6	2	2	2	2	1	22

a Project Manager
b Project controller
c Project Director
d Vice Presisent Domain
e Domain Financial Controller
f Senor Vice President Bids & Projet
g Chief Operation Officer

Table 25: Summary of Physical interviews

	# interviews	Project		Units				Group	
		PM (a)	PC (b)	PD (c)	VP Domain (d)	Domain FC (e)	COO (f)	SVP Bid & Projects (f)	∑
French unit	DML		1						
	WCC	1	1		1	1	1		7
	Caribbean		1						
Dutch unit	South American	2	1						
	The K	1	1	1	1	1	1		11
	THE D-X	1	1						
Group								1	1
∑		5	6	1	2	2	2	1	19

The interview were conducted between 2020 & 2021. There were initially set up for 1 hour. The introduction has not been recorded, which is the reason why most of the interviews lasted a little bit less than 60mn. Knowing quite well it took me between 10 to 15mn to explain my research object and really start the interaction with the participants. We compiled almost 800 hours of interviews. The table 26 provides the detail of the interview with their location, in the Netherland, in France or remotely, as well as the date of the interview and the duration of each interview.

Table 26: Interviews detailed overview

Interview	location	Duration (mn)	Interview date
1	Hengelo	48	13/08/2020
2	Hengelo	43	11/08/2020
3	Hengelo	62	17/08/2020
4	Hengelo	38	20/08/2020
5	Hengelo	46	16/07/2020
6	Hengelo	35	13/07/2020
7	Hengelo	43	17/08/2020
8	Hengelo	45	24/08/2020
9	Hengelo	57	12/08/2020
10	Hengelo	41	23/09/2020
11	Hengelo	45	23/09/2020
12	Velizy	60	05/01/2021
13	Velizy	54	05/01/2021
14	Velizy	40	05/01/2021
15	remote	48	04/11/2020
16	remote	75	14/06/2021
17	Velizy	60	06/01/2021

Average	49
Total Mn	780

3.1.2. Interview methodology

3.1.2.1. The choice of the semi structured interview

For those interviews we followed the semi structured interview. I decided to use such model as I wanted to have a grounded narrative Interview experience (Galetta, 2013, p 45). I did not want to constraint the Interview within a tight framework and leave him the opportunity to share feelings and reflection on the subject addressed. We are comforted in the choice of the semi structured interview by the following statement of Romelaer (2005) we couldn't more agree: *"we will deal essentially with what is called the semi-structured interview. a mode of interview in which the researcher leads the respondent to communicate numerous detailed and quality information on the subjects related to the research, influencing him very little, and thus with guarantees of absence of bias which go in the direction of a good scientific quality."*

3.1.2.2. Opening remark

Prior to the interview, I prepared 3 different opening remark depending of the participant's role in the case.

For the project team member I started we the following statement: "Thank you for accepting this interview. In the frame of my executive Doctorate, I`m conducting a study during project execution

about the relationship between the project as an organization and the permanent organization the project belongs to. I won't ask you many detailed question but I would just like you to talk about this relationship in term of Autonomy and tensions created during project execution vis a vis your permanent organization XX ." XX being **SFI**, the Name of the French unit when the related project was within the French perimeter or **1Naval**, the name of the Dutch unit when the related project was within the Dutch perimeter.

For the participant that had a supervision role within the Business line or the unit, I started with the following statement:
"Thank you for accepting this interview. In the frame of my executive Doctorate, I`m conducting a study during project execution about the relationship between the project as an organization and the permanent organization the project belongs to. I won't ask you many detailed question but I would just like you to talk about this relationship in term of Autonomy and tensions you may have noticed or felt with the permanent entity or between projects during the execution of

- The WWC project, the DML project and the Caribbean project ." when the participant was a member of the French supervision entity
- The South American project, the K project and the D-X project" when the participant was a member of the Dutch supervision entity

Finally when the participant was from the corporate I introduced the interview with the following statement:
"Thank you for accepting this interview. In the frame of my executive Doctorate, I`m conducting a study during project execution about the relationship between the project as an organization and the permanent organization the project belongs to. I won't ask you many detailed question but I would just like you to talk about this relationship in term of Autonomy and tensions you may have noticed or felt with the permanent entity or between projects during the execution"

In all cases I tried to be as simple as possible and leave wide open the beginning of the interview. I don't know if my opening remark ere synthetic and simple enough but they definitively encourage fruitful outcome from the participant right from the beginning as the 2 following verbatims shows:

- "*I'm glad you asked for my opinion on the subject and the feedback I can provide. It's nice to do that. In relation to your question and in relation to the beginning of your remark related to the project organization and the separation between the general organization of the company and then the ad hoc organization necessary in the*

*framework of a project. So, I'm actually going to deal with the subject in relation to the DML Project**[40] Interview #15

-

- "*So based on those three examples The K project, the South American Project and the D-X project, both land based and naval, you want me to give you some comments on these aspects*." (Interview #10)

3.1.2.3. Interview guide

My interview guide was simple it was a check list of the topic I wanted the participant to discuss during the interview. I wanted them to provide not only their opinion, feelings but also to describe their experience during project execution during project supervision. I emphasized my interest on Having their return on experience through description of situations and facts.

It includes their vision of the 9 attributes

- Temporality of the project organization
- The object of the project organization
- The scope of the project
- The processes used by the project
- The resources of the project
- The schedule of the project
- The Budget of the project
- The quality within the project
- The development approach

In relation to those attributes how would they consider the level of autonomy they were given by the supervising unit or they were giving to the project team depending of the participant's role.
In relation to the same attributes did they notices tensions arising between the project organization and their parent unit and if yes out of the 9 attributes which one were the most subject to tension.
Verbatim or remark to use to drive towards the specific attributes

- Their view about the project being an autonomous and temporary organization
- Processes (company driven or specifics)
- Scope (customer specific or product policy implementation)

[40] All verbatim coming from the data collected finishing by a bold * have been Translated with www.DeepL.com/Translator (free version)

- Resources (shared of dedicated)
- Schedule dependencies with other project or company priorities
- Budget allocation and budget management

Over the interview it was obvious that some of the attributes were more complicated to understand than others and more specifically farer from their daily concerns. This is particularly true when question the temporality of the project organization or the project organization object. Those were question that most of the participants were not having in mind.

3.2. Processes and Standards.

In the literature review, I was able to present the standardization trend in Project management simultaneous to a decoupling trend requested by project teams. Gathering processes and standards related to project management was therefore important to

1- Analyze the level of autonomy left to the project team within the standards:
2- Analyze the tailoring level of standards made by the units itself if any

Standardization of project management practices is one of the key contributor of the increasing tight coupling between projects and the permanent organization they belong to. Therefore gathering processes and standards helped us to analyze the group philosophy towards standardization and provided us insight on the level of autonomy the Group is willing to leave to its units and its project management teams.

The group is using a tool called “chorus” to overall manage and present the group standards and processes: All employee have access to all Group generic process and the ones related to the unit they belong to. As an example, as a Group employee I have access to the General Group processes, the avionic specific processes as well as the US IFE (InFlight Enterainment)

The figure 21 hereafter is the general mapping of all group Main process in line with the group operation model. This is the representation of the Group Main backbone that any employee can access to in order to drill down to the desired process or standard.

Figure 21: Thales Group Process MAP

All the document gathered and presented below in table 27 in the next page are available under the Main process 5- Manage Bids & Projects, circled in red in the figure xx, and more specifically under the sub process 5.2 Manage project. Those document are a subset of a longer list of document available for this main process.

As of Dec 2021, 28 general documents related to the process 5.2 "Manage Project" were available in the Group quality system. Out of the 28 documents, 9 are guidelines, 13 are instructions 4 of them are template to be used and lastly 2 are training content. IN the quality system, the group defines instructions as an *"Official document describing the conditions for implementing a directive issued by the Group or Entity."*

Table 27: Group Project management standards process or guidelines

Ref	Title
83450024-PRJ-NLD-EN	Project Management Plan Generic
87202784-PRJ-GRP-EN	Project efficiency instruction
87211056-PRJ-GRP-EN	Managing Multi-Entity Projects
87201466-PRJ-GRP-EN	Monitor and Control instruction
87201471-PRJ-GRP-EN	PMP Writing Instruction
87201465-PRJ-GRP-EN	Project characterisation
87201254-PRJ-GRP-EN	Team Charter instruction
FP03_SP_30062017	Famille Professionnelle Management Offres & Projets (FP03)
87206412-GOV-GRP-EN-006	Main Rules For Bids organization and approval. (MRBOA)
87206413-GOV-GRP-EN-003	Main Rules For Projets Supervision (MRPS)
87208128-PRJ-GRP-EN	Tailoring instruction for Manage Project

3.3. Project specific documentation

The third set of data, is project specific documentations. To be more precise, some documents included in this category are unit documents that refers to the studied project. The Business Operation Review (BOR) as an example is a standard monthly review that is organized at all group level. All operational aspects are reviewed included a section related to project status. For the Dutch unit I also got access to the Business management Review presentations. This is a review that is specific to the Dutch unit that I will further present in the chapter 4: "Findings"

I voluntarily reduce the project data to the project dashboard and the group mandatory document such as the Project Management plan (PMP) and the Team charter. Two document that are explaining how the project will be executed and how the project organization team will be organized. and added when necessary some specific additional data such as email or minutes of meetings . Due to its complexity, the number of additional was necessary for. The DML project for. A. better understanding of its context. Nonetheless the main source of project data is the standard project dashboard that I will describe further in a subsequent part.

This basic set of data were. Primarily. Use to analyze each project individually in term of project organization, project execution, their level of complexity. I then had a good understanding of the technical, schedule or financial issues the project was encountered. The use of unit data also provided a good insight on the way the units and/or the project team were communicating and reporting on their project status to the upper level.

The table 8 provides a summary of the project specific documents that were gathered for the research

Table 28: Summary of Project specific documents

	Frech unit	The WCC	The Caribbean	The DML	Dutch Unit	The South American	The K	The D-X	Total
PMP		1	N#A	1		1	1	1	5
Team charter		1		1		1	1	1	5
Dashboards		2	2	2		2	2	2	12
Others *		3	1	7		1	1	1	14
BOR	4				2				6
BMR	N#A				3				3
Total	4	7	3	11	5	5	5	5	45

* other are different specific doument sur as minute of meeting, specific topics presetnation, contracts…

3.4. General information

The Data I grouped as general information are multitude of information from document, website, intranet that I gathered to better present the case, to better present the units, to better understand the project management culture within the case as well as the pressure felt at group level on project execution failures. Those are information that make the overall story comprehensible and give enough context so that readers can understand the overall case interlocking. These data were also used to feed my own questioning. As for example, knowing the unit history led my questioning of its impact on the project management culture and the overall culture of the unit studied.

In the previous part of this research I did emphasize the importance of taking the project environment into account. The use of those data set is primarily to provide better understanding of the group organization, the group culture and its history

The following table 29 presents a non-exhaustive list of general information data we used for this purpose

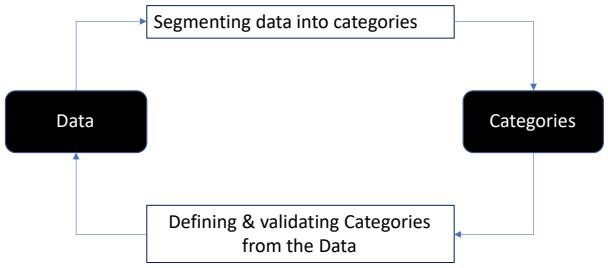
Table 29: Non exhaustive list of general Information gathered for the case study

Method of data collection	Data sources	Interest for the case study
Financial Reports	Media communication page	Provide à financial overview of the Case
Thales History	Intranet page	Provide the Group history in term of key dates and boun daries evolutions
Project management training content	E learning tool	provide an understanding of the Project manager role within the group ansd see the importance of PMI & IPMA certification for the group
Proejct management training offer presentation	E learning tool	provide an understanding of the Project manager role within the group ansd see the importance of PMI & IPMA certification for the group
CEO presentation	Group executive	understand the importance of project execution and potential failure to the group
Thales internal General Organization Memo	Group quality system	Understand and present the group general operating model
Group presentation	Intranet	Presentation of different group activities
Thales Netherland presentation	Old Thales website on webarchive.org	understand the own history of the studied unit
Excellence in Bid & Project Delivery	Group executive	understand the importance of project execution and potential failure to the group

4. DATA ANALYSIS

Several definitions of data analysis can be found in the scientific literature. I found one that is applicable to qualitative data analysis and that describes well what I did during this phase of the research: "*Qualitative analysis is the segmenting of data into relevant categories and the naming of these categories with codes while simultaneously generating the categories from the data. In the reassembling phase the categories are related to one another to generate theoretical understanding of the social phenomenon under study in terms of the research questions*." (Boeije, 2010). In this definition I found interesting the simultaneity of both actions that can be described in the figure 22 below. The analysis of the data for example led us to add another analysis axis: the supervision practices that we did not initially intended to use.

Figure 22: Diagram of simultaneous interaction between Data & categories



The data analysis followed different steps that are listed and explained in the following section.

4.1. The different step followed during the data analysis process.

4.1.1. Organizing the data

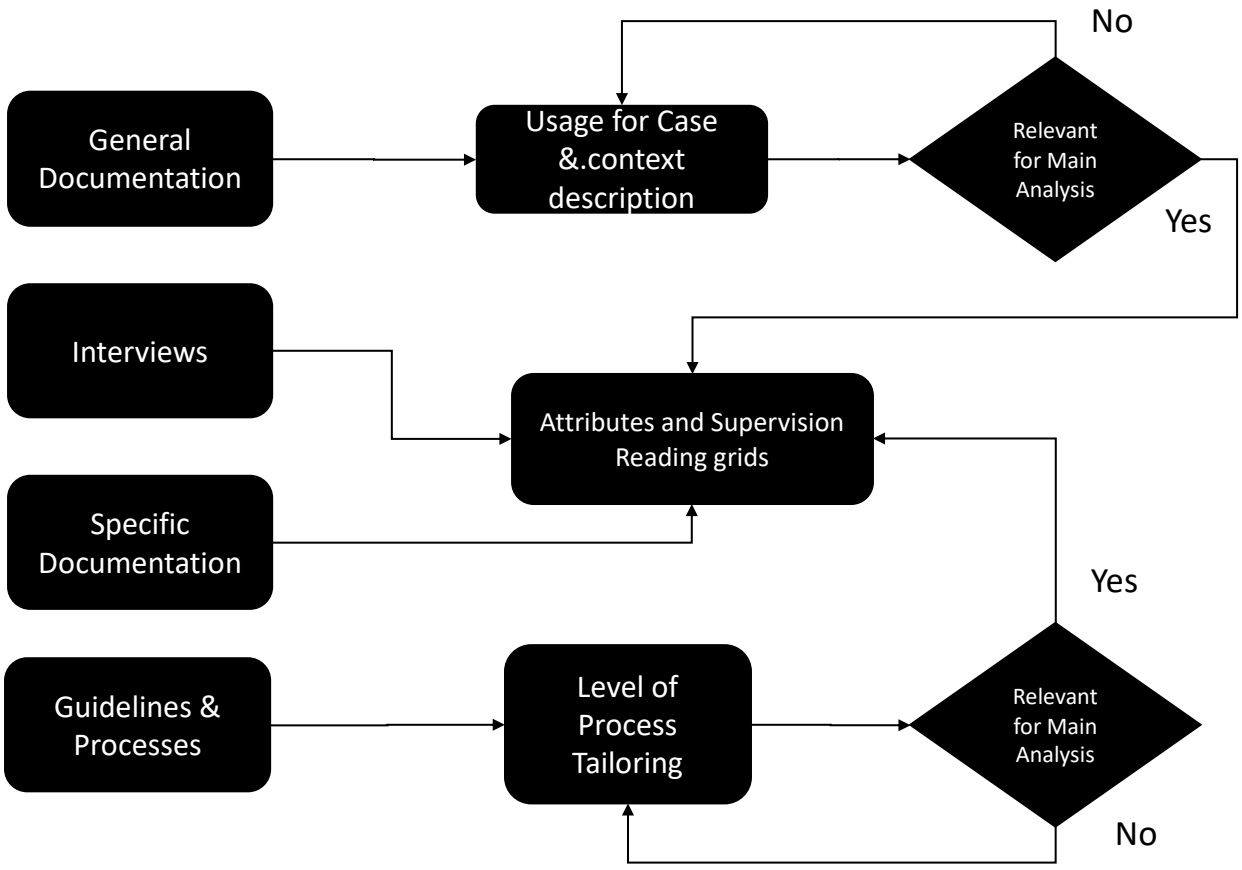
Organizing the data allowed me to review all data collected and to categorize them into 4 different source sof data as they were listed in the previous Section 3: "Data collection method" of the current chapter. The interviews, the project and units specific documentation, the general documentation and the Guidelines and Processes. This step is the only step that is common to the 4 different sources of data.

I first reviewed the general Documentation to conclude whether or not those data collected from this type of source should be integrated in the main data analysis. I did the same test for the data provided by the guidelines and processes. This testing process will be described in the following steps.

I then gathered the interview transcripts and the project & units specific documentation together to use and with the reading grids we define from our literature review.

The figure 23 presents the process of Data organization.

Figure 23: Testing Data from sources for usage in the Reading grids



4.1.2. Data from general Documentation Analysis

4.1.2.1. Step 1: Reviewing Documentation

This set of data has been mainly used to present the case, the units that were studied and the project that were selected for the research. For some of the general documentation, I collected them, read them, making annotation and highlighted the information I considered interesting to provide insightful understanding for the case and the different level of the embedded case (units or Projects) and their contextual environment.

For other documentation, I collected them while I was looking for a specific information related to the case that I was missing in the already collected set of documentation and I was considering important and relevant to share either in the case presentation (Section 2 of the current chapter)

During the redaction, I reviewed several time the documentation collected to gather data that would be used for the case presentation; the project or the unit presentation (Chapter 3: Methodology – case presentation). I also reviewed them when I was looking for information that would provide insightful context, status or environmental information of the project, unit or case studied (chapter 4 : “Findings”).

4.1.2.2. Step 2: Testing the relevance of data from the general documentation for the Case main analysis.

I did read those information a last time to ensure whether or not I would find relevant data to be used for the main data analysis using the reading grids I previously defined that will be presented in 4.1.3 of the current chapter.

All the documentation was for informative, for marketing or financial communication purpose therefore I couldn't find data that would be relevant to enlighten the operating model of the case and its associated projects. Therefore none of the data used for the main analysis were coming from the General documentation source.

4.1.3. Data from The Guidelines and Processes Analysis

4.1.3.1. Step 1: Reviewing Documentation

My first intent with all processes collected was to compare them between the different level of the organization. I did look at each document to check if the units or the project team made specific document or tailored some process or guidelines. The table 30 below summarize the analysis while providing the Main purpose of each document as per Group standard.

Table 30: Summary of processes analysis

Ref	Title	Group	FR	The K	The S.A.	The D-X	FR	WCC	The Car	The DML	Purpose
83450024-PRJ-NLD-EN	Project Management Plan Generic	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	PMP Generic Part template (incl. Project/Team charter).
87202784-PRJ-GRP-EN	Project efficiency instruction	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	This document outlines the techniques to measure and investigate ways to improve project efficiency. It gives guidelines to improve profitability on projects and also to reduce our negative variances as well as to increase opportunities on our profitability by an in-depth analysis of root causes and associated plans.
87211056-PRJ-GRP-EN	Managing Multi-Entity Projects	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	This document defines a set of Project Management rules which are applicable when a project requires the participation of several Business Entities (i.e. BL, Countries, Domains…).
87201466-PRJ-GRP-EN	Monitor and Control instruction	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	This instruction is to identify the areas of the Project that need to be monitored and controlled and how to manage variances to the Project Baseline
87201471-PRJ-GRP-EN	PMP Writing Instruction	X	G	M	M	M	G	G	G	G	The Project Management Plan (PMP) defines how the project is executed, monitored and controlled, and finally closed. The PMP content will vary depending upon the application area and complexity of the project. It is a living document which is progressively elaborated from the bid phase until project closure by updates through controlled and approved stages. The template in the attachment is typically listing the topics to be addressed for the PMP.
87201465-PRJ-GRP-EN	Project characterisation	X	G	G	G	G	G	G	M	G	This instruction describes the methodology to evaluate the characterisation of the Project in order to determine project tailoring and provide input for project classification.
87201254-PRJ-GRP-EN	Team Charter instruction	X	G	G	G	G	G	G	G	G	This instruction is to establish a document called "Team Charter" which is a written record of agreements about both the scope of the team's work and how it will go about accomplishing this work. The Charter acts as a living agreement among the team, its Senior Management, and other groups or individuals with whom the team interacts.
FP03_SP_30062017	Famille Professionnelle Management Offres & Projets (FP03)	X	N#A	N#A	N#A	N#A	N#A	N#A	N#A	N#A	
87206412-GOV-GRP-EN-006	Main Rules For Bids organization and approval. (MRBOA)	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	The present instruction defines the governance rules for bids organisation and approval, in the framework defined by the Thales General Organisation [1] and the Thales Operating Principles [2] memos. These rules provide a clear framework for decision making while ensuring empowerment and accountability at all levels of the Group.
87206413-GOV-GRP-EN-003	Main Rules For Projets Supervision (MRPS)	X	G	N#A	N#A	N#A	G	N#A	N#A	N#A	The present instruction defines the main rules for the supervision of project execution, in the framework defined by the [1] Thales General Organisation and the [2] Thales Operating Principles memos.
87208128-PRJ-GRP-EN	Tailoring instruction for Manage Project	X	N#A	N#A	N#A	N#A	N#A	N#A	N#A	N#A	The management of a project needs to perform all the activities described in the "Manage Project" process [R3]. This document provides a synthesis of tailoring rules to be applied to the Manage Project process according to the project category and taking into account the governance rules MRPS [R2] and MRBOA [R1]. Each Thales entity is free to add complementary instruction in order to define in more details the tailoring adapted to their specific business.

The bold **X** means that I was able to collect and review the process or guideline.

The G has 2 explanation

- Either the unit refers to the group standard in its own quality system meaning the unit did not write a specific or adapted process or guideline

- Either the unit or project team filled the blank of the generic Group process or guideline adding the identity of a given project but without changing the any wording of the process. In that case the group process or guideline have been used as a pure template.

The M means there should be such document but we couldn't find it. Either these documents actually do not exist or there are not easily accessible like the others.
The N#A means Not Applicable

4.1.3.2. Step 2: Testing the relevance of data from the general documentation for the Case main analysis.

Each of the process at any level were similar and no tailoring have been applied was already an instructive information for the case; therefore I decided to include the data coming for the Process and guidelines in the main analysis.
For the general documentation, the review data collected are very generic and not related directly to the purpose of the research. We used them mainly to build the case presentation and to bring some context in the findings.

4.1.4. Data from The Interview and The Specific documentation Analysis

4.1.4.1. Step 1 Interview transcript

All the interviews were recorded and were transcribed afterward within a week after the interview. To expedite the time consuming transcription process I subscribed and used Amberscript.com as a tool. I found the tool very easy to use, and it made me save a lot of time by an automated pre transcription that I was then able to improve by listening the interview. I have been helped for the first level of transcript and then I reviewed each of the transcript and I listened to each interview to fine tune the transcript and add or correct all technical, company or business words that were used and unknown from the automated transcript and from the first transcript review step. In the transcription phase, I tried to preserve as much as I can the words as they were pronounced by the Interviews.

4.1.4.2. Step 2 setting up the reading grids

When looking at the best way to assess the level of autonomy given to the project, the supervision practices in the units and the adequacy between those 2, I came to the conclusion that a good reading grids would be the re-use of the attributes framework that we created in the Literature review. Another analysis axis would be the assessing of the data through the Standardization & decoupling elements that we also reviewed in the Literature Review. The table 31 provide the

detail of the attributes and their definition, their properties and the definition of the property as well as a typical example of data such as verbatim that characterize the attribute and its property.

Table 31: Attributes Overview[41][42]

Attributes Definition	Property Definition	Example of Verbatim
Temporality	Definite	*"Most of our projects have a certain kind of temporality instantiation because we start at program and we stop a program."*
The Temporality attribute is the lifetime of the project as an organization. This temporality might be definite or Permanent	The Project organization is setup for à limited time period and will be dimantled once the project outcome has been executed	
	Permanent	*"No it's not fully set up only to deliver once something, because in most of the cases we also want to get something out of it for a longer time."*
	The project organization is maintained opened well above the initial outcome execution in order to execute subsequent outcomes	
Object	specific	*"So we have now a structure with our unique identified person allocated to the program. So we have now more focus but unfortunately in the software it's still a multi-task organization"*
The object attribute relates to the purpose of the project organization. Why the project organization has been set-up and how unique, specific is the project organization. The Set up of the organization can be Specific or Generic	The Project object is set up to answer adequalty and in the most efficient way to the specific needs of the proect in term of Project organization	
	Generic	*"but most of the projects, we have that same structure in place; at least as i'm aware."*
	The project organization that is set up is generic in the sense that it is applied to most project despite the specificity and adaptation the project may require	
Scope	Unique	*"there are some customer specifics which you will never reuse again"*
*Project scope: "The work performed to deliver a product, service, or result with the specified features and functions. The term project scope is sometimes viewed as including product scope" **	The scope of the expected outcome is unique in the sense that it has been design for this specific project answering to the specific requirements received and will most likely not be repeated in the future	
	Standard	*"Afterwards for me the right decision was to try to standardize all the products but that the project is not the right place to do it. it must be done upstream with a good roadmap a good product investment to develop."#*
	The scope of the project is the execution of à scope that as been already executed in the past and may present over or under compliance to the reauirement received	
Processes	specific	*"I can imagine it was the case, but I think that our organization here in the Netherlands is open for these kinds of tailored processes. If you have a good motivation, then I'm sure that they do not stick with the process... the tailored process is also acceptable."*
*Project Processes: "A process is a set of interrelated actions and activities performed to create a pre-specified product, service, or Result" **	À process is specific when it has been design and written for the all purpose of the current project execution	
	Standard	*"In terms of process, project management, in relation to the Thales process, we didn't do any Tayloring, we didn't even suggest that the project team do it, and they followed the Thales process as in most projects." #*
	À process is standard hen in has been written in à generic manner and is used for several differnet project executions. the process is not tailored to answer all project specific requirement and needs.	
Resources	Dedicated	*"So we have now a structure with our unique identified person allocated to the program"*
*"The members of the team who carry out the work of creating the project deliverables". **	The resources are dedicated when the resource are exclusively allocated to the given Project and won t be shared for another Project at the request of the parent org.	
	Shared	*"First of all,because we're sharing resources"*
	The unit has à pool of resources that are allocated based on each project need and the priority given to each Project by the parent organization	
Budget	Unlimited	*"That's why they took people from everywhere they didn't even look at the hourly rates, the budgets, nothing and in the end the EAC (estimate at completion) was blown up." #*
*"Determine Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline."**	The budget of the projec is not constraint by any specific request from the unit management.	
	Constrained	*" and there is the moment that the structural organization or the supervisory authority can decide to release for instance management contingency or whatsoever."*
	An initial budget is set up and closely monitored by the Project and the parent organization	
Schedule	Very basic	*"That is to say that at some point for the Carribean proect the guys want to keep the date and they are willing to make concessions. It's not a very contractual approach, so typically at some point. There was the WYD. Six months before the inauguration date, they asked us for an acceleration plan to get the Pope on the train" #*
*"The project schedule is an output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources. At a minimum, the project schedule includes a planned start date and planned finish date for each activity" **	The schedule is basic in the sense that it does not reflect à high level of detail for the project to be executed and does not show nor take into account any external dependencies that would influence the given Project plan	
	Tech. Convoluted	*"At least, at project level, you see that the schedule is not totally independent and it depends a lot from the workforce availability and from the rest of the schedule or the other projects "*
	The schedule provided present à descent level of detail and take into account potential dependencies external tro the Project that might therefore be impacted	
Quality	Stringent	*On WCC, the consultant of the final customer, they are challenging the design!!! It's been running for three years. What are you talking about the design? It's been running for three years, the end customer is happy. Why is that? Is it contractual? He's going to look for the third decimal place in the spec. (specifications) To show you that it's you who's not on time*
"*Quality requirements, which capture any condition or criteria needed to validate the successful completion of a project deliverable or fulfillment of other project requirements*." *	The quality is stringent meaning that the project and units are focusing on fulfilling à high quality level that is most of the time required in technical project such as the one that have been studied	
Execution Approach	Trial & Errors	*"because before the contract, before the effective the development was already started. And then in 2013 or 2014, I got involved in the project as responsible for the so-called engineering development model: some kind of container concept to start... as a risk mitigation"*
"*the phasing and relationship of activities within the project's life cycle*" *	The development team has the ability to explore several option in parralele in order to define the best solution for the expected outcome of the project.	
	Phased concurrent	*"that's the standard... and it's very defined within factory acceptance tests harbor acceptance tests, the sea qualifications,* *sea acceptance test. All these normal steps are all in place within this project. They started it, they made a list of schedules to deliver all according to chorus "*
	the developpment is stage and each step must be validated before starting the next ones	

[41] All definition in italic and finishing with * are coming from the PMBOK 2013 edition.
[42] All Verbatim followed by # are free translation from French using deepl.com

Supervision practices reading grid

The intent with this reading grid is to define and understand the monitoring and supervision practices that the different level of the organization are using to review, monitor and control the different projects under their responsibilities. I want to understand if the focus of the leadership team is project centric meaning looking at the project through the unique project prism or if the environment, the external factors surrounding the project are also looking at simultaneously when reviewing and supervising the project.

Table 32: Summary of the Supervision reading grid[43]

	Property	Example of Verbatim
Definition	Definition	
Supervision Practices	Project Centric	
By supervision practice we mean how project is monitored, evaluated by the leadership team. What are the instance in place to review project execution, decision are made or arbitrage are rendered.	A supervision that is project centric will be monitored only at project level through the project angle only; All issues, information are provided, monitored and decision are made using the prism of the Project. Litlle interest is given to the external environment or external dependencies to provide a better understanding of the porject context.	*"A dashboard with everything associated, Project Review by entity by BL and conso at the prime level with the GBU (Global Business Unit) and here I believe it is the Chorus process. "#*
	Unit Centric	
	Project is supervised at the unit level meaning that the parent company environment. Decision are made at the level that requires actions. At project level if need be but also at product level or at the parent organization level if the rootcause of the issue is idnetified at this level. Project view is not the primary view of the leadership team to monitor and supervise the project.	*I think what we are doing well here is that we look through different angles to the same topic. And by doing it from different angles, you get an opinion on where to improve on where you are. And I think in essence, the naval MT and myself, we are rarely really only looking at one project.*
	Group Supervision	
	I added this property to track for everyu Project what tools used to supervise the studied project. Depending on the size, the issues faced and their consequences the group might be involved in the project supervision of the given Project.	*"For both projects… for the South american and for the K project we had, for both of them, Internal audits and to be honest the way that the project approached the internal audit due to some management's hand let's say… We were not really encouraged to be completely transparent about it. So what we said to the auditors many times was kind of hot sugar on it for both projects and then, well, the conclusion from the internal audit were never followed up"*

Decoupling vs Standardization reading grid

"The projectification history was found to be connected with two parallel movements: a push towards project decoupling countered by a pull towards standardization of project management practices to tighten the coupling. The direction of the movements was influenced from current project management trends." (Bergman et al, 2013).

Measuring the level of standardization and the level of coupling of the project organization with the parent unit is one of analysis I wanted to pursue. A high level of standardization would characterize a tight level of coupling between the 2 organization. To do so I analyzed the data looking for each attributes at the tension created by those two antinomic and simultaneous movements that Bergman et al. are referring to.

[43] All Verbatim followed by # are free translation from French using deepl.com

Table 33: Standardization vs decoupling reading grid

Standardization vs decoupling Definition	Example of Verbatim
Decoupling the level of coupling between 2 organization measure the level if integration and the level of autonomy that the parent unit is willing to give to the project organization	*"I think there's much more autonomy to structure the project of one offs than when you develop or work on the own series contract "* *"We can tailor it and it's the flexibility. There was never a fight regarding tailoring. If you can explain the reason why you want to tailor, because there is a dedicated situation, there was never a fight on that."*
Standardization the standardization is the process of implementing and impozing à set of rules defined through consensus that the project team will have to apply all along the project execution.	*"when I said: "I deal with it in a different way", then everybody popped up and said "no no no we have to follow the process".*

4.1.4.3. Step 3 Nvivo

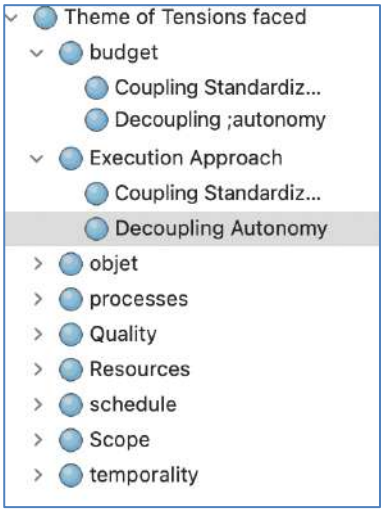
In Order to help me, in the coding process I used the NVivo 12 Software. Not being familiar with such tool I had to experiment it up front in order the master the very basic of the tool. I used it very basically, by creating nodes and sub nodes that I used thereafter to code the data I uploaded in the tool.

The figure 24 is an screenshot of the nodes in Nvivo that translate the reading grid related to the attributes. This nodes has been used to allocate verbatim in the different attributes and properties.

Figure 24: Coding the attributes

The coupling standardization phenomenon has been created in Nvivo as described in the Figure 25 below. Following the same process, data have been allocated to the specific properties when identified as relevant.

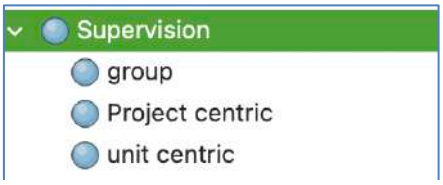
Figure 25: Coding the Tensions



Finally, the nodes that represent the supervision practices have been set up in Nvivo as presented in the Figure 26 below.

For the supervision, I identified in the data when the supervision was project centric meaning the main focus was the project and all information shared were through the project angle or if the supervision was more either at portfolio level or unit level and that environment of the project are also taken into account in the supervision practices. Product policy status, global resources status are some example of more global topic that can be looked at when supervising a specific project.

Figure 26: coding the supervision



4.1.4.4. Step 5 Data analysis

Once I defined my reading grid, in our case built in our literature review, I defined 3 different level of analysis the first level is at project level, the intra unit analysis. I used the data to characterize for each project the property towards each attributes in one end and also characterize the supervision practices for each project on the other end. For each project I then draw some conclusion related to the adequacy of the supervision practices and the level of autonomy left by the parent unit to the project team and the project organization.

Once achieved the first level, I analyzed a level up and compared the 3 projects towards their attributes characterization and the supervision practices applied for each of them looking at patterns, commonalities or differences to draw some conclusion at unit level on the adequacy of the supervision practices with the level of coupling left by the unit to the project organization.
Finally, I did compare the 2 units to draw some conclusions at the case level on whether or not we could see some commonalities of practices at the case level.
Each of those analysis are described in the following part of the document below.

Intra unit analysis

The intra unit analysis consists of analyzing each project individually. Even though the methodology that consist at extracting from the data partial fragment and code them in all and any category it would fall, it is interesting to mention and explain the process from the data source standpoint.

The process and guidelines

For the process and Guidelines, I reviewed them primarily looking at some tailored nuances that might translate in a different level of coupling to the parent units. I a Preliminary analysis (refer to table 31 p 168) showed that the process and guideline were very much standard but I want ed to insurance that no tailoring was embedded that could lead to different interpretation with regards to the coupling level of the project organization.

The Project specific documentation

For the project specific document such as the dashboard, I primarily focus on findings references to the external environment of the project. I was interested in assessing how the project team is embedding the external environment, the unit context, the product policy or resources context in their project management practices and reporting practices. I also focused on determining the level of standardization of the document collected. Is the dashboard totally standard, what is the level of tailoring that the project team used.

Interviews

Finally I coded the data collected from the interview towards the attribute frameworks the supervising practices. In the transcript I identified all data related to the attributes and the supervision practices using the reading grids we described earlier.

Conclusion

After the analysis of all data, we were able to present a conclusion on the supervision practices used by the units to monitor and supervise each of the project.

We were able to conclude whether the supervision was project centric meaning that the prism of the project was the primarily prism to review the project or if the supervision was more unit centric and would review at the same time, the external contextual topics such as product development, resources availability etc etc.

We were also able to conclude on the positioning of the project whether the project would be aligned with the characterization of the project definition and therefore showing a higher level of decoupling or the project would be aligned with the current project paradigm characterization and therefore demonstrating a tighter level of coupling with the parent organization. The conclusion has been presented at the end using the following template. (table 34)

Table 34: template of Project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The project
Temporality	Temporary	Permanent	
Object	Specific	Generic	
Scope	Unique	Standard	
Processes	Specific	Standard	
Resources	Dedicated	shared	
Budget	Not limited	Constrained	
Schedule	Basic	Technically convoluted	
Quality	Stringent	Stringent	
Approach	Trial & Errors	Phased Concurrent	

Intra unit inter-project analysis

For this second level of analysis I compared the supervision practices of the unit with the level of coupling of the project organization and the unit. Such level of coupling being the outcome of the project analysis we conducted at intra unit level.. This allowed me to bring out commonalities within the unit and patterns that did help to characterize the unit itself vis a vis the level of coupling with its different project organizations. I was also able to draw some conclusion at unit level in regard to the supervision practices used by the unit to monitor and review their projects. The table 35 represents the template use to summarize the characterization of each unit and its comparison with the project definition characterization and the project paradigm characterization. I was then able to conclude for each unit on their level of coupling with their respective project.

Table 35: unit characterization Grid

	Definition 1930's-**2010's**	Paradigm 00's-10's	The Unit
Temporality	Temporary	Permanent	
Object	specific	Generic	
Scope	Unique	Standard	
Processes	Specific	Standard	
Resources	Dedicated	shared	
Budget	Not limited	Constrained	
Schedule	Basic	Technically convoluted	
Quality	Stringent	Stringent	
Approach	Trial & Errors	Phased Concurrent	

Inter unit analysis

Finally, the third analysis level consisted of 2 folds.

First comparing the top unit once again from a characterization towards attributes stand point which allowed me to conclude on the level of coupling the group and its units leave to their project organizations.

More importantly I analyzed the supervision practices between the two units. I was then able to search for commonalties of practices in the supervision methods and to conclude at the case level. From this analysis I concluded on the adequacy between the leadership teams of the units were supervising projects and the level of coupling of the project organization with their parent organization.

Table 36: Unit comparison towards attributes

	Definition 1930's-**2010's**	Paradigm 00's-10's	The Dutch Unit	The French Unit
Temporality	Temporary	Permanent		
Object	specific	Generic		
Scope	Unique	Standard		
Processes	Specific	Standard		
Resources	Dedicated	shared		
Budget	Not limited	Constrained		
Schedule	Basic	Technically convoluted		
Quality	Stringent	Stringent		
Approach	Trial & Errors	Phased Concurrent		

From the analysis process I just described in this section, I was able to provide some results to the earlier raised question on the adequacy of the supervision practices and the level of coupling between the parent organization and the project organizations. This is those results that I am presenting in the next chapter.

CHAPTER 4 : FINDINGS

In this chapter we will present our empirical findings following a four steps approach. In the first steps we will analyze and present our findings for each project towards the standardization vs decoupling dilemma. To do so, we reviewed all interviews and assessed the level of coupling of the project vs its parent unit as well as the level of standardization we can identified applying the same attribute analysis we conducted in chapter 2 of this research. In this first steps we will also elaborate for each project how the unit was supervising this specific project.

In the second step, we are presenting a comparison of the projects within the same unit. We present the commonalities, the similar pattern noticed between projects. We also characterize the problems faced during project execution towards their uniqueness or specificity to the project itself vs the externality of the problem's source. In other words, are the problem faced inherent to the project environment only or if external factors are driving the problems faced. We will then Compare the level of commonalities between projects, the level of coupling between the projects and the parent unit and the supervising tools used by the unit to monitor those projects. This will enable us to present an assessment of the level of adequacy between the projects difficulties and the supervision tools and method used by the unit. When the inadequacy of supervising practices and the problems the projects faced will be demonstrated, we will present the consequences of such inadequacy from a project management standpoint as well as from a unit management standpoint.

In the third part of this chapter, we will compare the two unit of the case. We will present in both units how the project are tightly coupled with their organization and what are the supervision monitoring practices. We will therefore present how one unit tried to reduce the inadequacy between their project supervision practices and the high level of standardization of their projects while the second unit apply the group supervision instruction despite this noticeable inadequacy.

We will then present how the supervisors denying of this inadequacy drive management bias and impact negatively projects execution or project recovery when issue arise

1. INTRA-PROJECT ANALYSIS

For most of the projects identified, it appears that some of the attributes were of greater importance than others over the proposed list of attributes. I will therefore concentrate on the ones that were the most discussed and summarize my overall understanding of the positioning on Decoupling/Standardization dilemma for the less discussed attributes.

1.1. The WCC Project

1.1.1. The positioning of the WCC project towards the decoupling/standardization attributes

At the time of the study, the WCC project is up and running. It encounters significant execution issues that are mainly related to the project environment from a customer and country standpoint as well as from internal decision related to product policy and portfolio management.

The WCC project is a green field project meaning the tramway line is a brand new line that is mostly driven by the construction work. The final customer subcontracted the overall project management and coordination to a civil engineering firm. The layer between the final customer and Thales is driving some complexity. The contractual term is also driving some difficulties as the contract is a Yellow FIDIC contract. Yellow FIDIC contract are mostly very well suited for construction activities but are bringing complexity when it relates to system integration contract. The Change order management is challenging for system project in a FIDIC environment.

The analysis of the 9 attributes for the WCC contract is described below:

1.1.1.1. Temporality

At the time of the study, the temporality of the project is not a topic for the project team. In fact when asked they consider the project temporality linked to the contractual term of the project. The project starts at T0 which is the contractual entry into force of the project. On the other end, the maintenance period that was initially contracted has been descoped by the customer. This could have led potentially some questioning of the project temporality but after such descoping the temporality is quite clear to the project team. The project started a the contractual T0 and will end after the warranty period. The project manager considers it as very straightforward.

From a unit standpoint the temporality attribute is not also really questioned. The unit follows the group standards in term of project management and the starting date of the project is aligned with the T0 of the contract. The group and therefore the unit, considers the Launch Review as the transitioning milestone from the Bid status to the project status and the transition step from the Bid

team to the project team. Anything prior to the Launch review relates to the Bid phase while anything after the launch review will be part of the project.

1.1.1.2. Object

The project is composed of some activities in France, the Offshore part and some activities in the destination country: The onshore part. The onshore part, is in charge of the on-site activities and project coordination with other contractors and the civil engineering firm as well as the overall Project Management responsibility. The reason for localizing the overall project responsibility in the destination country is obviously related to the willingness to better coordinate and better communicate with the different layer of the customers while increasing the speed of decision process.

Despite the fact that the main technical risks and problems the project was facing are located in Europe (France and to a lesser extent in Portugal) the Project management role was maintained in the destination country. The choice of not changing from group recommendation was in fact counterproductive to the project execution. The project manager was unable to commit to the customer to any deadline or technical choices before clarifying with France therefore translation real Project management responsibilities to France.

From an object attribute standpoint, it is very clear that the unit applied the Group and unit standard with no deviation recommended for export contract with a minimal organization onshore and most of the team offshore. There is a Work Breakdown structure defined that the unit apply on both team, the offshore one and the onshore one.

From an Object perspective we can conclude that the organization that was set-up for the WCC project was very standardized and in line with the unit and the Group recommendations.

1.1.1.3. Scope

The contractual scope of the project is the installation of an integrated Control and communication system for the 4 lines of the Tram as well as for the Operational Control Center and the Back-up Operational Center. (Control center that can take over the lines supervisions if anything goes wrong with the Prime Operational Control Center.

At the time of the Project, The business Line is reinforcing a product policy and nominated French to lead the Integration of all Control & Communication components of the Business Line into a unique product called Thales ICSS. the French unit is responsible to integrate all the components as well as to develop the upper layer that will integrates all the bricks or sub-product (SCADA, PIS PAS etc etc). The project being a Light Rail Transit (LRT), technical term for a Tram, the

ICSS requirement is somehow basic and is estimated to be fully aligned with the initial Product policy features. As already mentioned; the project is parallel to another project, The DML project, in the same country. The second project is also part of this study and is related to the delivery of 3 metro lines. The technical requirements and the complexity related to metro lines vs LRT lines is considered largely above.

The Difficulties and the schedule issues faced by the DML project are such that the Business Line and the French unit, decided to change their product policy in order to embed a much complex integrated Control and communication system, than initially envisaged. At the origin, the Product was planned to be develop with a level of complexity and a number of features that would feat with LRT requirement and all the specific complex technical requirements necessary of the DML project would be developed as project specific. This will be further explained in the review of the DML project but the consequences from a scope standpoint for the WCC project were significant. The WCC would therefore benefit to a much stronger, much complex system that was not contractually required but imposed by the product policy change made by the business line and the French unit. This led obviously to schedule impact that will be further explained in the schedule attribute analysis.

From a Scope stand point, we can conclude that initially the intend was the delivery of a standard product aligned with contractual requirements and that at the end the contractual scope did not change, but the product delivered was oversized for an LRT project. We can therefore conclude of the strong standardization of the scope delivered to the project and that external factors drove the choice of the product delivered more than the customer or contractual requirements.

1.1.1.4. Processes

For this Project in particular but overall for all French projects, the Group processes are not questioned. They are part of the environment, and the unit is following them. The project dashboard is filled by the team, The Project team chart, the Project Management plan and all other documentations are done using the group standards. No one highlighted the need of adjusting or having some flexibility on the processes. One of the Interviews also mentioned that the process were written in a way that you could have enough flexibility could be use without any need of adaptation. *" *Basically, Project WCC is very simple from a project management point of view and the group's processes are sufficient and well adapted to manage this kind of project "* [44] (Interview#12)

[44] In this chapter all verbatims starting with a bold * are free translation fro, French to English using Deepl.com

The French unit is belonging to a larger unit with a main focus on Defense activities. We definitively feel it when talking to the team and as supervisor, I very often felt the weight of the mother unit was strong and the powerful when decisions had to be made.

As a summary, For the WCC, the process used to manage the project were the group's recommended one and the project did not require any specific adjustment to those standards. "**Well, in terms of process, project management, in relation to the Thales process, we didn't do any Tayloring, we didn't even suggest that the project team do it, and there they followed the Thales process as in most other projects"* (Interview # 13)

1.1.1.5. Resources

For the WCC project, few resources onshore (in the country of project execution) were fully dedicated to the project but for the offshore unit, there was no resources fully dedicated to the project the offshore unit team project manager was also in charge of the offshore part of the DML project and the Project controller was also dedicated to several projects of which the WCC and the DML project.

For the WCC project, the resources have been a continuous issue all along the project life in the offshore unit as well as in the onshore unit. The project was totally dependent on the progress made by the DML project which was the top priority for the unit, for the Business line and the GBU. *"* Well we GBU, our problem is DML and for the others (projects) it is necessary to manage to avoid, to reduce the risks but priority.., we do not touch DML* " (Interview # 13)

Once the DML project faced installation issue, the WCC had to provide his own installation team to support the DML schedule. On the offshore side, which is the unit studied, the priority and resource allocation was driven by the DML project. All resources of the unit were focusing on the DML issue resolution. "**On the contrary, the DML project, it has absorbed all the resources of the unit and therefore on WCC they have suffered and suffered from this lack of resources of priorities we always privileged DML, always, DML*" (Interview # 12)

From a resource standpoint the analysis shows that the project has not been autonomous. The project was under severe resources tension due to prioritization given to the DML project. The project team well integrated the GBU instructions and did not react negatively to the project. One of the Interview considered the DML project in some instance help the WCC execution that could have been worse from a technical and execution stand point. A lot of issue were identified and resolved on the DML project and somehow facilitated the WCC project execution… Another evidence of the inter-play between projects… "* *Nevertheless, WCC has benefited from this, it has not had the extra costs, I mean, when we developed the solution and wiped the slate clean on DML*

with a lot of money. That benefited WCC a lot. So if it hadn't happened on DML, what would it have been like on WCC? " (Interview # 12)

As a conclusion, in relation to the attribute categorization, we can conclude that on the WCC project the resources were shared.

1.1.1.6. Budget/ Schedule/ Quality

From a quality standpoint, there was High quality expectation when delivering the WCC project. The first reason is that it is part of the unit DNA as well as the group DNA to deliver project with High quality standard. The second reason is the region of the project execution. The Middle east region is ready to pay as long as the level of delivery is at the highest standard and that they can reference themselves as worldwide reference. This was the case for the WCC project *"WCC tram will soon become the main transportation hub for our visionary City, the largest single sustainable development to be undertaken in our State* " [45]

The third reason is due to the contractual frame. The project was under the supervision of a third party. This 3rd party was a "civil engineering firm" with very limited knowledge in system delivery. It ended up with a very contractual relationship and strict application of contractual requirement. This led to high quality standard in the project execution and delivery. "***On WCC, with the direct customer, they are challenging the design! It's been running for three years. What are you talking about the design? It's been running for three years, the end customer is happy. Why is that? Is it a contract? He'll look for the third decimal place in the specifications to show you that you're not on time.*** *"* (Interview #12)

In term of schedule, the analysis demonstrate the strong inter-dependency between projects and more specifically with the DML project (cf. p 195). "***Francois*** *: ***** So there was a real interdependence between all the projects, that is to say that the staffing was reduced on the other projects to give priority to DML and there was a real impact on the other projets*

- Interview #13 *: absolutely, but we were well aware of it".*

THE WCC also suffered from customer delay as the project was a brand new project, the civil company also generated delays to the project. " ***Francois:** *If WWC had had these good resources it would not have taken so much delay for example it could have been delivered more quickly?*

- Interview #13 : *WWC no, perhaps in the software part but the delays WWC they are not only product, we had delays from customer as well " (*(Interview #13)

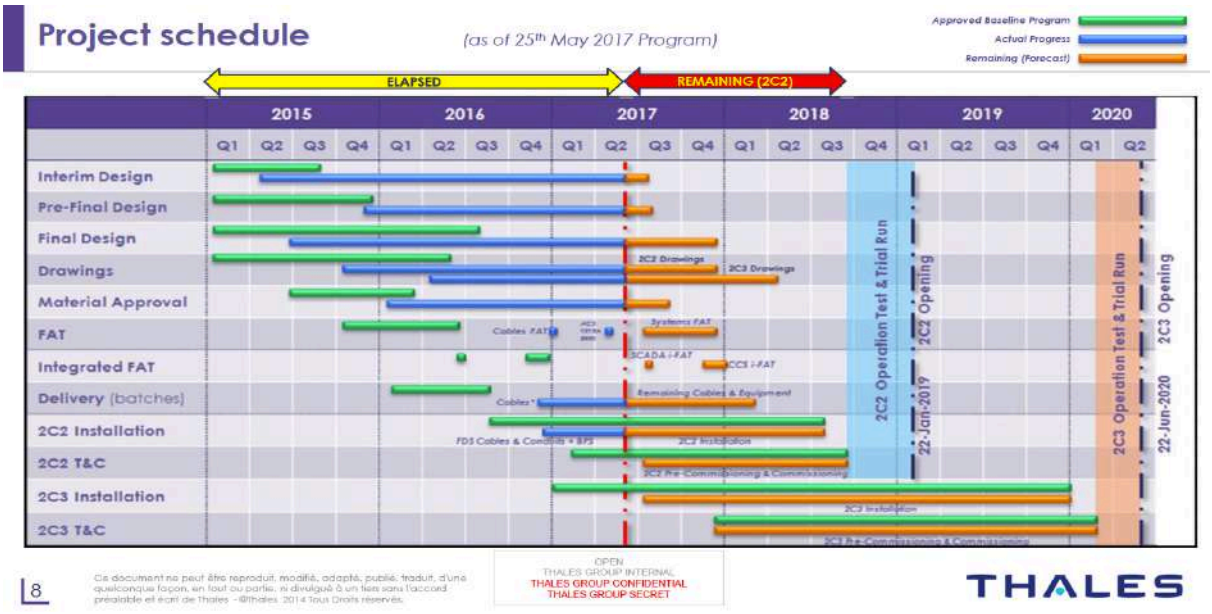
[45] Source official city website

For the WCC, once again, the DML project was the big driver. As mentioned earlier, it saved some money on the WCC project . "***** *So if it hadn't happened on DML, what would it have been like on WWC? I think we would have seen the bill too. "(Interview # 12).* " (Interview # 12)
but also drove a lot of Schedule impact and execution issues and a clear lack of project execution optimization. *"* I don't think I'm saying that the budget was imposed, but rules were imposed that prevented them from controlling their budgets and their ability to deliver."* (Interview # 13)
As a conclusion of my analysis, the Quality attribute is qualified as Stringent, the schedule is Technically convoluted and strongly dependent to the outside environment and the budget is driven by external decision leaving little autonomy to the project team.

1.1.1.7. Approach

The WCC project is not a development project. A product solution will be delivered therefore there is very limited engineering development effort. The main engineering activity on the WCC was integration work and interface definition as despite of the delivery of a standard product the system is interfacing with other system that were or were not the same as the DML project or the Carribean Project. "*****WWC benefits a lot, a lot from DML because the software versions are exactly the same, the functionalities are almost identical, there are things that change because we have third parties that are different so the interfaces change but overall the system is the same" (Interview # 13).
Nevertheless, the execution approach is aligned with group principles and a phased approach has been set up to execute the project.
The following figure 27 presents the general schedule of the project showing the different phases identified for the project execution.

Figure 27: WWC Milestones schedules



1.1.2. Reporting supervision structure

The WCC project strictly followed the Group standards and recommendation. Project Review have been organized on a monthly basis and the Project dashboard was filled and use to review the project.

Nevertheless, the supervision level and the level of authority of the WCC project changed over time. The project monitoring and supervision can be defined in 2 different phases. The first one being the quiet phase before all the problems arose and the second one, the storm one, when all technical, schedule and product issues were identified.

In the first phase of the project that corresponds to the initial phase of the project execution, the level of supervision was kept at the unit level and mainly sub delegated to the project team. There was a combined review with the attendance of all project teams involved in the project. Project director being located in the country of project delivery, the onshore and offshore projects are review simultaneously by the project team. The project management team is quite senior therefore, little attention is given to the project by the unit managements and even less by the Business line. There is potential technical risks but the unit considers them as manageable and very little focus is made to those risk during the project reviews. The project is overall rated as not too complex.

The project team is mostly suffering and complaining about the lack of resources they are facing due to the growing DML project issues.

In the second phase of the program that coincides with the growing difficulties of the project itself as well as the growing difficulties of the DML project, the supervision layer is escalated first at the unit level and very shortly after to the Business Line. The Project Review is now organized with the attendance of the Business Line head and the Business Line management team. Schedule, technical and financial issues are now overseen by the BL management. The project is also reviewed on a quarterly basis by the GBU.

During the second phase as well as during the first one, the project is looked at using the group standard format and is looked at a standalone project. Issue and problems are looked in the frame of the project even though some of those problems are inherent to the project environment. The environment is taken as a given and solution are looked at within the project framework. the environment is looked as an input to the project and joint solution or joint mitigation are not looked at.

So from a reporting and supervision standpoint the monitoring of the WCC is project centric as recommended by the group.

1.1.3. Conclusion

When looking at the 9 attributes, the analysis shows the WCC project is well aligned with the current project paradigm. There is a strong coupling between the project organization and the mother unit. The project organization has very little autonomy for two main reasons. The Project leadership is based in the country of delivery so the Project organization is seen has a subset of the Project organization implemented in the onshore unit.
The second reason is that due to the complex environment, the difficulties faced from a product standpoint and the priority given to the DML Project, the project team has very little autonomy to execute and manage the onshore part of the project.

Most of the attribute categorization shows the tight coupling of the WCC project with its mother units. The resources sharing and the difficulties encountered due to the DML project the product to be delivered that is common to the other projects studied, the project organization itself that is aligned with all export project shows the little autonomy left to the project organization.

The overall analysis of the project using the 9 attribute framework is summarized thereafter (table 37) the project is fully aligned with the current project paradigm being standardized long lasting project organization tightly coupled to its parent unit.

Table 37: The WWC project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WCC projet
Temporality	Temporary	Permanent	Permanent
Object	Specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

From a monitoring and supervision stand point, the analysis also demonstrates the inadequacy between the supervision mode of the project and the level of autonomy & decoupling between the project and its mother unit. The coupling is very tight leading to very little autonomy left to the project. While the environment is taken as an input like other input for the project execution, all

actions, and problem solving are project focus. BY focusing the monitoring at the project level, the unit and the business unit which I was part of, did not address the problem at the right level. Instead of taking the environment as an input, the unit should have tried to influence or solve the issues within the project environment itself. This is also recognized by the Business line management. They highlight the importance of the project reviews ; "***** *For me, I believe that the project review is essential, but on the other hand, I think that today this project review is misused, because for me in the project review, what is important is that the dashboard is up to date, because it's mainly a tool for the team to monitor the progress of the project, to have all the information they need to manage the project, but after the project review, it should only be a point of presentation to share the status of the project, not more than that."* (Interview#12) but also underline the lack of portfolio management. "*****I think that portfolio visibility is missing and at the BL level we don't do it and I think that at the country level they don't do it either We always look at a project in silo I think that the portfolio review can lead to reduce the tension between projects or to identify a problem common to everyone either in terms of resources, skills, we can find a product that is supported by the same person but for different projects at the same time" (Interview#12)

1.2. The Caribbean Project

1.2.1. The positioning of the Caribbean project towards the decoupling/standardization attributes

The Caribbean project is related to a new metro line after the successful delivery of a first line few years back. The scope is quite the same as the first project but the Command and control system to be provided is up to the latest standard and the new line will benefit from the last company's product developed for the DML project and the WCC project as well. The relationship with the customer is good. The visit of the pope is the only "political constraint" the company will have to care about. The customer wants to inaugurate before Pope's visit and want to have to pope into this new metro line.

1.2.1.1. Temporality

At the time of the study, the temporality is not a question for the unit. The project starts at the contractual start of the project and will end after the warranty period planned initially in 2021. Like any other unit's project, we create a project organization at the T0 of the project that will be

close after the last delivery of the contractual commitments which are very often the warranty period. This is as per the unit standard as well as the group standard.
Nevertheless, the interesting part is that along the life of the project the scope changed over time and evolved including others contracts related to an extension, to the maintenance of the second line but also to the maintenance of the first line. The project organization has been therefore extended and the temporality in this context has been somehow relative. From a project with a precise beginning and end date, the project organization evolve over time and was extended to cover additional contracts and additional activities. All activities being not directly linked to the original scope but to the transportation activities of the unit in the destination country.

The extension of the life of the project organization and the integration of new contractual commitments over time, demonstration the permanent status of the Caribbean project organization. As demonstrated with figure 27 and 28, the project is nevertheless reviewed as a single project carrying the early stage of the second line implementation. The unit did not deem necessary to create different project organization with a define life limit. The fact that the maintenance is added to the "construction part" is surprising as maintenance does not require the same project organization nor the same teams to deliver. Most of the time those are very different activities that are manage separately. This reinforce the permanence status of the organization where we keep the same organization, along the extension of the activity in the destination country.

Figure 28: Extract of Project Dashboard Oct 2017 – scope of the project

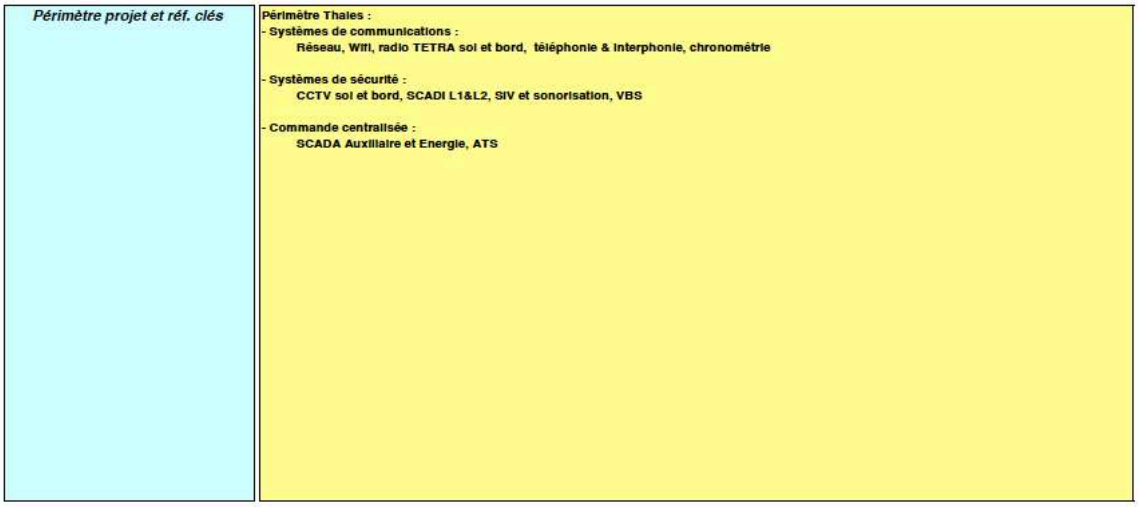
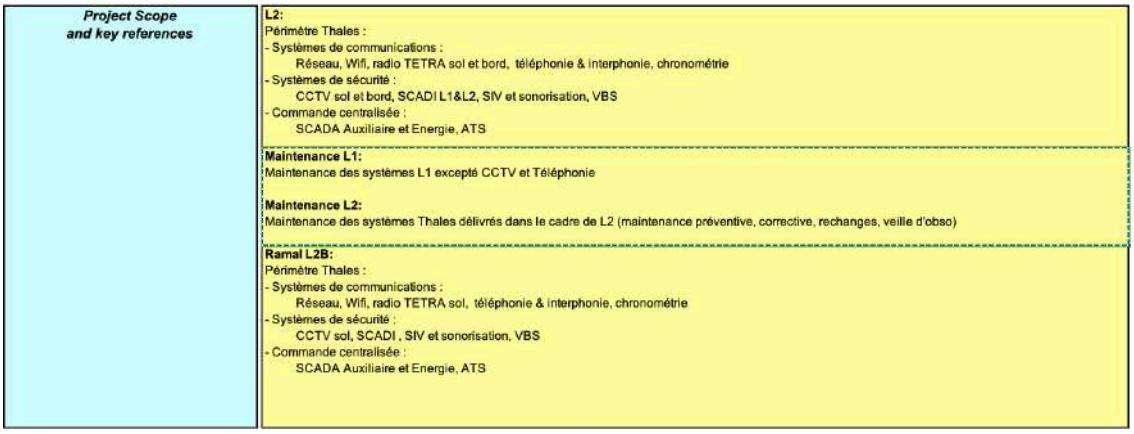


Figure 29: Extract of Project Dashboard sept 2021 – scope of the project



Project Scope and key references	L2: Périmètre Thales : - Systèmes de communications : Réseau, Wifi, radio TETRA sol et bord, téléphonie & interphonie, chronométrie - Systèmes de sécurité : CCTV sol et bord, SCADI L1&L2, SIV et sonorisation, VBS - Commande centralisée : SCADA Auxiliaire et Energie, ATS
	Maintenance L1: Maintenance des systèmes L1 excepté CCTV et Téléphonie **Maintenance L2:** Maintenance des systèmes Thales délivrés dans le cadre de L2 (maintenance préventive, corrective, rechanges, veille d'obso)
	Ramal L2B: Périmètre Thales : - Systèmes de communications : Réseau, Wifi, radio TETRA sol, téléphonie & interphonie, chronométrie - Systèmes de sécurité : CCTV sol, SCADI , SIV et sonorisation, VBS - Commande centralisée : SCADA Auxiliaire et Energie, ATS

This extension of the project extension lifetime is interesting and confirm my own vision of project organization where normally we stick to the contractual timeframe while in my view the project should be seen as a much longer timeline including the bid preparation and the aftermarket activity. When I discuss the temporality topic explaining we were in a kind of project factory were project team were delivering one project after the other using the same standardized organization; with one of the Interview, he understood my view but was struggling with the term permanent. "**I agree. Yeah, yeah, yeah. Yeah, so. If you want, that's the thing. Permanent, it seems to me anyway.... It's recurring projects actually I would call it recurring* " (Interview #12) He preferred the term recurring instead

1.2.1.2. Object

" **And above all, we had done a line 1 with the same client. The engineer had changed, but the same client and the same consortium*

-It was a bit of a repetition? ....

-exactly, it was copy and paste " (Interview #12)

" **The Caribbean project .... took advantage of the fact that it was not the first project with the same client, we already knew each other and we were able to do many more things in the design here in France and to do only the deployment on site, because we had the experience of working together, the knowledge, the maturity and the trust between both parties.*" (Interview #13)

In the case of the Caribbean project, one of the Interview did confirm the generic component of the project organization arguing it was a cut & paste of the first metro line. The organization was composed of an onshore part and an offshore part as it was for the WCC and the DML project. The organization set-up was the one used for the first metro line similar to the initial ones set up for the DMC and the WCC projects . The only difference that gave more autonomy to the project team but more importantly to the unit was the fact that Thales does not have a representative office

there and the unit had to create a permanent establishment from a tax stand point in the country which is the legal extension of the unit in this Caribbean country. Not having to negotiate with the country organization and not being dependent on their in-country strategy gave a lot more autonomy to the unit.
Referring to the Figure 27 & 28 above, the additional contract that have been added to the Project confirm the genericity of the project object. A line extension has been added and more interestingly 2 maintenance have also been added of which one is related to the first Metro line.
In the Caribbean case, we conclude of the generic status pour the project object.

1.2.1.3. Scope

The Caribbean project is a very good example of the Product/project dilemma and the standardization trend I want to demonstrate. There are two main rationales to categorize the Caribbean project scope as standard.
As previously mentioned, initially the project is the second metro line to be installed in the country and the project team as well as the unit management is clearly looking at the Caribbean project as a repeat order and in that sense we can categorize the project scope as standardized. The intent is to deliver a second line that is similar to the first one, within the same consortium and the same partners.
Time and technology evolving, the command and control system that will finally be installed is different from the first Metro line but interestingly enough is the one developed for the DML project and the WCC project. This System is over engineered for the technical requirement of the Caribbean project but the unit considered that developing at first a high end product that would answer the DML project requirement could then be used as the standard product for any new project. "***** *Yes, for example we can see today that projects like DANHAI, SYDNEY or even the Caribbean project have taken advantage of the standardization that was done for the DML project ...../.... No, the Caribbean project takes advantage of the versions, but it's like the other projects, the functionalities are much smaller, but they take the body of the development of each product that was done for the DML project and with that they meet practically all the requirements, which is quite incredible. In fact, we did very little development there* " (Interview #13)

Once again, we conclude that the scope of the project is not unique and is mainly related to the delivery of a standard project. The Unit considered that an overengineered project would fit all needs and decided to avoid any specific development. The strategy is not questionable or at least this is not my intent but from a pure project attribute analysis, the scope of the Caribbean project is definitively not unique but standardized.

1.2.1.4. Processes

The process are not questioned within the French unit. Groups processes and standard are applied and seldomly customized. From a supervisor standpoint, I had very little visibility on the project as there was no alarming criteria that would have required the Business Line involvement. During the interview, nothing was said on the process apart that Thales process were followed. The project was reviewed once a month by the unit management. and the project dashboard was maintained according to the group guidelines. This is confirmed by the Dashboard who monitors the reviews held by the unit. (figure 29)

Figure 30: Reviews follow-up

DECISIONS de CARACTERISATION du PROJET

Evenement Projet	Date	Catégorie du projet	Supervisory Authority
Revue de Transition	15-Nov-2015	A2	SFI
Revue de Lancement	22-Jan-2016	A2	SFI

CALENDRIER des REVUES de PROJET

Nr	Niveau de revue	Planifié	Réalisé
01	BL/SFI	21-Feb-2017	21-Feb-2017
02	BL/SFI	28-Mar-2017	Non réalisé
03	BL/SFI	28-Apr-2017	28-Apr-2017
04	BL/SFI	16-May-2017	16-May-2017
05	BL/SFI	15-Jun-2017	30-Jun-2017
06	BL/SFI	10-Jul-2017	Tableau de bord remis le 28/07/2017
07	BL/SFI	19-Sep-2017	25-Sep-2017
08	BL/SFI	10-Oct-2017	

Extract from project Dashboard October 2017

In the same dashboard, we note the project has been one the selected project for an ISO audit which concluded of the no action no issue were noticed. (figure 30)

Figure 31: Quality extract from project dashboard Oct 2017.

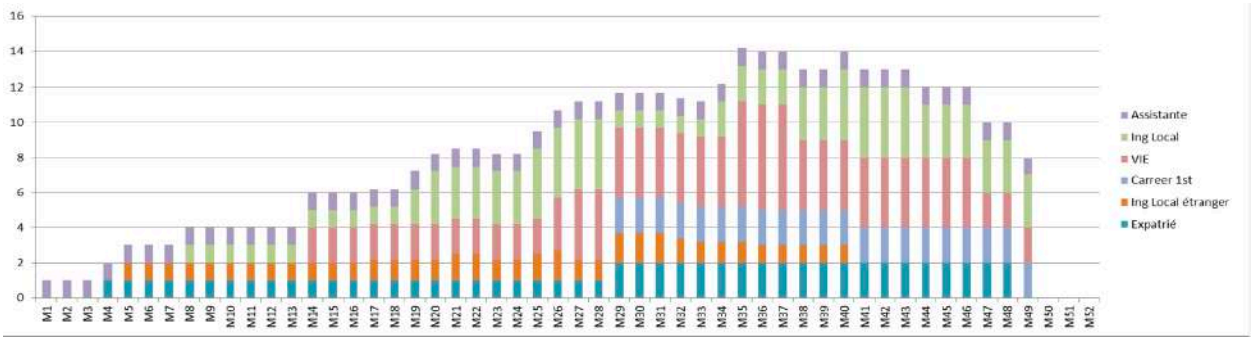
We conclude that for the Caribbean project, the process were applied and fully aligned with Group and unit recommendations and guidelines.

1.2.1.5. Resources

On the resource side, we distinguish between the onshore part of the project and the onshore part of the project. The onshore organization is a legal extension of the French unit so it is part of the scope studied. In country, there is only one team that is delivering both project. They are finishing the first line while starting to deliver the second line. The onshore team is limited and will go up to 14 heads over the life of the project. Most of the resources are provided by the partner in the consortium. The resources is not a source of tension for the onshore part of the project. Local skilled resources are difficult to find but a good mix of local and overseas resources compose the

local team. The figure 31 below represents the workforce plan of the project overtime (M +x being the x month after project start. The different color represents different Employee type such as expatriates, local engineers etc etc.

Figure 32: Onshore part resources forecast per employee type



The project and the unit do not have locally to compete with other Thales projects and do not need to share resources with other Thales units which does simplify the project organization and execution. "**It's Caribbean. We don't have a team, we have local teams, but we don't have a Thales Caraibe, so we are really in control of our destiny. At the level of the IC (Integration Center) system, we have a permanent establishment, we have recruited locally, etc. And we are more or less accountable for our actions. And we are accountable to almost no one, except to our customers, to the consortium and, of course, to the BL.*" (Interview ##12)

On the offshore part of the project, in France, the situation is more complex. All resources are dedicated to the DML project and the product development leading to schedule issues. There is no specific resources allocated to the *Caribbean* project. The project management team is also not fully dedicated to the project.

As a conclusion, the resources are shared either with another local project in country or with the rest of the projects of the units for the offshore part. The project team is not dedicated to the Caribbean project.

1.2.1.6. Budget/ Schedule/ Quality

High level of quality is for this project as well, a must to achieve. What is nevertheless interesting is the pragmatic approach demonstrated by the project and the customer to achieve this level of quality. In the eyes of the customers, schedule prevails from the quality or the completion of some of the requirements. The political environment is such that governmental communication is important and the customer agrees to receive a degraded system at the beginning to respect the official schedule and to complete to project with the right level of quality and requirement after

the Official milestones are achieved and official's inaugural ceremony. " **That is to say ta one point for the Caribbean project, the guys want to keep the date and they are ready to make concessions. It's not a very contractual approach, so typically at some point. There was the World Youth Day. Six months before the inauguration date, they asked us for an acceleration plan, to get the Pope on the train. So we did something very, very degraded that would never have been accepted, for example in the Middle East. But they had a new metro and he wanted to show that there was the WYD. The pilgrims had to be taken from the airport to I don't know where and something was done. And so, in a hyper pragmatic mode, hyper, I want to show that the thing is running. I don't want a perfect thing, but I want to show that the thing is running because it's public investments, there are elections, etc. Plus, it was a little before the election. The planning is debatable, like everything else. In the end, you keep more or less the dates. With more or less, you see you have features that arrive 6 months later, you negotiated it in exchange for something else, etc.* " (Interview #12)

So quality remains a priority at the end but the customer agreed to progressive approach to the right level of quality and External communication remained a higher constraint than the contractual requirement and quality level. Nevertheless at the end, customer expectation and units expectation were aligned to reach high quality standard. Security couldn't be a negotiable at the end.

Like any other project, the Budget is constrained, but Analysis shows that financials have not been an issue or an area of concern all along the project life. Table 38 presents the financials of the project over the year. The AGM column is the adjusted gross margin; The margin that is expected at the end of the project after execution. As we can see between the start of the project presented in the line "Situation initiale" and the current situation presented in the first line of the table "Situation courante" the expected margin did not evolved. The financials of the project is stable

Table 38: Carribean Project financial performance overtime.

Synthèse Projet												
	Montant contrat	CBB	Provisions dans CBB	Dépenses (Actuals)	ETC (hors provisions)	PC (ETC %)	MC (ETC %)	FC (ETC %)	PC+MC+FC (ETC %)	EAC avec provisions (PC+MC+FC)	Variance CBB - EAC	AGM
Situation courante (*)	49 272	37 947	6 628	10 888	21 184	1 179 5,6%	903 4,3%	3 794 17,9%	5 876 27,7%	37 947	0 0,0 %	11 325 23,0%
Revue précédente (à fin septembre)	49 272	37 947	6 628	9 439	22 633	1 179 5,2%	903 4,0%	3 794 16,8%	5 876 26,0%	37 948	(1) -0,0%	11 324 23,0%
Fin année (**) N-1	49 272	37 947	6 628	4 290	27 549	1 414 5,1%	903 3,3%	3 794 13,8%	6 111 22,2%	37 950	(3) -0,0%	11 322 23,0%
MYB	0	0	0	0	0					0	0	0
Situation initiale	49 272	37 947	6 628	0	31 319	1 929 6,2%	903 2,9%	3 796 12,1%	6 628 21,2%	37 947	(0) -0,0%	11 325 23,0%

The project financials are stable and therefore not raising any particular issue. Nevertheless, one of the Interview raised the fact that the Caribbean project is seen as a success while another project with the same execution and same technical success would not be seen as a success. " **... we must*

question the notion of success. What makes a project a success? Because typically, the Carribbean project? Yes, it is a success. But I think it's also linked to the fact that we sold it well." (Interview #12) and to conclude *"…* so that made a success the caribbean project because it is above all a financial success "* (Interview #12)

As a conclusion we can categorized the Caribbean project in a constrained budget but this does not generate any tension, any questions from the project organization at any time. Due to the little visibility of the project, The unit management team has been full autonomy to manage the financials of the project.

In term of schedule, the project is highly dependent on the product development and the resources allocation dedicated to the DML project which is at the time of the project execution the most critical project and the highest priority for the unit, the Business Line and the Global Business Unit. "*Francois: and the schedule? I think you've already answered the question but the WCC schedule and the Caribbean Project, they were actually underlying the DML project? Was there a real interrelationship between the three projects at that time?*

Interview #12: Yes there was a real interrelationship and with such different clients"

The project is coupled to the rest of the organization and the Project team has very little autonomy to manage the project schedule. Therefore the Project negotiate with the customer to adjust the schedule with degraded delivery in compensation to additional scope or additional feature that were not initially contracted.

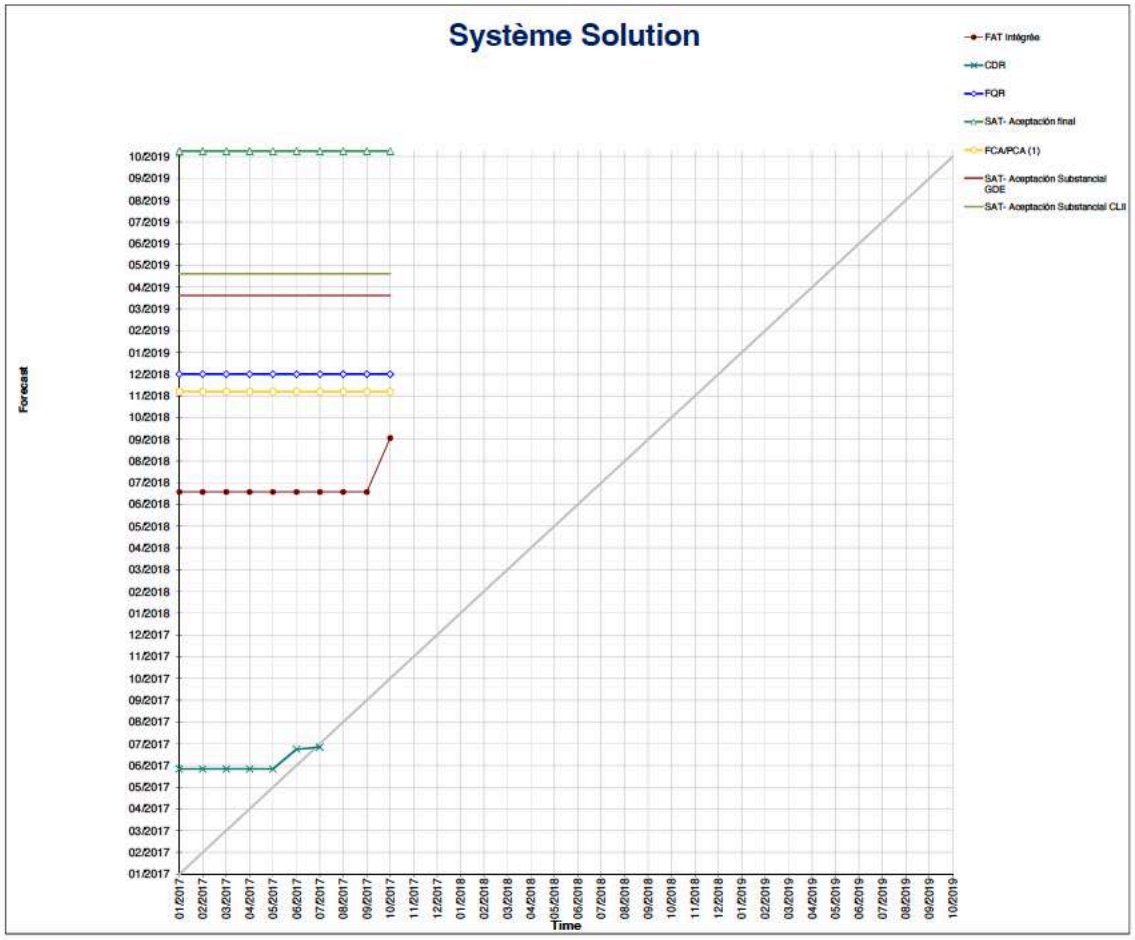
1.2.1.7. Approach

In term of engineering approach, as for the WCC project, the Caribbean Project will benefit from an over engineered system that is developed for the DML Project.

The project is not a development project. The engineering activities are related to Integration and validation activities mostly. The product that is developed is nevertheless developed under a phased approach, progressing milestone after milestones. The Figure 33 shows a standard milestone trackers included in the group standard dashboard. We track overtime the expected date of the milestone. This gives us to better understand the potential delays of the projects. As an example during that month's review, The integrated FAT milestone was announced with 2 month delays.

Our analysis confirmed the phased approach used for the Caribbean project execution,

Figure 33: Caribbean Milestone Trackers



Commentaires :

- Octobre 2017 :

Prochain jalon solution : IFAT planifiée septembre 2018 (version ISCS disponible au 15/07)
Autres jalons : FCA / PCA au niveau solution puis réception provisoire et définitive, jalons contractuels.
La bonne tenue des jalons usine FAT n'est pas sur le chemin critique de ses jalons. Le chemin critique est lié à la date de mise à disposition des stations par le GC et leur énergisation qui conditionne le début du T&C site.

1.2.2. Reporting supervision structure

The Caribbean Project was not of high visibility for the higher management of the organization. The project was not categorized as critical and the size of the project allows the unit to manage the project without upper reporting.

The project is reviewed on a monthly Basis by the unit management during the project review, using the standard project dashboard.

In term of project governance and supervision, the project is reviewed as a standalone project. There is no other instance where the project is reviewed and monitored. Once par quarter a project review is organized at the Business line level but with the low level of risks and issues the review is seen by the project team and the unit management as a reporting exercise. "*****No, nothing, I went to inaugurate it. I went to the inauguration of the Caribbean Project, that's all.. "(Interview #14)

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What is more interesting in the case of the Caribbean project is the fact that the project is highly dependent on the DML project, from a resource, schedule and product standpoint. Looking at the highlight of the project dashboard, nothing related to the Product development on going for the DML project nor subsequent schedule issues are mentioned: The project team is focusing on its own issues. The team seems to consider this inter-dependency as an external output or an input to their project. In the Project Highlights extract below Fig #32, out of 12 topics highlighted, 12 are directly linked to the project. None is related to the context or external factor. In the threat, the product is mentioned but only to mention that the additional specific required add on have not been quoted yet…

We conclude the project supervision is purely project centric and fully aligned with the unit policy and supervision practices.

Figure 34: Project Highlights (Dashboard extract)

EVENEMENTS POSITIFS	EVENEMENTS NEGATIFS
SUCCES	**PRINCIPALES DIFFICULTES**
- **Paiement** reçu en septembre : 973 k€ correspondant à la certification du mois d'avril (Mes 20) - **Facturation** : * émise en septembre : 1 382 k€ certification du mois de juillet (Mes 23) * émise début octobre : Mes 24 : 275 k€ * certification en cours : Mes 25 : 5 092 k€ - **Financement** : Les contrats UBS et INBURSA en vigueur. Demande à CL2 de fournir une copie des contrats de financement avec les organismes bancaires. -**CA TRR SCADI (433 k€)** : à passer formellement en octobre. Ressources disponibles et phase IVV en finalisation en vue de la FAT mi-octobre. - **Expédition maritime** des équipements Commande Centralisée : mise à FOB prévue le 26/10 - CA associé : 797 k€ -**Documentation** : Livraison dans une première version des ICD détaillées commande centralisée à GDE sur la base des informations transmises par CL2. -**Installations** Etape 1 démarrée pour les sous-systèmes Réseau, Téléphonie, CCTV, TETRA et SCADI L2. L'avancement des installations est en phase avec la baseline.	- **Insatisfaction du client sur le retard du planning SCADI** : Le client souhaite avoir une sécurisation du CCO en avance de phase du déploiement en stations. Installations Sofratesa démarrées sur SCADI L2 étape 1 et en cours de démarrage sur SCADI L1 étape 1. Fin de l'IVV en vue d'une FAT au 16/10. Déploiement à suivre. Réunions client organisées sur l'avancement des activités et planning global afin de partager le retard. - **Réseau** : problèmes majeurs liés à l'implémentation du multicast => FAT Nokia refusée. Support Nokia en plateforme Vélizy mis en place. Problèmes majeurs reproduits mais pas date de résolution communiquée par Nokia. Courriers contractuels échangés - attente d'une réponse Nokia mercredi 11/10. Impact projet : décalage CA mise à FOB Réseau (1 145 k€) - décalage jalon de facturation (619 KUSD) + retard de l'intégration des équipements par partenaire Sofratesa planifié à partir du 15/11. Chemin critique : début des activités T&C site janvier 2018. - **CA mise à FOB TETRA (1 309 k€)** : lié à des problèmes HSE, l'expédition du matériel a été retardé. Problème résolu et expédition prévue en novembre. : décalage CA de d'octobre à novembre + décalage facturation (1 108 kUSD) - **CA FAT CCTV bord** : retard C4S dans le développement des fonctionnalités va retarder la FAT. Plan d'action / planification C4S attendu au 11/10. CA retardé à novembre 2017 (766 k€).
OPPORTUNITES	**MENACES**
- Offre Connexion Aéroport remise fin décembre 2016 réactualisée et prix transmis à MPSA : extension de 2 nouvelles stations pour juin 2019 et mise en service partielle pour les JMJ de janvier 2019. Offre sous forme d'avenant au contrat L2 en cours. Prix Thales : 6 061 k€- MB : 26,5%	- **ISCS / produits** : chiffrage et planning de réalisation des ECR Panama non consolidé. - **Mégaphonie** : CL2 considère que le système de sonorisation est un système sécuritaire d'évacuation des stations (Voice Alarm System) et doit être conforme à la norme NFPA 72. Le système APIS sous-traité à Thales Portugal ne répond pas à ces normes et est un système d'information voyageur. Courrier envoyé à CL2 pour leur rappeler que le système est une extension L1 et que CL2 fournissant le système de FDS doit fournir un Voice Alarm System ou porter la responsabilité d'utiliser le système d'information voyageur à cette fin. Stratégie à faire défendre par CL2 à MPSA : faire une démonstration GAME d'équivalence su système L2 avec le système L1 validé par l'autorité des pompiers. - **Compétence architecture IT** non acquise sur le projet entraîne des difficultés en plateforme et retards FAT. Stratégie à mettre en place par la DT. - **CCTV bord** : retard de fabrication du matériel OBIF pour intégration dans les trains Alstom MR. Si nécessaire le matériel sera envoyé sur site (intégration simple dans le matériel roulant). Retard partagé avec Alstom MR sur la criticité de mise à disposition du matériel OBIF. **Nouvel impact technique** suite à modification des caméras : enregistrement des flux MJEP non implémenté. Sujet à faire remonté à Alstom MR et en CODIR pour savoir qui prend en charge l'implémentation (chiffrage C4S en cours)

1.2.3. Conclusion

In regards of the 9 attributes, the Caribbean project is with no doubt aligned with the Project paradigm of the beginning of the 21st century. The temporality of the project is questionable and the adding of additional contracts to the original Line 2 lead to conclude to the permanence of the organization. The organization has not been design for the specificity of the project although the onshore part has been slightly customized due to the lack of Thales footprint in the country. The

project will also benefit with a high end system that its technical requirements is not justifying but the unit interest to strictly implement its product policy and implement the same product for all projects will drive the choice of the technical solution. Not the contractual requirements…

It is also demonstrated the delay faced by the project is externally driven, more specifically driven by the choice of the unit , the business Line and the Global Business Unit to prioritize the DML project and to develop a product that would be fully compliant to the DML project and therefore over designed for the Caribbean project.

The project is also driven by the unit not by the project team. The head of the unit and the business line made the choice to implement the same product as the WCC and the DML project. They are also the ones that made the choice to delay the project whatever the consequences on the project.

As a conclusion the project is highly integrated to the unit and very little autonomy is left to the project organization.

Table 39: The Caribbean project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The Caribbean projet
Temporality	Temporary	Permanent	Permanent
Object	Specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

In term of supervision, the project has been monitored and supervised in the classical project way. Project review is the main instance to discuss the project and the Group Standard dashboard is followed during the monthly review.

Unfortunately, due to the strategic choice in term of product implementation and the strong interrelation and schedule dependency to this product development and to the WCC and the DML projects, the unit and the project would have benefited from a transversal approach where the project would have been reviewed from a product standpoint and from a general portfolio point of view. The project is still considered by the unit as it did not face any financial difficulties but as said by the head of the unit, the project has been well sold.

1.3. The DML Project

The DML project, is the most important, the most complex and the most challenging the unit has ever been asked to deliver. The Country context, the customer context, the technical complexity are some of the constraints the unit will have to face during the project execution.

1.3.1. The positioning of the DML project towards the decoupling/standardization attributes

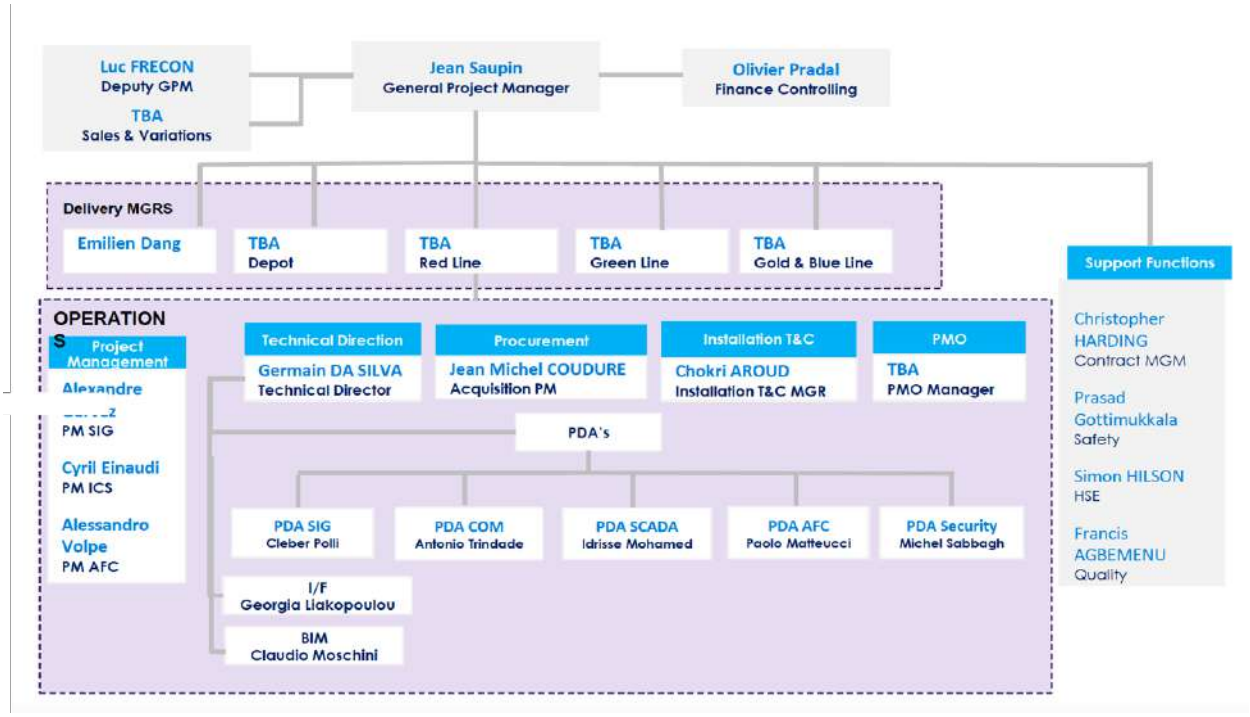
1.3.1.1. Object , Temporality & Scope

For this project, in the sake of repetition avoidance, I am merging the analysis of the Object, the scope and the Temporality attributes as they are strongly correlated.

The contract is composed of an integrated communication and control system to be delivered by the French unit as a lead unit: The contract is also composed of a signaling system that will be delivered by the Canadian unit. Both units have also planned to implement a local team for the installation and all local on shore parts of the contract delivery. Each component of the contract is managed separately by both unit as 2 different projects, with 2 different teams.
At the beginning of the Control & Communication project, the organization that has been implemented in the offshore unit is a standard organization. The overall project management is planned to be managed from the offshore unit and all engineering design and integration work is also planned to occur in France. Progressively, when difficulties are occurring, there is a strong shift from 2 separate projects to a combine and unique joint project organization that makes the project organization quite unusual. The French Project management team is little by little losing all their authority and responsibilities while a Project directorate is implemented in country to supervise the overall and unique project.
From a French unit standpoint, the unit within the perimeter of this case, the project object has transitioned from a typical and generic organization fully aligned with group standards and recommendation to an hybrid project organization, merged with the signaling organization losing all main responsibilities and falling under the supervision of an overall project organization.

The figure below shows the new integrated project organization that has been setup to manage the overall scope of the contract. The ICS and SIG are the two components that were initially supposed to be delivered individually with 2 different projects setup. The New organization added a layer for the overall supervision and the overall project execution of the project.

Figure 35: Project Organization – Extract from Project Dashboard



The temporality and the object of the project organization has been affected by the merge of the signaling and the command & Control scope leading to a new overall project schedule (temporality) and Object.

A second key project organizational aspect influenced strongly the French Project organization's temporality and object. Along the life of the project, one engineering team was in charge of the Product development while another team was developing the specifics related to the DML. Sometimes, the same people were part of the two different teams which were not aligned. At one stage during the project, the management team decided that the product would be the one covering the full DML specification and therefore subsequently the two team were merged in order to develop one single product. As the project was struggling, it is interesting to note the product team was integrated to the project team while we could have imagined the reverse would happen.

In conclusion the Project scope attribute evolve from a delivery of a command and control system for the DML to a development of a standard product while delivering it to the DML project.
The temporality and object attributes have been impacted by the merging of the signaling and C&C team and by the strategic change when merging the product team to the project team.

In that sense, when looking at the attributes classification, I am concluding that for the French unit, the project organization has been generic at the first place and move to a specific organization for the remaining time of the project delivery.

1.3.1.2. Processes

The Project suffered from processes issues. Those issues were related to two distinct organizational choices: The first one being relative to the relationship between the Business Line and the French unit; the second being the merging of the ICS scope to the URS (signaling) scope.

Right from the beginning the project suffered from a process perspective. We were at the launch of a new complex product and we were launching at the same time the biggest and most complex project. The project being the launching customer of this new command and control system. The processes, the role and responsibility between the Business Line, the product owner, and the French entity, lead unit for the project were not fully define. " ***in fact, I, when I took over DML At the same time as I took over the domain, the worm was already in the fruit at the beginning, because we were an ICS system on DML for the ICS part, and I felt that the team was expecting a lot from the IT department, which was supposed to take care of the product, even though most of the resources were there. And so, I think that Olivier, my predecessor, put the BL in front of its responsibilities by saying: "Wait a minute, we're making a product, give us the specs and then we'll make the gaps and develop the thing. So there was this governance that was not very, very clear." (Interview #12)*

Once the overall difficulties arose on the project, the GBU decided to transfer the responsibility of the overall project to the signaling team. This decision was made in order to better coordinate the team in place and increase the decision process in problem solving. This decision seemed a good move at the time as internal discussion between all actors were not helping the project resolution. Nevertheless none of the team was prepared for the change and the GBU did not brought fast enough the governance associated to this new organization and none of the existing process were aligned with the new project execution model. This led to additional difficulties in the project execution and increase the feeling of "Not in control" that most of the project players felt. It also led to some lack of accountability on the French unit side as they were not in charge of the project per say but were just here to execute.

Overall the project had too many actors from the BL, the GBU and the countries that brought a lot of issues in term of governance and processes. In that sense I conclude that processes used were the group standard but they were not compatible with the project execution mode and its environment leading to confusion and additional project execution issues. *"* I think we had too many actors outside the projects, for me it was the GBU, the countries either France or Canada that were not intrusive enough but on the other hand at one point the Middle-East, the host country*

wanted to be more interventionist, to have more weight. I think that didn't help the whole situation. I think that for me the root cause of the tensions was too many actors outside the project team." (Interview #13)

In conclusion, the responsibility matrix changed overtime but the structure, the governance and the processes remained the same. "******In terms of process, project management, compared to the Thales process, we didn't do any Tayloring, we didn't even suggest that the project team do it, and they followed the Thales process as in most projects. A dashboard with everything associated with it, Project Review by entity by BL and conso at the premium level with the GBU (Global Business Unit) or and there I think it's the Chorus process. ."* (Interview #13)
We can therefore conclude that the Process attributes is categorized 'standard' in our analysis.

1.3.1.3. Resources

The DML project did suffer from the lack of resources at the beginning of the project, but very soon when the project started to face operational difficulties and that the project became a GBU priority, all resources available and requested by the project were assigned to the project. The GBU instructed the Business Line the project was the top mandatory project for the overall transportation organization. "******Yes, we explained the situation, there are countries that heard the message and others that raised the issue at the GBU level. The GBU said, gentlemen, the priority is DML, the rest we manage, if we have to pay penalties, we will pay, there was a decision, we can have different ideas, but when there is a decision, we apply it.*." (Interview #13). At the beginning some resources were shared between projects especially on the engineering side and were also split between the Product team and the projects team. "******So what I did was to merge the two teams. We said product equals project, which means that we told the product teams that you would now deliver DML and then the others, which means that you develop on the DML specifications, you stop with your product specifications. So, if it was a little bit for them,... it was very disruptive because it meant giving up having a product, etc. And so on. So there was a lot of resistance. We didn't get there completely.*" (Interview #12)

From a resource standpoint we can still conclude that the resource for this project were shared despite the statement that all resource available and required were allocated to the DML project. This was due to the course of the project execution and prioritization made by the GBU but the principle of shared resources had not been questioned by the unit nor by the GBU.

1.3.1.4. Budget/ Schedule/ Quality

In term of financials, the DML project is one of the worse project ever for the Group transportation business. Very soon after the project started localization decisions on Engineering designed at the request of the customer and the merge of the project organization between the signaling activity and the communication activity, drove significant budget issues. The project team by losing their leadership on the Coms part did not get any autonomy on managing their budget. The project was so sensitive that successful execution was what matter. "******I don't think I'm saying that the budget was imposed, but rules were imposed that in any case prevented them from controlling their budgets and also their capacity to deliver. For example, for DML they imposed us to go up in power with I don't know how many people. That's why they took people everywhere, they didn't even look at the hourly rates, the budgets, nothing, and in the end the EAC was blown up. But in this case it wasn't the decisions of the project team. Things were imposed.*" (Interview # 13)

Being part of the management team at Business Line level, I can confirm the pressure received on this project. Nevertheless the financial was still a key issue for the GBU and the budget was managed at a higher level taking into account the GBU financials calendar but the budget was still manage and discussed extensively between parties on how to share the multiple impacts.

We cannot conclude the budget was no limit. The budget was constraint but outside the project lead team.

The schedule suffered from different perspective on the project. First of all, it suffered from the non-readiness of the product itself. "***** *yes it was the maturity and a good layer of the product was developed at the same time as the project. In the end the product team and the project team... we put the teams together.*" (Interview #13). " *But really, DML is more of a product problem than at first project. Also, a problem. A mature project, a mature product at startup.* " (Interview #12)

The product roadmap, and the product development were not aligned with the project execution schedule leading to delays and issues for the DML project. As mentioned, at the end, the unit had to merge both team in order to deliver the expected product while limiting schedule impact. The second major schedule slippage driver was the decision to merge the Signaling and the Coms together. The coms scope became part of an overall scope and suffered delay and installation schedule issues. The project leadership at the GBU level was supervising the overall project taking decision in the benefit to the overall project but sometimes detrimental to the COMs scope…

*''*******You could see that locally, if you wanted to keep the dates in 2 minutes, by looking at the schedule, you could see that you needed 3 teams, a G team, an R team, an O team. That was probably what he had planned at the beginning, but afterwards, as we had made a mistake on the*

volumes, everyone did the R team because we had to go to the fire and so instead of working in parallel, we worked in series. So instead of working in parallel, we worked in series. Except that, you would break your first schedule and break the second and the third. And that was really obvious. And I couldn't tell MC and DG, Benoit was listening to me and he had the same message. I couldn't say, but we made commitments that we would work in parallel. ... and that, if you like, is very frustrating because, in the end, you are responsible for everything and you have authority over nothing. .... So then there were other delays in the civil engineering. You know how it is on the ground. But if you want we were not staffed according to our commitments. We were supposed to have 3 teams and I didn't manage to do it. " (Interview #12)

From à schedule standpoint the schedule was very complex and subject to a lot of external dependencies, therefore I would categorize the attribute as technically convoluted.

The quality has been also a challenging in the project. First due to the complexity of the project "******If we were to do it again today, there would still be the complexity of the large volume of equipment. 9000 cameras, loudspeakers, the base stations are like Châtelet-les-Halles with a loudspeaker every two meters. In short, you have a real complexity of deployment where we arrive in a country even if we had made the port. There wasn't much maturity on big deployments.* " (Interview #12)

Another factor increased the quality awareness ion this project. The end customer contracted an external firm to help them managing the project. This firm was more a civil engineering expert and therefore relied a lot on the contractual specification to monitor the project leading to a huge administrative burden and quality insurance burden.

1.3.1.5. Approach

The DML is an interesting case in the sense that the system to be delivered was supposed to be based on a brand new standardize product developed to be the next offering generation of the Business Line. The Feature and the technical requirements were such that specific development would also be necessary to fulfill our contractual requirements. From the beginning the generic development was late and non-mature leading to project specific development and execution delays as well as additional delay on the product development. Same skilled resources being requested on both developments. Despite the difficulties faced, the engineering has never been challenged or questioned by the unit. The teams were merge and the DML product became the generic product but the engineering approach based on phased approach remained following Group engineering standards. The development was late and delivery date were uncertain. : "******The*

*number of times that the software organization said to us: "*Yes, yes, we'll deliver the patch thingy on the 24th at night", and it was the 30th, and we still had nothing, and we still didn't know when it was going to be delivered, you don't have that independence. On the other hand, it's you on DML, who have to manage the customer who starts to jump up and down like that, because he doesn't have his product. And so, the whole problem at some point is the balance, the balancing, which is complicated to define - who drives the decision, who makes the decision and who gives priority where it is needed.* " (Interview #15)

We can therefore conclude the DML project followed the group approach processes and can be characterized as using Phased approach.

1.3.2. Reporting supervision structure

The DML Project supervision has been following over the life of the project: It started like any other multi country multi Business lines project with a monthly project review at the unit level, a monthly project review at the Business line level and then a quarterly Project review at the GBU Level.

As already explained the leadership of the project for the studied scope changed when the activity was merged under the leadership of the signaling team and then under the direct leadership of the head of the transportation Business (GBU) that was involved daily on the project execution.

None withstanding the leadership changed and escalated; the project governance followed the same group standard and each unit, each business line organized their own project review before the GBU that became also monthly.

The project review is a tool that is used to share the project information, escalate issues and seek for decision depending on the Delegation of Authority and the governance. The process was fully followed while the GBU head was daily involved and therefore fully aware and the decision was made by him outside the project review….

1.3.3. Conclusion

"**But I consider that DML is an example of what not to do in terms of management. Because, you have the big boss who wants to do the job of the project team. So today, as soon as we try to take examples to look at good retell, I say that we should not take DML.* " Interview #14. This statement from an executive is à good summary of the DML project execution. The pressure of the customer was such that proper governances and proper distancing from the execute leadership team was gone was at one point:

In each of the attribute we concluded on the standardization, the respect of the group instructions which also accelerated the complexity and the difficulty on the project. The Project was not standard, non- standard organizational decision have been made but all Group processes were followed: "**In terms of process, project management, in relation to the Thales process, we did not do any Tailoring, we did not even suggest that the project team do it, and there they followed the Thales process as in most projects. A dashboard with everything associated, Project Review by entity by BL and conso at the premium level with the GBU (Global Business Unit) or and there I think it is the Chorus process. Maybe we could avoid a few meetings, but maybe four levels. We managed. With that, we had a bit of an overload on the teams to prepare everything.* " (Interview #13)

Table 40: The DML project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The DML Project
Temporality	Temporary	Permanent	Permanent
Object	specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

1.4. The South American Project

1.4.1. The positioning of the South American project towards the decoupling/standardization attributes

The south American project, is the first contract the Dutch unit signed after the large restructuring that occurred in 2015. It consists of the delivery of several key equipment such as Radars and combat management system on Long range Ocean Patrol vessels for a south American country. In the context of the unit, this south American project is key as this is the first large contract that the Dutch unit signed outside Netherlands for the last few years.High visibility is given to this project at the beginning of the contract

1.4.1.1. Scope

The scope is definitively a subject for the South American Project. My analysis enables us to conclude the scope of the South American project is not unique. In fact it has been a subject of frustration for the Project Manager. Some of the elements that were delivered were not in the initial scope of the project nor in the contract specification. "The *South American Project had to deliver the security that was not even in the original budget so we got ourselves into a very tight spot due to the management decision on introducing this security in Network,*" *(Interview # 1)* It appears that the South American project funding have been used to develop a standard product related to Network security. The company used the project financial resources to fund a part of their product policy. "*Yeah, we have over delivered because of the Project has a very good Gross Margin and it was taking us an opportunity to do some development to help and support Poland (Polish engineering center)"(Interview # 1)*

The feedback was that the project suffered from this extra scope, from a financial standpoint but also from a schedule standpoint as well as from a quality of the outcome *"but during the whole three years of the project nobody really knew where all of this decision came from and it cost a lot of money a lot of time and we were late on the delivery of Tacticos* (Tacticos is the Name of the Command and Control System of the Dutch unit) *because of this. Otherwise it would have been a lot easier*"(Interview # 5)

For the South American project, the scope has been a subject of tension and feedback received confirmed that standard Product took over the unicity of the scope to an extent that the project over delivered as compared to the company contractual requirement.

1.4.1.2. Resources

As already explained in the project presentation, The south American Project is the first sizable export contract for the Dutch unit after their restructuring in 2015. The backlog of the company is yet to be filled.

There has been therefore 2 periods in the project execution, the first part of the project execution took place in the context of very low competition between projects for resources allocation and the second part, after the company successful commercial recovery where skilled and key resources were scarce.

Nevertheless, in term of resources, there has been few resources dedicated to the project at least part time but overall it comes out that resources are shared between projects and for most of them are reporting not to the Project Manager but to their line manager: *"There's no project in this company that is autonomous at all. First of all, because we're sharing resources,"*(Interview # 5)

Another interesting comment on resources highlights the questionable profitable outcome of such resources allocation process: *"The problem is not only that we're sharing resources but the expert resources that we need are very scarce. So, we are not only sharing but we're also competing for them and all of those resources are in our critical paths so the moment that you swap you are hurting the project that you're swapping it from but you also hurting the resource because they're so little that they're getting on to burnout very fast."* (Interview # 5)

I couldn't confirm with numbers a high ratio of Burn-out in the company, but this issue was on a regular basis on the table of the executive Committee I was part of. We were in the vicious cycle were the same expert were overloaded by the project workload, and were in the same time requested to train the youngest resources the company tried to embark to save the load issues…

When looking at the Resource attribute, it is obvious that resource were not dedicated to the South American Project and that the shared resources was the norm. Therefore for this attribute we can also conclude of a strong coupling of the Project organization to the Dutch unit.

1.4.1.3. Budget/quality/Schedule

For the South American project, I decided to summarize the level of coupling of the project to its parent unit for three attributes as there are interrelated and difficult to present one by one.

The project was initially sound and the project team was very confident to deliver on budget. Then management decision on adding scope and dedicating funding to product roadmap development changed the pace and the financials of the project. This choice also drove consequent schedule

issues that finally Impacted the quality of the project outcome. Trade off had to be made and this has been detrimental to the project execution: "*We deliver months in advance the ship but with a quality that is really not good and some of the trainings were actually pushed outside of the commissioning just because it was physically impossible to do so. Thanks to the fact that the customer has been very flexible we have been able to deliver on time …but the quality is not there.* They are aware that it's not there but they trust that we will solve it" (Interview # 5)

In term of schedule it is also obvious that priorities in term of resources allocation and therefore potential project schedule impact were driven by external factors. There has been no autonomy given to the project team to manage their schedule. External factors such as contractual penalties at stake or product roadmap, were imposed to them: "*When it came to the priority discussions, both in the South American Project and in The K project there was a moment that the discussion came to :what is the penalty ? how much is the penalty on your project ? and there was such an amount of frustration I would also say the scope was not mine. It was for management to decide; and then I was very very very late on some of the milestones due to, for example Tacticos that was outrageously late, Gatekeeper was outrageously late, and I had no priority over the resources and the management decided to increase my scope."* (Interview # 5)

We already reviewed the change of scope that changed the financials of the projects. The project team also did not feel fully responsible or did not have a full autonomy to manage their project as clearly stated the one of the controllers that has been in charge for a certain period on the project : "*I cannot plan for it, or I cannot be responsible for it. So, in terms of being a CFO of the project, I'm not totally independent. I'm always really relying on Rob (*Finance Head of the Unit*) … most of the time it's Rob… thinks for budget reasons, or whatever reason we have. But up until a certain level you are... and I like being responsible and also being able to do well and on my own not having so much involvement from Rob, let's say."* (Interview # 4) The lack of autonomy is also reported as an issue on the way the performance of the team is appreciated and monitored : "*On the project, that's, in my opinion, what is happening. Maybe a good example is the financials, we have a budget which is in place now for the next year... and, well, next year we will live in a totally different world... other assumptions are being made and not always on the project level, maybe on a company level or One Naval level which are impacting your project in the end. So, in the end, you will not have your sales or your cash-in which you have forecasted for... How do you judge your project manager? or how do you reward him? or on only the financials, let's say, it's difficult because there's so much happening which he cannot decide on."* (Interview # 4)

As a summary, the schedule and the budget has been driven by external factors and decision makers external to the project team which led to some trade off when it relates to the quality of the outcome delivered to the customer. After the interviews, most of the quality weaknesses have been resolved leading to additional delayed and extra costs but facially, thanks to the openness of the **customer the project was delivered on time.**

1.4.1.4. Temporality

The temporality attribute was a difficult topic to address with the project team. The fact that, the project starts at project signature and ends at the last delivery of the project, is so embedded in the company DNA that questioning it seemed almost impossible. There is clearly a contractual approach when it relates to the temporality of the project. One of the Project team members nevertheless raise some interesting thinking about the current left shifting trend within the company. The left shifting is a de-risking initiative where some action are taken prior to the contract signature to ensure the proper delivery of the project as per future contract requirement. Those action are at risk as not funded. There are not part of the bid process and would be reintegrated in the project when the contract would be signed.

The project manager also discussed his role towards a longer period on the project. How can he contribute after project delivery to the customer satisfaction and the chasing of after sales opportunity such as maintenance , spare parts, services opportunities. "*You talked about the beginning and the end of the project. Currently we have a big problem there because the project manager we have and we have an organization for sales ; we're trying to left shift the project manager into the salesperson into the bidding, then the project manager takes over ….I don't believe in this because we want to sell more and the client needs to see the same person so I am still during quarantine and I will be supporting after, but that's not very common, and that's something that I personally had to fight a little bit with my management but I said I am going to be part of the sales team the after-sales because that's important for the customer. As a culture its important."* (Interview # 5)

Even though the project temporality is defined as the contractual duration, there is a willingness to extend above and beyond to cover the after Sales activity. As also mentioned by the Project Manager, involvement of the Project Manager during the bid phase (Before contract award) is also recommended for better project execution and continuity with the customer relationship.

Therefore from a coupling perspective the temporality is subject to interpretation and people very often are confusing contractual duration and project temporality.

1.4.1.5. Object

The object attribute is also a concept that is difficult for the Project team to assess and discuss. Nevertheless the Project Chart was a standard one and the team has been set-up using the standard group recommendation. The continuity of the team is also requested by the unit to go from a project to another to acquire knowledge and improve the overall project delivery efficiency.: *"No it's not fully set up only to deliver once something, because in most of the cases we also want to get something out of it for a longer time."* (Interview # 6)The fact that the teammate can change as the standard team is respected is also acknowledge giving the company some flexibility for some of the key role in Project execution: "*I think if you look to a project team, of course, there you also would like to have some continuity. But I think it's more easier and flexible to deliver. But it's also more generic skills like project management or contract management or ship contract management. Yes, preferably keep them for a certain while. But during a project, I think it's easier to change people from one project to another project."* (Interview # 6)

From the Object attribute perspective, we see the object of the project organization is standard using a standard model with very minimum deviation. The fact that people try to constitute the same team when it has been successful increase the generic status of such organization as the core project team will most likely tried to reunify to deliver the next customer contract. *"The problem is their resources know the project manager and the project manager knows the resources so we tend to team up with the people we know that are good at working with or that we like to work with."* (Interview # 5) The project team nor the parent unit would have problem or a "project factory" type of organization where the project team would remain unchanged and would deliver project after project. In that sense we can discuss the uniqueness of the project object.

1.4.1.6. Processes

Once related to Processes it is clear that standard group and unit processes were followed by the project team: *"Most of the time we follow the chorus project processes, as far as I'm concerned. I'm not aware about everything in chorus (Chorus being the Process tool used at group level) but most of the time everyone tries to follow the processes we have in place to manage the project."* (Interview # 5)

There is also a consensus on the need for using the standard process: *"Yeah, in general I think processes are needed at the top Level; and my opinion is that that you should not have processes*

in place for every single step you take. So you should have some flexibility to act in different situations," (Interview # 4)

The project team is recognizing the need for Standard processes but would also appreciate some flexibility to adapt to the project circumstances. Overall the processes followed by the project team are Group standard and there was no mention of specific processes developed or applied to the project execution.

1.4.1.7. Approach

In term of engineering approach, the fact that a big part of the project is related of the delivery of standard product with some customization sometimes does not leave a lot of initiative in term of engineering approach. We were not in a development project and a phased approach with specific standard milestone have been used up to the overall integration of the system finalized by an acceptance test. Nonetheless, the Project Manager believes that with more time they would have handle the customization of some part of the project differently: " *You talk about engineering, and it was funny because you said before it was trial and an error and that's okay when you have budget and now we're more like through design. So we like the uniqueness which means more customization, more design and that is okay if you have time, you know ; but that's the same, that the trial that's what that makes sense if you have time, but these, the projects that we are having in nowadays : they have absolutely no time… I had no time in this project to deliver."* (Interview # 5)

The project funding have been used to fund the development of a security upgrade for the Combat Management System but the development itself was not integrated to the project execution per se. Therefore the project execution was quite classical with different milestones to be achieved all along the integration of the system. In that sense the project is a typically Milestone driven project the so called "stage-gate" approach commonly spread by the professional organization as a best practice.

1.4.2. The Supervision practices and reviews for the south American Project

The project has been monitored thru different instantiations. Every month, there has been project review conducted within the unit. The project is using a standard tool "the project dashboard". This dashboard is seen by the group primarily as a tool to help monitoring the project while it is very often seen by the project managers as a reporting tool. No comments has been made by the

Interview but the analysis of one of the dashboard of the project demonstrates the tool is used as a reporting. During the project review, all aspects of the project execution ar reviewed following one after one the different sheet of the dashboard. Highlights of the month are reviewed, schedule and milestones, financials are reviewed. During this review, the project team is deciding with the project management organization what are the topic that need escalation to the unit management (Resources issues as an example).

In addition to the project review, the most project centric review, there is a Management Business Review (MBR) implemented monthly within the unit. The purpose of such meeting is to review the Business through different angles such as the regional angle or the product angle. A part of the unit portfolio, the project has been also reviewed once a in the MBR . During this MBR the project has been reviewed when reviewing each product that the project was delivering and was also addressed when the South American region status was presented. The south American as all major project from the portfolio has been discussed or mentioned at least once during the MBR.

The fact that part of the funding was used to develop security features as part of the Combat Management System product policy certainly increased the focus on the project at some points. I attended several MBR where the case of this project has been discussed extensively due to the choice made on product policy and the negative consequences in term of schedule the project had to suffer from.

The project has been also subject to an audit from the Internal Group audit Team. The project team felt that it was more an administrative process and did not felt being authorized of being fully open. "*So actually Mexico had one Darci Audit that said that everything was going great and if you really look behind it was not as great… So, the main problem is not about really the Darci Audit, it is just… it looks more like a checklist internally. …. It's not taken seriously, it's just to please management in France. That's… that's how it is and it is it is a shame because it would be a good opportunity to not lose money on the project that way. But to be honest that's how it is"* (Interview # 5)

1.4.3. Conclusion

The South American project can be with no question classified as tightly coupled with its parent units. The fact, the feeling form the project team are with no ambiguity. The scope has been driven by the unit, not only by the contractual requirement, leading to some cost and schedule issues also derivate from the lack of resources and the competition with other projects. In term of priority setting it is also clearly stated that it was not driven by the project specific needs but managed at unit level for the best of interest of the unit even though it may impact an individual project.

The quality of the delivery was also not at the requested level which is quite unique for this unit. I believe that the this trade off on quality has to do with the customer that was willing for political reason not to delay the delivery of their ships. Therefore they agreed to accept some temporary non quality knowing the quality driven reputation of the units. Months after the official delivery, the quality of the project execution has been brought to highest expected standard at the costs of the unit.

The use of standard product is also a pre requisite once listening to the project team. In this case the unit used the sound financials of the project to dedicate funding and resources to develop unnecessary development for the project but key in term of overall product roadmap.

In term of project organization, no specific ones has been define that would suit best to the project. The project team tried to apply the standard organization and also tried to group teammates that already delivered prior projects. So the organization was standard and some of the key role were taken with people that were used to work together.

The project team overall feeling is that project could have been a standard project execution, delivering well known standard product, in time, within budget and with the expected scope and quality but the unit evolution and the growing resources issues and management decision had transformed the project in unnecessary complexity with additional delay and cost increased.

Following the same process we used to analyze the project paradigm evolution, we can compare the project's attributes status to the project definition and the most current project paradigm; this analysis shows a tight coupling of the project with the parent unit and very little autonomy left to the project team while standardization is heavily implemented.

Table 41: The South American project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The South American Project
Temporality	Temporary	Permanent	Temporary/ Permanent
Object	specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted

Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

1.5. The K project

1.5.1. The positioning of the K. project towards the decoupling/standardization attributes

At the time of the study and the interviews, the K project is still in its early phased and the progress the project execution is quite limited. The project suffers from a very complex industrial and contractual organization and the scope of work is not yet fully defined by the end users. This project is also highly political as the industrial set-up is composed of several competitors that had to team up for this "repeat order" while all preparing themselves to compete for a major bid to provide the customer the next generation of frigates warships. This is an important constituent of the project environment as it has consequences on industrial alignment and contractual requirement definition between the different members of the consortiums.

1.5.1.1. Scope

At the beginning the scope of the project is not unique as it is supposed to be a repeat order of the corvette warship that were delivered to this European navy in the early 2000. *"so I think for K-130 if you look to temporality, I think K-130 was mentioned as a kind of repeat program. So it would reuse part of what we already have."* (Interview # 6)

Nevertheless what is interesting on this project is the lack of clarity of the scope at the beginning of the project even after contract signature as mentioned during the interviews. *"so we start the project in April 18 with an undefined scope. We booked a contract ,but the final scope was unclear at that moment*" (Interview # 8). This led to majors issues. First of all, we finally concluded the project would not be a repeat order as technology changed after 20 years and security and especially cybersecurity requirement have changed drastically, impacting significantly the system backbone. At the end we had to deliver product that were part of our product policy but some of them with a high level of customization: "*Within the project, we had lots of discussions on the "to be delivered" products. It is not in accordance with our product scope. Even stronger, we don't have products related to the K. project. The DIU is a new product that was an incentive of the management to have, at the end*" (Interview # 2)

From a scope standpoint, we started with the idea of executing a standard scope using standard products but finally discovered that a certain level of customization would be necessary.

Some of the customization though have been since then embedded in the company product policy in the Combat Management System for example on what relates to the cybersecurity. This is summarized by the Interview #6 as follow "*If you then go to K project, uh, I think that's a bit in between because K project has to reuse what was already there, but also still has to adapt quite a lot only for this specific customer. So not even for the product... Most things that will come out of K project are not always back in the store again. So if you don't take care, it's a kind of one off for K project."*

1.5.1.2. Resources

The resources are definitively shared for this project, being a frustration to the project manager: *"In K project , it was a complete chaos. I have... on all positions, the people exchanged... on all positions... Nobody left in the job itself, except for myself… so am I doing something wrong here?"* (Interview # 2). This is also recognized by the project team member as the biggest issue. Not the fact the resources are shared but the fact that the right resources are not available at the right time for the project creating discontinuity in project execution and schedule delay. "*But resources is the biggest issue"*. (Interview # 8)*"…also the resources… In the beginning of the project there were always resource problems: so we had not enough resources. We organized a launch in October, last year, with also a new planning, and one day after the launch... so the PM, had the commitment that he would have the right resources; but after the launch a lot of critical software resources were reallocated to another project. Then the schedule was already not up to date anymore"* (Interview # 8)

In time of scarce resources it is commonly recognized that PM rely to the escalation process to have the right resources at the right time: "*there's a total lack of autonomy in the project team for staffing. Staffing is fully decided by the structural organization"* (Interview # 10). But what is also mention is also acknowledge is that external factors would also influence the decision during escalation meetings: "*What is the main reason for you to believe that he was able to bring back the people on the project? Is there any good reason for that? M: Yeah, penalties and LD's (Liquidated damages)"* (Interview # 8)

Finally some Interview questioned the never ending swapping of resources from one project to another especially in the case of the K Project as it is counterproductive generating, waste and productivity issues: "*I think that it's totally counterproductive to swap around critical resources every now and then, because I think that's... so an architect that is swapped from K-130 another project, Then he needs weeks before he gets up to speed again and before he's up to speed, he's already considered for another project. I think that we need to have much more stability, much less nervousness in this critical process. We should allow... we should accept that sometimes you*

cannot have the right resources and that should delay the activities rather than doing it partly with incomplete capacity." (Interview # 11). In other words another Interview come up with the same interrogation about the inefficiency related to sharing resources: "*This is a real issue, of course, this continuously changing teaming but for each individual employee it's also very demotivating, very tiresome to switch, very inefficient, from a business point of view, but very tiresome*" (Interview # 10)

1.5.1.3. Budget/Schedule/Quality

What appears clearly by analyzing the data is that the budget is not in the hands of the PM, the schedule is also driven mainly by external factors and the lack of clear specification drives quality as well as cost overruns issue. "*and what you see now is that the software quality is not good. So, they have to repeat work, to repeat work, to repeat work and that's also what will result in EAC (estimate at completion) increases so*" (Interview # 8)

Due to the matrix organization the PM is in the impression he has no autonomy to manage his budget which is in the hands of the line managers: "*No, as I said before the budget is split up-front. So I have four budget numbers and it's allocated to the line management. I have no say anymore on the risk budget for a hardware development department. So why should I care? I only add and tell the message. I think that the PM stands for project manager but it's more messenger than manager, nowadays. Sorry for saying that but it's how it feels, right now*" (Interview # 2)

Another verbatim express the frustrations linked to budget and schedule delays: "*But it took time, it costs money, because they spend a lot of hours, charging on my project for nothing. I cannot help it, I cannot do anything about it… It's also not my project, because I have to split the budget over the development departments. So they get a bag of money, and they will do something for you, and, at the end, if it's not successful they start claiming: "yeah, it was not enough I need more money!". That's the practice right now*". (Interview # 2)

This lack of autonomy on budget and schedule monitoring is recognized by the parent units in general still arguing that a minimum level of autonomy remains within the project, some room to maneuver exists according to one of the Interview: "*The autonomy is very much linked to one moment in the process …./…After he accepted the budget, assuming that there are no ECPs during the project execution, the budget is the budget: it's a fixed baseline and he has a bit of autonomy that, if his certain work packages, if his team is more efficient, he can store these efficiency results within his parameter and can use this to compensate some setbacks. So there he has some room to maneuver within the fixed baseline*." (Interview # 10)

In term of planning as well, the autonomy is limited and strongly linked to the decision made by the unit in term of resources, humans but also material availability. "*Planning is driven, of course, by the availability of resources and material. Resources, we just discussed, autonomy of the program manager in relation to resources, in my opinion, is extremely limited"* (Interview # 10)
Finally it is also mentioned that the lack of requirement associated with a tight schedule drove some anticipation work qualified as poor in term of quality. "*Because we have no resource or not enough resources, and the schedule is important so they already started with the work. But, now we see that the quality is not good."* (Interview # 8)

1.5.1.4. Temporality

For the K project, the temporality, as stated in the previous project, is seen as the contractual time frame. The project is deemed to start at contract signature and ends by the end of the contract. This is the general thinking we observed "*But in essence, a project has a beginning and an end here. So it's temporary, even if it is many years. And I think that yields, by the way, for all the three year here . The project is temporary.*" (Interview #6). Nevertheless when asked some of the Interview question this generic statement : "Starting with the temporality of the project. I think temporality is questionable." (Interview # 10). The same Interview is for example puzzled on the handling of the warranty. Despite the fact that the warranty is very often treated separately to the project (not being considered as part of the project) it remains a contractual commitment. "*The duration of the actual contract obligations is much longer than what we call the project execution phase. When the project, internally, is finalized is not so much clearly defined. We have a gray area starting with the warranty phase ... / ...But for K-130, where we have to deliver several systems, we will run in the standard situation that part of the systems are already under warranty and parts are still in execution. So to deal with that, it's already a topic to be decided upon. In the end, when all systems are delivered, there should be a clear decision*" (Interview # 10).
Another key player sees his role well beyond the contractual timeline boundary. According to him, the most important is to manage the customer relationship and this requires a certain level of stability within the customer's interface community: "*The most easy part is to deliver according to the contract and forget the 20 years. But that's not the right attitude to keep the customer inside Thales. So, we have to take care of, what we call, long-time services. But in the project we have a separate department, creating the service department who is doing the service to the customer. So we have to include them in the project as well. So it's not only running your program to deliver the ship but it's also in the meantime preparing the logistics…" (Interview # 2)*

The same key contributor also highlighted the need for the project core team to be included prior at the bid phase,

"…Yeah, but you start in the bid phase. In the other programs, as well as this one, I start together with the bid manager in the bid phase to understand the customer's needs because what you write down in a contract is only, let's say, half of what is understood from the customer. So in the discussions you learn better about what they really want.

Interviewer: So you were involved in the big discussion?

Yes, also in my previous programs, I was always involved in writing the contract and understanding the customer needs and that's far beyond what is written down. And it helps you during the program to discuss on the right level: what is discussed during contract level and what should be delivered at the end." (Interview #2)

As a summary, our analysis shows a questioning on the temporality of the project organization. Some of the Interview envisage their role prior to the project starts, during the bid phase for example while some others are also questioning the end of the project to embed the full contract commitment like the warranty as well as for customer intimacy in the long run.

1.5.1.5. Object

The analysis on the object attribute for the K project towards the standardization reveal 2 steps in the project organization. At the beginning, as any project the structure put in place was according to the group and unit standard. No deviation was recognize during this first phase. In fact the was no questioning of the structure being inappropriate to execute the K project: *"In my opinion, as I said, project is defined as the execution of a certain set of contractual requirements. So from this respect we set up a project organization in a more or less standard way to execute a contract, at least significant parts of the contract. This project organization is currently supported by the product and project organization. we define work packages in a more standardized way." (Interview # 10)*

Nevertheless, a second phase arose quickly and a new project organization has been set up to cope to improve project execution. We understood the seniority of the PM allowed him to convince the management to set up another organization. From the interview we concluded the change were not major. The Project manager imposed to have the core team sitting together instead of each of them sitting in their department. He also made sure the team would be stabilized for a certain period of time. although the change was not significant, the key players considered t as a major improvement in the functioning of the core team and in the project execution. *"Yeah, so we started with a standard TNL organization, but it didn't work. It didn't work because the people were changing,*

changing, changing and we had no focus and I had no guys in my team that focused on K-130" (Interview #2) another Interview presented it as follow: " *He changed some people, some work package managers.; and it was an important change. The other one is that the communications was decreasing. It was more one-to-one contacts, and less at a team with various levels; to act more efficiently. He changed that" (Interview # 8)*

As a summary, we believe the change have not been major, although efficient and appreciated by the team, and the project organization remained more or less the same. The way people interacted, the special physical location for the team has been appreciated by the team, but the structure of the organization itself remained standard and not much different from other project studied.

1.5.1.6. Processes

For this project, the analysis shows the processes are not questioned and are even requested by the team.: "*Is there anything that we can do that would be better? M: Follow the processes."(Interview #8).* It appears that the request for better following the processes in coming from project issues at one point. The processes were not followed which drove some quality issues and some costs overruns as the job had to be reworked several times.: "*So, it's not in line with the process and what you see now is that the software quality is not good. So, they have to repeat work, to repeat work, to repeat work and that's also what will result in EAC (Estimate at completion) increases* so…" (Interview#8).
One of the key project contributor mentioned the difficulties to apply group project despite their ability to tailor the processes to better adjust to the project needs : "*Yeah, so that's not a position you would like to stay in (laughter). And of course you want to follow the processes within... Chorus has a very good process description of how to run a project with all the tailoring possibilities and you have enough, you know enough theoretically... but to run… the practice is, when you have so many deviations from the process, because of: "it doesn't work like that, we have to do something else"*(Interview # 2)

As a summary, the project definitively tried to follow the group processes while using the tailoring capabilities offered by the Group processes: "*The execution of the project is through the standard processes."* (Interview #10) Nevertheless, the project faced some issues related to the non-respect of the processes. This non-respect is explained by the project team by a lack of discipline more than any attempts to customize the given processes.

1.5.1.7. Approach

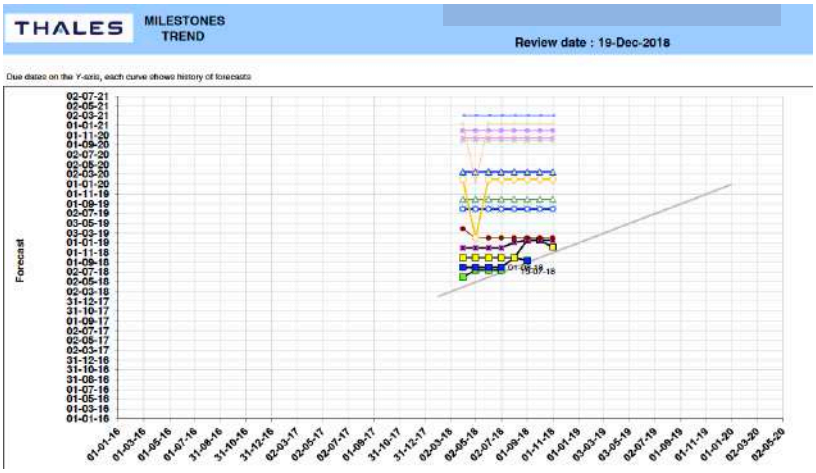
The approach seen for the project is definitively a regular, standard phased approach were milestone are monitored. At the origin of the project, it was supposed to be a repeat order therefore no major development were required nor anticipated. Nevertheless, at the early stage of the project, it became obvious that the products expected to be delivered for the second batch of war ship war were outdated and would require some refurbishment to say the least.

"*…It created tension in the project where a debate arose between specific development for this specific customer and the delivering of product defined in the product policy. At the end, the project was delivering a mix of specific and standard products. If you then go to the K project, uh, I think that's a bit in between because the K project has to reuse what was already there, but also still has to adapt quite a lot only for this specific customer. So not even for the product... Most things that will come out of the K project are not always back in the store again. So if you don't take care, it's a kind of one off for the K project."* (Interview #6)

The specific and product related development have been monitored along the life of the project as different milestones to be achieved. In that sense we can confirm the project was a typical stage phased approach project.

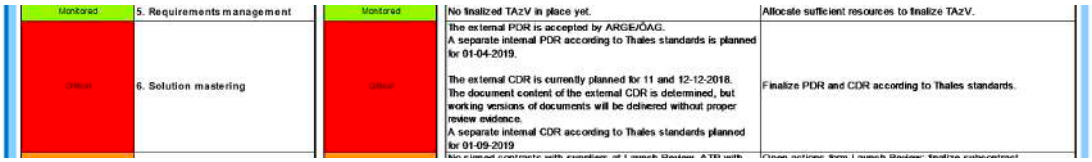
In the project Dashboard presented below (Figure 34) we can follow and monitor the trend of all and every milestones. The fact that the Dashboard has a specific sheet to track the milestone achievement date confirm that we are in a typical phased approach.

Figure 36: The K project, Milestone Trend



The. Dashboard also shows the typical phased approach when evaluating the Risk associated with each Milestone (PDR or CDR).

Previous Assessment	Quality Advice Topics	Current Assessment	Findings	Recommendations



1.5.2. The Supervision practices and reviews for the K Project

In term of supervision, the K project has been monitored following the different layers of supervision in place in the company.

First of all, there has been a monthly project review with the project team and the line managers involved in the project. this project review is hold by the project director of the unit in charge of the coordination and execution for of all projects of the units.

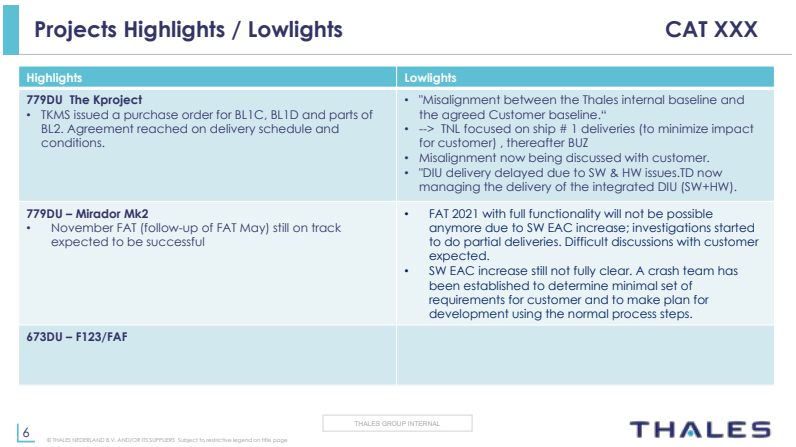
For the review, the project team updates on a monthly basis the Group standard Project dashboard that is aiming to help all parties to understand the project status in all aspects of the project execution. As previously stated in the previous project reviewed, the analysis of the dashboard demonstrates the dashboard is primarily seen as a reporting tools that can be communicated a each et every level of the Group. As an example, the dashboard does not reflect the conflict between the project team and the product team as for the development and delivery of some requirement while the strict appliance of the product policy would require some trade off with the customer. This conflict has been raised by the actors during the interviews but do not appear in the project Dashboard!

As for the South American project, the K project is also reviewed during the Management Business Review (MBR). The MBR is the unit supervisory meeting where Projects and other operational topics (current pursuits (bids) , …) are reviewed from a product axis as well as from a regional axis. Due to the industrial set up and the stakes for future business in the country, the K project has been reviewed multiple times during the regional review. Most of the competitors for futures business were timing-up on this project and the relationship between industrial was tense and subject of political/commercial pressures.

The following figure, is an extract of the regional presentation. The CAT being the Customer account team. The cat is a transverse team that support and follow a specific region.

The extract has been slightly anonymized.

Figure 37: Extract of the Regional Review during MBR



Projects Highlights / Lowlights — CAT XXX

Highlights	Lowlights
779DU The Kproject • TKMS issued a purchase order for BL1C, BL1D and parts of BL2. Agreement reached on delivery schedule and conditions.	• "Misalignment between the Thales internal baseline and the agreed Customer baseline." • --> TNL focused on ship # 1 deliveries (to minimize impact for customer) , thereafter BUZ • Misalignment now being discussed with customer. • "DIU delivery delayed due to SW & HW issues.TD now managing the delivery of the integrated DIU (SW+HW).
779DU – Mirador Mk2 • November FAT (follow-up of FAT May) still on track expected to be successful	• FAT 2021 with full functionality will not be possible anymore due to SW EAC increase; investigations started to do partial deliveries. Difficult discussions with customer expected. • SW EAC increase still not fully clear. A crash team has been established to determine minimal set of requirements for customer and to make plan for development using the normal process steps.
673DU – F123/FAF	

The project also has been widely discussed from a product point of view during the MBR. The fact that the project was initially a repeat order and became very quickly a technical challenge where trade-off between standard product, product policy and specific customer requirement created a lot of tension in the unit, generating delays in the project and some priority challenges for the concerned product roadmap. The following extract (figure 36) shows the dilemma the project brought to the unit:

Figure 38: MBR extract : Product status and Action

The K project (Multi-entity project) **J L/B H.**

- DIU delivery and potential additional costs from security requirements is to be further investigated/resolved by the K project management. This should not (yet) be on the topics escalated to PRB (**action: K project management**)

As a conclusion, the project has been reviewed extensively in all instance due to the political context, the technical complexity and the issues faced by the project team at the early stage of the project.

1.5.3. Conclusion

The K project drove a lot of attention within the unit and the group. It started as a repeat order which should be delivered without major problems, at least that's what the unit had in mind. Very early in the process, the unit concluded that the repeat order would turn mostly into new product development for the unit. The industrial context and the inability of the end customer to finalize its contractual requirement brought to the project a level of complexity that was not expected. Despite the complexity the analysis shows the tight coupling of the K project with the parent unit.

The project scope remained unclear for some time after contract signature mainly due to the inability of the end user to define its needs and therefore the associated contractual/technical

requirements. It is nevertheless obvious that the project scope was a mix of customer specific and standard project where the unit tried to drive customer's needs towards its own product policy.
Like the south American project, the company took also the opportunity of the K project to fund and develop part of its product roadmap. This led the project with significant quality issues that led to schedule delays and costs overruns.

For the resources, the K project faced the same constraints of lack of resources and resources sharing. "*Yeah, so we started with a standard TNL (Thales Netherlands) organization, but it didn't work. It didn't work because the people were changing, changing, changing and we had no focus and I had no guys in my team that focused on the K project*." (Interview #2)

In term of temporalities, the unit follows the same principle meaning the project start at the contract signature and ends at the last delivery of the project. The project team, especially the Project manager was involved before the contract signature and recommends a longer commitment than the system delivery for customer intimacy and long term relationship. Nevertheless from a project organization the project has a temporality linked to its contractual terms.

Finally, The project team, claimed for the respect of Group processes, and used it as a tool to bring back the project on track using the tailoring capabilities the processes were given to adapt as close as possible to the project needs. The processes nevertheless can still be considered as highly standardized for the K project. Due to the schedule constraints mainly, The project team also followed a phased approach to deliver the project, leaving minimal autonomy to the teams in term of development or project execution approach:
the quality of the project execution has been brought to highest expected standard at the costs of the unit.

When referring to the project paradigm evolution the K project would be classify as follow (table 42):

Table 42:The D-X project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The K Project
Temporality	Temporary	Permanent	Temporary/ Permanent
Object	specific	Generic	Generic
Scope	Unique	Standard	Standard Partially customized

Processes	Specific	Standard	Standard tailored
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

1.6. The D-X Project

1.6.1. The positioning of the D-X project towards the decoupling/standardization attributes

The D-X project is the only development project I studied within the Dutch unit. At the time of the study, the development of the project is finished but 2 new production contract for two different customers have been added to the original development project. In addition, at the early stage of the project when the contract was not yet awarded this new development was seen as an upgrade of an existing system installed already since the early 2000's. So over time the project transformed from a development project to small series of system production with very limited change in the core project team and its governance.

1.6.1.1. Temporality

From the temporality attribute point of view, this project is very interesting. At the time of the interviews and at the time of this research the project already shifted from a development project to a production project. In that sense we can question the temporary status of the project which started in 2012, for the development of an upgraded system to which two subsequent production order have been placed. "*I became responsible for the series production for the six systems we are now producing for the X army... for the Navy and the Air Force... And when H. transferred to another function, I became the project manager also for the old project and also for development*" (Interview #1). Each of the three projects could have been executed and supervised separately but the Dutch unit made the choice to maintain the same initial project organization to execute first the development and then the two production order totaling of 6 systems to be delivered to two different customers. In that sense we can discuss the temporality of the project organization and its temporary status. "*The project first was split up in two components: a development and a series component so for the development of the system and the series for the building, the supply chain*

and the production… After a few years, those two are combined so now it's a combined meeting because the last D-X" (Interview #9)

When was the true starting date of the project and when will it end? What about the project organization and the project team if a third production project would be awarded to the unit? Would they close the original project started in 2012 and open a new one or continue and add this new contract to the existing project organization? I believe the unit would keep the same team within the same project. In fact that s what happen for a different system where the project team is delivering in parallel 8 system to 8 different countries…. "*It's also the objective of the new naval organization to organize like that. But I think that it takes some time to come there. And to come back to the smart L, I know that smart L started before the effective date of contract already with all kind of studies and maybe pre-developments and at the end we got a contract because it was sold as an upgrade of the existing smart L on board of the X frigates."* (Interview # 1)

From the analysis of the temporality of the D-X project, we can conclude the D-X project organization can be qualified as permanent. It executed first a development project and then several production orders for different customers.

1.6.1.2. Object

As the D-X project was initially a development project, we could have expected a unique project organization, different from the rest of the standardized customer project organization. In reality, the project organization have been set up to develop the project and then to produce and deliver the systems; "I *hope that we are transferring towards a kind of product organization to have stable teams on product level, but in time of smart L, we had a product development for the launching customer… … and okay we started with the Navy, and after that we got an order for the Air Force, but it was the same product but with some add-on"* (Interview # 1) The core project team has been the same and when they changed, their role was maintain unchanged. We also need to highlight the development started seven years before the interviews and I believe some history of the beginning of the project might have been loss. In addition the project started with a different unit organization that was more project oriented and much less product oriented.

My analysis shows the project team organization remained the same and in fact it was not questioned by the team. The project was at the end composed of 3 different customer projects. One for the development and two production contract. *"if the scope is the same probably the same team*

could do another project as well" (Interview # 9). Another Interviewee said almost the same; "*but in timeline it was a follow-up of the first one which was still in development. So it was logical to have the same team, development team, to embed it, let's say, in the same organization*." (Interview # 1)

It is interesting to note that one of the Interview considers that the current organization did not finalize its transformation towards a Project and product organization and some un-clarity remains that should be fixed: *"We have to make some other steps, but we also have to organize it in that way, because now I get the feeling that we are in between, we are looking, we are searching for things, and as a result of the lack of certain things, we do it on our own. Because we have to go on" (Interview #1)- "I think that organization was already in transferring towards a product organization to have building blocks, common architecture to have it efficiently developed to reuse these kinds of things for new developments" (Interview #1)*

As a conclusion and despite some willingness to adapt the organization and some uncertainty related to those potential changes or adaptations,, we can conclude the project organization was a generic one.

1.6.1.3. Scope

Initially the project was related to the development of a new radar, therefore we could claim the uniqueness of the scope. Well, this is true to a certain extend as the news development was initially considered as an upgrade of the previous version in service of the radar. In that sense, in term of architecture and development some building blocks re-use were considered. The outcome was also part of group product policy and shared building blocks and common architecture were expected among several system among the French and the Dutch unit. The French unit not being the one studied but another unit covering the same business scope than the Dutch unit. "…*building blocks, common architecture also with Y also with Z from France and because also the development of the common core architecture and the building blocks... Yeah, we had to reuse these things. So it's more than a development, only for this customer"* (Interview #1) –

One of the key unit stakeholder also confirmed at the origin the development was part of the product policy with the aim to sell it to different navy; "*The D-X project, which was the development of a long range radar, the idea was to have a product that we can reach out to other customers to relaunch afterwards other projects. So I think that one is a special... is a development program for a product which should be a key product"* Interview # 6)

Then from a project standpoint, as two production contracts for two different customer have been added, we can easily conclude that the project's scope is standardized and not unique. *"…and okay we started with the naval, and after that we got an order for the air force, but it was the same product"* (Interview # 1)

In that sense, the D-X project is a concrete example of the unit strategy. *"…and indeed, I think this is the ultimate goal of the One Naval organization from the very beginning. Of course, there are some things that disturbed that picture because we not only have the idea of the standard product organization that delivers standard products, but we also want to develop our roadmap by customer funded projects."* (Interview # 3)

As a conclusion, the project's scope is not unique. First of all because of the re-use part on the development and the fact the project was already covering 2 different customer with the same outcome. As mentioned by another Interview, this is the goal of the unit to get funded by customer to develop product being part of the overall product strategy

1.6.1.4. Processes

Like the other Dutch project, in the D-X project, respect of unit processes is a must. *"…Yeah that's the standard… and it's very defined within factory acceptance tests harbor acceptance tests, the sea qualifications, sea acceptance test. All these normal steps are all in place within this project. They started it, they made a list of schedules to deliver all according to Chorus .We try to do it and use all the guidelines as good as possible"* (Interview # 9). The same Interview insists on the continuity of processes and method; *"For the reporting, well I took over from my predecessor and all the processes were already in place and I just followed it up*"

Another key player of the D-X project mentioned the ability given by the unit to tailor a bit the processes but does not mention having to do it for the D-X project; "*I can imagine it was the case, but I think that our organization here in the Netherlands is open for these kinds of tailored processes. If you have a good motivation, then I'm sure that they do not stick with the process… the tailored process is also acceptable."* (Interview #1). Another stakeholder, mentioned it the same way. The unit allows tailoring but the processes are standard and the unit strongly request to follow them. "*think, the process we address it in a certain way that it's very standardized. R: Very*

standardized, limited ways of tailoring. In the PMP, there's a bit of tailoring possible, but we work in a very standardized way using the standardized processes" (Interview # 10)

As a conclusion, for. The D-X project I can conclude that the processes used were standardized and reinforced by the project team.

1.6.1.5. Resources

From a resource point of view, the D-X project is also different than the two other projects in the sense that it started way earlier, in 2012. At that time, the unit did not have the same organization. The unit organization was more project oriented and was not suffering from resources shortage. Resources issues started to appear in the late phase of the development after the restructuring in 2015 and during the business ramp up of the unit from 2018 to 2020. During this last period, the project was, dealing with the last development issues and with the production of the radar to be delivered to de two different customers.
At the time of. The study, the project is managed the same way as the other projects. Resources are shared within project and switch from one project to another depending on the priority which is seen as a source of tension by the team; *"What tension do we see? The people at this moment are put together as a project team but they also work on other projects."* (Interview #9)

Each and every project needs to "promote" its own project to increase their chance to get the right resources at the right time.; *"yeah we always have to fight to get the right attention and prioritizing of our project. That's one of the… It's not a dedicated fully dedicated team"* (Interview #1)

As already mentioned, sharing resources is seen as an issue as people have then to switch from one project to another, from one problematic to another, and there is a time to reconnect with each project that clearly influence the project and individual productivity; "I think that it's totally counterproductive to swap around critical resources every now and then" (Interview# 11). This also drive some frustration as one of the project team member mentioned*: "I think that management needs to stick to what they are saying. If we have a launch for a project and they say okay this is your master schedule, this is the funding, this is the resources, you have commitment of the resources: stick to those commitments! Don't reject your commitment and say yeah now the prioritizing is different"* (Interview # 9)

The analysis leads me to conclude that the resources on this project are shared and not dedicated to the D-X during it s execution. In that sense, despite the fact the project has been launched prior to the reorganization, the project had to fit in the new unit structure. It is nevertheless not very clear what was the resource policy before 2015. I know that resources were shared but it is not possible to conclude to which extent the resources management was different before the new organization.

1.6.1.6. Budget/ Schedule/ Quality

The analysis shows the project team has not a full control of the budget and the schedule. The D-X project is a major development project for the unit. The radar under development is a key element of the unit product policy. It is also a customer funded development which makes it special as compared to the other project studied. All the quality issues or the scope issues identified will impact the project. This is what happened to the project when a security issue has been detected. The project has been requested to take the issue from a project standpoint into account, to bare its costs and to fix it. In that sense, the project team does not have a full autonomy in regards to the budget, schedule and the quality of the outcome.; " *This activity plan, I remember very well, was about 1.3 million euros. So it was significant. I presented it to the management, and asked them how do we do this; because self-funded was not an option. "Well I did not take it into account". In the contract there was no budget, not in naval and not in the air force… So what do we do? Do we take the risk that something will happen here on the plant or maybe in the field. Someone said: "No, we don't want to take this risk, to end up in the newspaper". So they asked me to take it into account in the current development and they agreed then that my estimate at completion was 1.3 million higher. Okay, I think it's very fair to present it and to decide on this kind of thing together, and from that moment I reported on this functional safety implementation also separately to G. so that he was aware of the progress of this issue. That's what I liked the most... Yes, I feel a lot of pressure, of course, in development projects but it's also very challenging and I think that it's a common achievement of the project and also of the management, including the resource management, to make it a success of the project"* (Interview #1)

This long verbatim is interesting for 2 reasons. It demonstrates the lack of autonomy of the Project Manager that is forced to accept to bare product development overruns on his project funds while it should be funded by Self-Funded Research & Development.(SFRD). The Second interesting fact out this verbatim is that the PM totally integrated this lack of autonomy in his reasoning so this lack of autonomy is not seen as an issue from his side. It is in the interest of the company to fix the issue therefore he does not question the funding source to fix it.

1.6.1.7. Approach

The D-X project has been developed in a very standard way for the unit. Following different steps, passing different milestones that were all followed carefully. *"... it's very defined within factory acceptance tests harbor acceptance tests, the sea qualifications, sea acceptance test. All these normal steps are all in place within this project. They started it, they made a list of schedules to deliver all according to chorus"* (Interview #9).

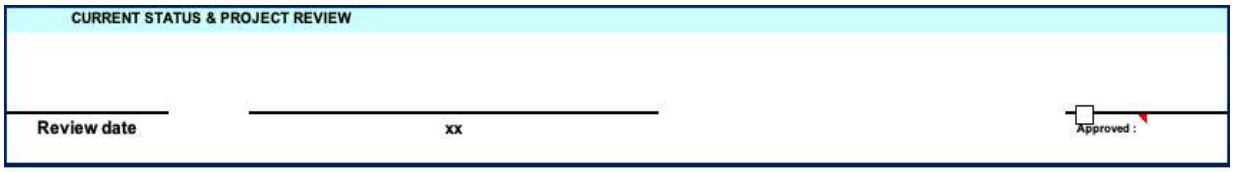
When I questioned one of the unit leader about the risk of reducing the potential in Innovation of the unit he answered that they are pragmatic and are preferring developing an industrialized product with the latest technology rather than looking at innovation for the sake of innovate; "*Because if I looked at the company here, if we would have done that, I'm quite sure maybe we would have even funnier, smarter things in it. But the real question is would we have been able to produce it, for example, because we do not deliver only an algorithm to the customer. It has to be a system that is working for 30 years, including the panels on the front end and the delamination and all the other things. So if you only put your engineers in it, then it might be a very nice algorithm, smart things, but is this producible for certain, and is it also then affordable by the customer? Is it payable by the customer? So in essence, I think that we have an innovation process which is rather independent from the engineering approach, by the way. Yeah, our complete innovation cycle with all the level of TRL and everything which is in it, is quite a nice innovative process and it is a bit independent of the engineering approach*" (Interview #6)

As a summary, this development and production project has followed all the main processes and the execution approach has been as per the standard for the development part as well as for the production part following several milestones subsequent to each other's.

1.6.2. Reporting supervision structure

The D-X Project was reviewed by the project team and the unit management team during the project review that was held once a month. A standard project dashboard is maintain by the project team and is presented during the monthly project review as any other project of the unit.

Figure 39: Review dates sheet from the Project dashboard



CURRENT STATUS & PROJECT REVIEW

Review date xx Approved :

PROJECT CHARACTERISATION DECISION

Project event	Date	Project category	Supervisory Authority
at Hand Over Review	dd-mmm-yyyy	A2	CBU
at Launch Review	dd-mmm-yyyy	A2	GBU
updated	dd-mmm-yyyy	A2	
updated	dd-mmm-yyyy	A2	

PROJECT REVIEWS SCHEDULE

Nr	Review level	Planned	Actual
01	Naval	10-Jul-2017	10-Jul-2017
02	Naval	14-Sep-2017	14-Sep-2017
03	Naval	11-Oct-2017	11-Oct-2017
04	Naval	6-Nov-2017	6-Nov-2017
05	Naval	30-Nov-2017	30-Nov-2017
06	Naval	9-Feb-2018	9-Feb-2018
07	Naval	8-Mar-2018	8-Mar-2018
08	Naval	4-Apr-2018	4-Apr-2018
09	Naval	8-May-2018	8-May-2018
10	Naval	12-Jun-2018	12-Jun-2018
11	Naval	6-Jul-2018	6-Jul-2018
12	Naval	4-Sep-2018	4-Sep-2018
13	Naval	4-Oct-2018	4-Oct-2018
14	Naval	7-Nov-2018	7-Nov-2018
15	Naval	10-Dec-2018	10-Dec-2018
16	Naval	16-Jan-2019	16-Jan-2019
17	Naval	5-Feb-2019	5-Feb-2019
18	Naval	6-Mar-2019	6-Mar-2019
19	Naval	1-Apr-2019	17-Apr-2019
20	Naval	6-May-2019	6-May-2019
21	Naval	12-Jun-2019	12-Jun-2019
21	Naval	10-Jul-2019	

Source Standard Project Dashboard

In addition to the monthly project review, the D-X project has been reviewed by the unit, the business line and the country management team during the monthly BMR, the Business Management Review. Being part of the supervising team, I have very often addressed the D-X project issues through the Business management review.

We reviewed the project from a customer angle as the customer was very important for the unit. Therefore, any delay, any issues were escalated very quickly and reviewed at the highest level of the country organization. It was also important to review it at country level and from a customer standpoint as there was other key funded developments projects at stake under discussions. Therefore the need for a tight monitoring and tight coordination between all the parties involved in the relationship with this major customer.

The D-X project faced also technical issues driving significant costs impact. The project was therefore review and monitored from a product standpoint by the unit and the product team. Problems were related. To production issues but linked to initial development recommendation. The gluing process of the radar's panels was very complex and not followed by the subcontractor which led to significant delays and financial impact to the project. We received complaints from the customer and the issue had to be resolved in a duly time frame.

Noise from the radar was also a complaint as one of the radar was located not far from a village and neighbors were complaining. The radar was conform to the noise requirement and we were

not able to replicate the same noise level with the radar we kept for testing. It took us several months to solve the issue under some pressure from the customer.

As a summary, the D-X project was reviewed with a standard project review by the project team but due to the importance of the project, it was also reviewed monthly in the business review from a customer and a product angles.

1.6.3. Conclusion

The analysis of the D-X project demonstrates the tight coupling and the high level of standardization of the project. IN term of temporarily, the permanent status of the project can be claimed as from a development project, the D-X project was added to different production customer contract, extended therefore the duration of the existence of the project organization. The initial scope of the project could have supported a unique status but analysis shows that the D-X project was an upgrade of the preexisting radar and re-use from the previous version as well as with the French version was the keyword.

One of the project team member, acknowledged the organizational transition of the unit from a purely project oriented organization to a more balance project and product organization. *"We have to make some other steps, but we also have to organize it in that way, because now I get the feeling that we are in between, we are looking, we are searching for things, and as a result of the lack of certain things, we do it on our own because we have to go on…"* Interview #1). This transition created some tension but the its value is recognized by the team.

In term of supervision, the D-X project as already mentioned was loosely monitored. This close monitoring is due to the importance of the customer on one side and the importance of the new radar in the product strategy of the unit. In one sense the project suffered on the need for alignment between the customer needs and the overall unit product policy; "*the main tension is that the funding for the development is coming from the contract, from the customer, and the project organization should ensure that whatever the program organization is delivering meets the requirements of the standard product organization. The output should be in line with our standard future product portfolio and not a one-off customer specific. So that is the tension during the development phase"* (Interview # 10)

The overall analysis of the project using the 9 attribute framework is summarized thereafter the project is fully aligned with the current project paradigm being standardized long lasting organization tightly coupled to its parent unit.

Table 43: The DML project characterization

	Definition 1930's-**2010's**	Paradigm 00's-10's	The D-X Project
Temporality	Temporary	Permanent	Permanent
Object	Specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

From a supervision standpoint, the project is reviewed though 3 different angles. The project angle during the project review, the customer angle and the product angle during the monthly Business Management Review.

2. INTRA-UNIT INTER-PROJECT ANALYSIS

In this section, I am comparing the projects of the same unit and I demonstrate the recurring patterns in term of project execution practices, governance and use of unit standards. The outcome is double.

The first one is the demonstration of the embeddedness and tight coupling of the projects within the parent unit.. In the second part I analyze the adequacy between the supervision practices of the units and its project execution practices and demonstrate whether or not the coupling factors of the project organization is taken into account in the project supervision practices of each unit.

To analyze the coupling level of the projects I have followed the same principle used for the projects analysis and have used the 9 attributes framework to conclude at the unit level.

2.1. The French Unit

2.1.1. The attribute Framework Analysis

2.1.1.1. Temporality

Table 44: The temporality attributes within the French Unit

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Temporality	Temporary	Permanent	Permanent	Permanent	Permanent

The temporality of the project organization is not questioned by the unit. The project starts at contractual T0 and end at the end of the last contractual delivery that could be a warranty or a maintenance. Nevertheless, the project team remains the same for every project, with the same organization, the team member are also the same so there is a real continuity in the project organization that lead me to categorize the permanent temporality of the project. The beginning and end date of each project is more a administrative information to monitor contractually and financially the project but has nothing to do with the reality of the project organization temporality. On the Caribbean project, the first line, the maintenance of the first line, the second line have been managed by the same project team, on shore and offshore. Once delivered, the maintenance of the second line will also be manage by the same team. The two other project are more of a one off project: There has been no line extension, nevertheless during the execution of the maintenance, the project team remained operational. In the onshore unit that is not part of the research, the project organization have been fully maintained to execute the maintenance. So the context of the 3 projects are not the same, the Caribbean is a real example of the permanent characterization of a project organization while the one off status of the 2 other project provide less insights. Nevertheless the fact that the French controller and the French Project Manager were the same for the WWC and the DML project confirms the permanence of an overall project structure (Project factory) within the unit.

2.1.1.2. Object

Table 45: The Object attribute within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Object	specific	Generic	Generic	Generic	Generic

For the French unit, there is one standard organization and it has to be used for all project. One of the Interviews did mention that in term of process they did not ask the project team for any customization. This statement is also true for the Project object that is not challenged and not adapted to the need of the project. Group standard is the basis and needs to be followed

One of the Interviews, though, highlight what he calls the repeat project and the pioneer project. For the repeat project, he considers that the group organization is well suited and does not require and tailoring from the unit. For the pioneer projects such as DML recent experience shows that adapting the organization might have been beneficial:

"***** *I think it's true, the real thing. There are two types of things: the pioneer projects like GPA and DML, which must be treated separately, with real complexity and its dependencies here and there. Perhaps the organization of purely projects, we must find a happy medium between the first project and this articulation. It is complex and after all the projects that are repeat or Caribbean Projects, even if there was volume, as I said, they were not really product developments because they were not done on DML or if you have a super mature product, typically before, we were in Line 1. So it makes sense to have a dedicated project team with which you can do fine tuning with the client on subjects that are a little different from the product, etc. On these projects, I would say that the project organization seems to me to be adequate and relevant. On the big projects that I call pioneer projects. There is a real subject of reflection and we have tried hard to draw on DML, etc., in order to avoid making the same mistakes. So as not to make the same bullshit on the GPA*" (Interview #12)

At the time of the research and the interview, no change in project organization were defined to handle what the interviewee called pioneer project.

2.1.1.3. Scope

Table 46: The Scope attribute within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Scope	Unique	Standard	Standard	Standard	Standard

When the specific becomes the generic: The case of French unit is interesting. As previously mentioned there was a generic development ongoing when the DML project started. This Generic product was supposed to be implemented for all the project included the WWC, the Caribbean and the DML project. The DML execution issues were such that at one time, it has been decided to merge the product and project teams and that the DML product instantiation would become the generic product. The WWC and the Caribbean were also delivered this solution that was from a

technical standpoint largely oversized as compared to the contractual requirements of both projects.

The 3 projects demonstrates that the product delivered was not as per the contractual requirement for two of them but standardized in the way that one fit all… In this regard, the scope is strongly standardized in the French unit.

2.1.1.4. Processes

Table 47: The Processes attribute within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Processes	Specific	Standard	Standard	Standard	Standard

In term of process, once again the unit does follow the Group standard. There is no need for tailoring as per the leadership team. "***** *In terms of process, project management, in relation to the Thales process, we didn't tailor it, we didn't even suggest it to the project team and they followed the Thales process as in most projects. A dashboard with everything associated, Project Review by entity by BL and conso at the premium level with the GBU (Global Business Unit) or and there I think it is the Chorus process."* (Interview #13)

The above statement is self-explanatory in the sense that the unit is following group standard and has not appetite to derive from the Group instructions and processes.

2.1.1.5. Resources

Table 48: The Resources attribute within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Resources	Dedicated	shared	shared	shared	shared

From a resource perspective, the projects have little autonomy. Resources are shared and resources allocation are decided at unit level, at Business Line or GBU level depending on the level of escalation that the situation is requiring. When the DML became so problematic to the GBU all resources were allocated to the project. All Engineering resources were also allocated to the product development. Many other projects from the Business Line managed by different units but dependent of some French outcomes suffered a lot from these resources allocation choices. " *****Yes,

and it also created an additional tension between the countries and the BL because at one point it was the BL that was asked to make decisions on project priorities. If you're in Sydney, your priority is Sydney and you don't care about the rest. In Spain, it's Spain and this has created a bit of tension between the BL and the countries to manage all this." (Interview #13)

2.1.1.6. Budget/schedule/Quality

Table 49: The Golden triangle attributes within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project
Budget	Not limited	Constrained	Constrained	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent	Stringent

The project team of the Caribbean project has some autonomy in term of budget management. this is due to the lesser visibility of the project and the limited execution impact the project faced. As mentioned by one of the Interviews, this is a repeat order, the team is well structured and knows the customer and the country: All the potential product issues have been cleared within the DML project so at the end the project had more autonomy than the WWC and obviously the DML project. For the 2 remaining projects, the budget was driven by the Business Line for the WCC project and by the GBU for the DML project, given no budgetary autonomy to the project teams.

In term of schedule, the attribute analyses showed the interdependence between project and the priority given to the DML project by the GBU, impacted significantly the WCC and Caribbean project schedules. Both project suffered from the resources allocation choices as well as the increased complexity of the generic product leading to additional development delays: In that sense within the unit, the project team have limited autonomy in term of financial and schedule management.

2.1.1.7. Execution Approach

Table 50: The Execution approach attribute within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The WWC Project	The Caribbean Project	The DML Project

Approach	Trial & Errors	Phased Concurrent	Phased	Phased	Phased

Despite the difficulties faced by the unit to develop the new product, at no time the execution approach has been questioned. The product has been developed following a phased approach: At one point, the Project team of DML and the product team have been merged and the DML specifications became the generic specifications but all of those changes occurred within the group recommended development phased approach.

2.1.1.8. Conclusion

Table 51: The Attributes categorization within the French Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The French Unit
Temporality	Temporary	Permanent	Permanent
Object	specific	Generic	Generic
Scope	Unique	Standard	Standard
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

The analysis of the French unit, summarized in table 51, clearly demonstrate the affiliation of the French unit and its projects to the Current Project paradigm. Very little autonomy are given to the project team and Group Processes and standard are the mandatory journey to follow when executing a project. The unit and its members do not question this statement and comply without difficulties or questioning.

The French transportation business has been integrated to a large Defense unit of the group and the adherence to the group standard has been since the beginning a "no brainer".

2.1.2. Adequacy between project execution and project supervision

In the following part, we first present the monitoring and the supervision practices within the unit. We then conclude on the adequacy between the project positioning in the parent unit and the supervision practices in place.

2.1.2.1. Project execution

*"*In terms of process, project management, in relation to the Thales process, we didn't tailor it, we didn't even suggest it to the project team and they followed the Thales process as in most projects. A dashboard with everything associated, Project Review by entity by BL and conso at the premium level with the GBU (Global Business Unit) or and there I think it is the Chorus process."* (Interview #13).

This statement is a good summary of the unit culture at the time of the Study. Project were executed as much as possible as a standalone delivery following group guidelines in term of processes, standard and execution instruction. Very little autonomy is given to the project team and the unit aims to be compliant with all group guidelines. At the same time, the unit starts to initiate a product policy leading to more standardization in term of scope and features to be proposed to the customers. They have had a pragmatic approach when the DML product became the generic product. Nevertheless they did not recognize at that time the additional step of the unit towards standardization. "*But it's actually, me, when I took over. DML At the same time as I took over the domain, there was at the beginning, a bit of a worm in the fruit because we were an ICS system on DML or the ICS part, and I found that the team expected a lot from the BL, which was supposed to take care of the product, even though the essential resources were there..../... So what I did was to merge the two teams. We said product equals project, that is to say that we said to the product teams you will now deliver DML and then the others, that means that you develop on the DML Spec, you stop with your product spec. So, it was very disruptive because it meant giving up having a product, etc. And so on. So there was a lot of resistance. We didn't manage to do it completely, but in any case, it was that the product started to develop on the Spec DML and so in the end, it was a big product project. And the other projects? They used these developments, that is to say, all of this was developed, debugged. We made it work on DML and the other projects that were just behind it and less demanding in terms of functionality, because most of the requirements were more restrictive on DML. They inherited the product versions/DML project to do their thing,"* (Intreview 12). In this Verbatim we see the unit is in transition between a more product oriented company but anytime there are project issues, the project axis is coming back as the main axis…

The unit is still organized to execute project independently and individually while the analysis demonstrated an important interdependency between project. In term of scope, the DML product became the generic product, being delivered to the two other projects studied, the WCC project and the Caribbean project. In term of resource, budget and schedule, the WCC project and the Caribbean project suffered from the priority given to the DML project. Finally, the WCC and DML being in the same country of destination with the same final customer that it would have make

sense to execute the two project more jointly creating some synergies that the Merging of DML Coms and Signaling did not bring.

2.1.2.2. Project supervision

The Project supervision for the three projects follows the same belief of the unit that Group standard and Group instruction are to be followed. Each of the project studied has been supervised using the group standard dashboard and reviewed during a project review. This is emphasized by one of the interviewee: "**For me, I believe that the project review is essential, .../..., because for me, in the project review, what is important is that the dashboard is up to date, because it's mainly a tool for the team to monitor the progress of the project, to have all the information they need to manage the project well, but after the project review it should only be a presentation point to share the status of the project, not more than that, and it's there to deal with important enough subjects to highlight them and take action*" (Interview13)

Despite the fact that the Caribbean project did not face major concerns or issues, the project as per its categorization has been review at two different level of the organization. First at the unit level and then, due to its size (contract value) reviewed at the business level. As part of the business line management team I have most of the time attended to this project review. The project was reviewed quickly as it did not require a real Business line involvement and no major decision had to be taken most of the time. The meeting was set-up for the sake of Group standard compliance.

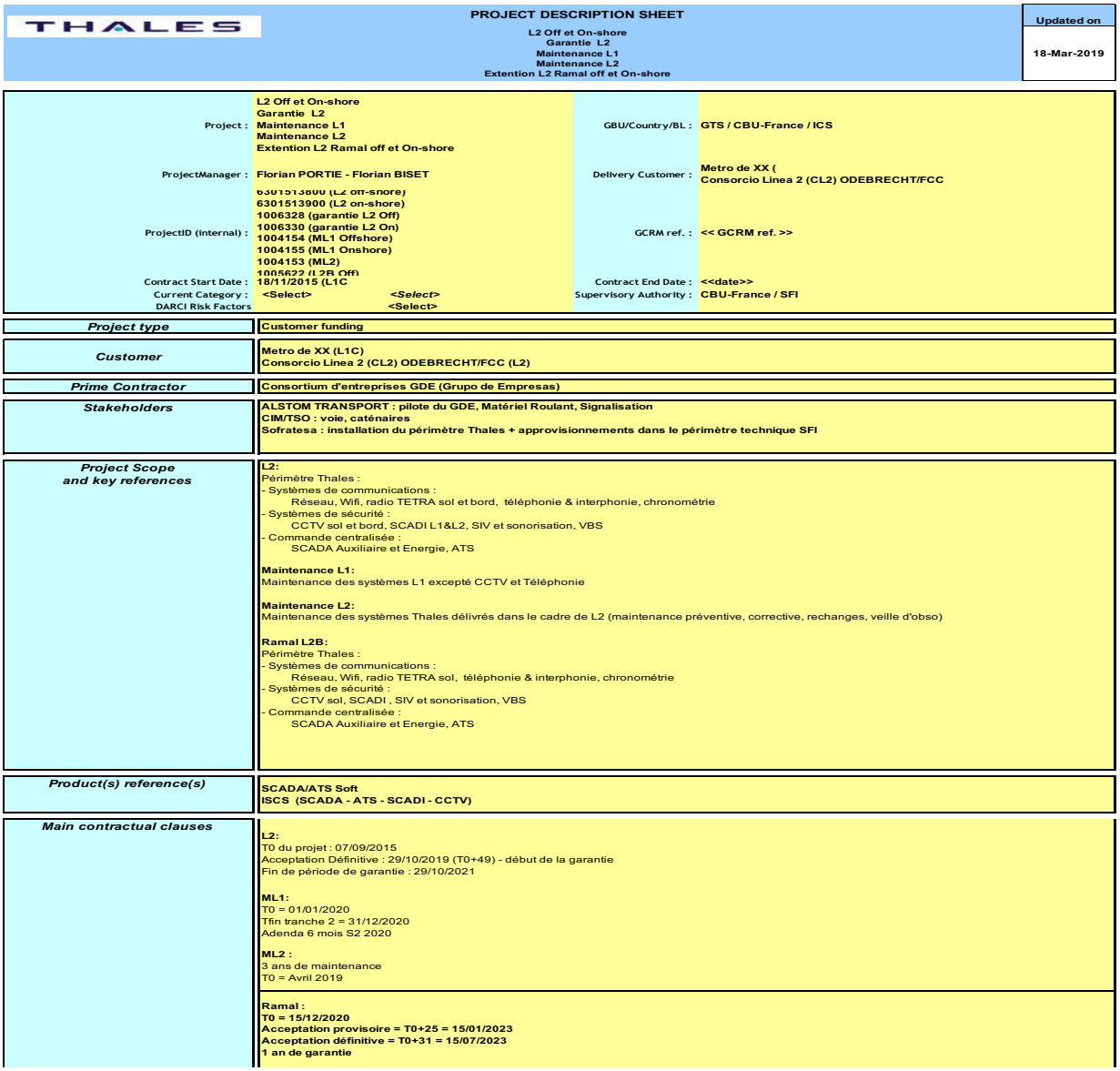
The WCC contract was also initially categorized such as the Business Line supervision was mandatory. Very soon the project became critical and required the supervision of the GBU. The GBU was so involved in the DML project that it did not took leadership on the WCC project. The GBU while attending the monthly project review relied and delegated the leadership of the project to the Business Line. Finally, the DML project, despite the organization changes, the merging of the product team and the project team, never stop to be reviewed every month in a project review. One at the unit level, one at the Business Level, a third one at the GBU level that was overseeing eh overall project including the signaling activity. There was also a corporate review once per quarter as the project was critical at group level as well.

As a conclusion, the French unit supervised its project using the group tools, including the standard project dashboard and the monthly project review. There was no other forum at the unit level to discuss and supervise the different projects and their interdependencies.

The following figure 38 is the front pages of the different dashboard for the 3 French projects we studied. This demonstrate the standardization of project monitoring in the French unit. The dashboard is composed of more than 20 different sheets addressing different topics sur as schedule, risk, financials, quality etc etc. It is not possible to attached all sheets to demonstrate the strict use

of standardized group Dashboard. The cover sheets have been anonymized has much as possible for the sake of this document.

Figure 40 front pages of the French Dashboards (DML, WWC & Caribbean Projects)



THALES

PROJECT DESCRIPTION SHEET

L2 Off et On-shore
Garantie L2
Maintenance L1
Maintenance L2
Extention L2 Ramal off et On-shore

Updated on: 18-Mar-2019

Project :	L2 Off et On-shore Garantie L2 Maintenance L1 Maintenance L2 Extention L2 Ramal off et On-shore	GBU/Country/BL :	GTS / CBU-France / ICS
ProjectManager :	Florian PORTIE - Florian BISET	Delivery Customer :	Metro de XX (Consorcio Linea 2 (CL2) ODEBRECHT/FCC
ProjectID (internal) :	6301513800 (L2 off-shore) 6301513900 (L2 on-shore) 1006328 (garantie L2 Off) 1006330 (garantie L2 On) 1004154 (ML1 Offshore) 1004155 (ML1 Onshore) 1004153 (ML2) 1005622 (L2B Off)	GCRM ref. :	<< GCRM ref. >>
Contract Start Date :	18/11/2015 (L1C	Contract End Date :	<<date>>
Current Category :	<Select>	Supervisory Authority :	CBU-France / SFI
DARCI Risk Factors	<Select> <Select>		

Project type	Customer funding
Customer	Metro de XX (L1C) Consorcio Linea 2 (CL2) ODEBRECHT/FCC (L2)
Prime Contractor	Consortium d'entreprises GDE (Grupo de Empresas)
Stakeholders	ALSTOM TRANSPORT : pilote du GDE, Matériel Roulant, Signalisation CIM/TSO : voie, caténaires Sofratesa : installation du périmètre Thales + approvisionnements dans le périmètre technique SFI
Project Scope and key references	**L2:** Périmètre Thales : - Systèmes de communications : Réseau, Wifi, radio TETRA sol et bord, téléphonie & interphonie, chronométrie - Systèmes de sécurité : CCTV sol et bord, SCADI L1&L2, SIV et sonorisation, VBS - Commande centralisée : SCADA Auxiliaire et Energie, ATS **Maintenance L1:** Maintenance des systèmes L1 excepté CCTV et Téléphonie **Maintenance L2:** Maintenance des systèmes Thales délivrés dans le cadre de L2 (maintenance préventive, corrective, rechanges, veille d'obso) **Ramal L2B:** Périmètre Thales : - Systèmes de communications : Réseau, Wifi, radio TETRA sol, téléphonie & interphonie, chronométrie - Systèmes de sécurité : CCTV sol, SCADI , SIV et sonorisation, VBS - Commande centralisée : SCADA Auxiliaire et Energie, ATS
Product(s) reference(s)	SCADA/ATS Soft ISCS (SCADA - ATS - SCADI - CCTV)
Main contractual clauses	**L2:** T0 du projet : 07/09/2015 Acceptation Définitive : 29/10/2019 (T0+49) - début de la garantie Fin de période de garantie : 29/10/2021 **ML1:** T0 = 01/01/2020 Tfin tranche 2 = 31/12/2020 Adenda 6 mois S2 2020 **ML2 :** 3 ans de maintenance T0 = Avril 2019
	Ramal : **T0 = 15/12/2020** **Acceptation provisoire = T0+25 = 15/01/2023** **Acceptation définitive = T0+31 = 15/07/2023** **1 an de garantie**

THALES

FICHE DESCRIPTIVE PROJET

DML (106301513500)

Nom du Projet :	DML	GBU/Country/BL :	GTS/FR/ICS
ProjectManager :	A.CRUCHET	Client	QRC
ID Projet (interne) :	106301513500	GCRM ref. :	82180546
Date début contrat :	20-Feb-15	Date fin de contrat	31-Oct-19
Catégorie courante :	CP *Multi-Entity Project*	Supervisory Authority :	BL GTS

Type de projet	Customer funding
Client	QRC
Société titulaire du contrat	Thales Canada, Transportation Solutions
Parties prenantes	QRC
Périmètre projet et réf. clés	Full turnkey Metro system package (Signaling, Communication, AFC, Trackworks, Power, Depot, Rolling Stock, Platform Screen Doors, Tunnel Ventilation, Overall System Integration) Part of the DML plan to be implemented in 2 phases 4 metro lines planned Phase 1: 86 km (69km in tunnel, 17 km outside), 37 stations, 75 Trains (base)+ 5 trains (option), 1 ICC, 1 ECC, 2 depots Thales is part of a Consortium (Mitsubishi Heavy Industries, Mitsubishi Corp, Hitachi, Kinki Sharyo) with 12.9% of the contract T0 = 20/02/2015 Contractual milestones attached to LDs (LDs capped 10% of the contract value, but if Thales is responsible of the delay, maximum up to 20% of Thales contract value) • 1st 4 Trains Arrive in Doha, Shipment and Delivery - 02/08/2017 - 0.0002% per day • Section 1 (Green Line) Complete, TOC - 31/10/2018 - 0.012% per day • Section 2 (Red Line N and South) Complete, TOC - 30/04/2019 - 0.034% per day • Section 3 (Gold Line, Blue Line and HIA) Complete TOC - 30/10/2019 - 0.012% per day TCS scope before VO 21 : Telecommunications & SCADA Telecommunications contains MOI Radio subsystems, Radios BBRS, Wifi Acces and Public cell Phone, CCTV, Acces Control and Intrusion detection, Fire Detection in tunnels, Dynamic signage, PIS, PAS, PES, PABX & ECS, WAN-LAN.
Référence(s) Produit(s)	ICS France : ISCS platform is integrating SCADA, PIS PAS PES , CCTV and ACS IDAS ICS Portugal : APIS product
Principales clauses contractuelles	FIDIC contract

THALES

PROJECT DESCRIPTION SHEET

WWC LRT (106301513200)

Review date : 1-Jul-21

Updated on

28-Feb-2020

Project :	WWC LRT	GBU/Country/BL :	GTS/FR/ICS
ProjectManager :	M. RADOVIC (GPM) / L. GUERARD (PM Offshore)	Delivery Customer :	QDVC
ProjectID (internal) :	106301513200	GCRM ref. :	82274040
Contract Start Date :	22-Jan-15	Contract End Date :	22-June -21 (Inclusive of warranty period)
Current Category :	A2 *Multi-Entity Project*	Supervisory Authority :	GTS/FR/ICS
DARCI Risk Factors	<Select>	Contract Value:	Single Performance Obligation overtime

Project type	Customer funding
Customer	QDVC: , for QRC
Prime Contractor	Consotium TCS + Thales Gulf
Stakeholders	QDVC Thales France SFI Thales Portugal (PIS/PAS) Thales Italy (AFC)
Project Scope and key references	The WWC Light Rail Transit (LRT) will serve the 19 districts of the Nnewcity and it will connect the city to the new international Airport via the DML prokject WWC LRT project consists in: • 4 Tramway operating lines; • 17.8 km of double track at grade; • 8.2 km of single track at grade; • 6.6 km of underground double track in and cover tunnel; • 29 Stations at grade, 9 Underground stations • 1 depot, maintenance /storage facility and test track • OCC, B-OCC • 30 Tramway vehicles using Catenary free technology For WWC LRT project, THALES TCS provides the Communication & Control System (CCS) implemented along the 4 LRT lines, including remote operations from OCC & B-OCC.
Product(s) reference(s)	State here the name(s) of the product(s) associated with this project (either developped/enhanced/supported by the project, or used by the project as part of the Solution)
Main contractual clauses	e.g. specific T&Cs (e.g. FIDIC contract) e.g. kind of payments clauses e.g. penalties / LDs clauses e.g. warranty clause e.g. termination clause e.g. other binding documents e.g. access regime, Customer

2.1.2.3. Adequacy interpretation

From a unit leaders perspective, aiming to respect and follow the Group standards, there was a strong adequacy between the supervision mode of the projects and their organization. Project were organized as a standalone organization that would be reviewed independently every month.

If you look from an external angle, then you would question the adequacy of the project supervision and the project execution. The 9 attributes analysis showed a lot of interdependencies between the projects studied as well and with the external environment.

From a product standpoint, I believe the projects would have had benefited from a product Review or thru a review of the project from a product angle. The DML project became the generic product leading to delivering over capable system the WCC and the Caribbean project. From a schedule and resources standpoint the projects were also interrelated. The Product development lasted longer as more complex with a lot more of technical capabilities leading to schedule delays for the three projects studied. In term of resources, there were all assigned to the DML project leading to delay for the WCC and the Caribbean project.

Overall the interdependencies between the project is demonstrated and a portfolio review would have been beneficial to all projects.

2.2. The Dutch Unit

2.2.1. The attribute Framework Analysis

2.2.1.1. Temporality

Table 52: The temporality attribute within the Dutch Unit.

	Definition 1930's-**2010**'s	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Temporality	Temporary	Permanent	Temporary/ Permanent	Temporary/ Permanent	Permanent

The Duration of each project organization is definitively an interesting topic for the Dutch unit. The unit is in transition from a pure project oriented organization to a mixed Project and product organization. This has an influence to the project organization and its temporality. The D-X is an example where the initial project organization has been kept after the development phase to execute 2 different production contracts. The K project temporality is also questioned by some project team members as the frontier between the project stats and the end of the bid process is unclear and the involvement of the project team in the bid phase has been significant and primordial according to the team. The project team was ready to take over another project with the same organization and the same project team as per the project manager.

My analysis shows that the unit is still organized by project and the project organization has still an existence but the unit is in a transition phase and after having a central PMO, I expect the company to create in the future a central project team, organized to deliver all projects in parallel and relying on the lines organization to deal with all technical and production aspect of the project. They would then be coordinator and would keep the customer relationship. When I left the unit, we were having that in mind and where starting to look at it. *"Sometimes you do three or four projects in parallel of exactly the same. So it's more of a kind of a project factory instead of a project. So there's one very big difference. So the one-offs and the one that you were producing series,…"* (Interview# 3)

2.2.1.2. Object

Table 53: The object attribute within the Dutch Unit.

	Definition 1930's-**2010**'s	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Object	Specific	Generic	Generic	Generic	Generic

Within the Dutch unit, the project organization is generic and does not take into account the specific need of a specific project. Standard project management team is set up within the company rules and standards and each project follows the implementation of the same organization. The genericity of the project object, is not questioned by the organization nor by the project team members. There has been some tailoring from time to time to cope with specific events but overall, the project organization is definitively generic. *"...but most of the projects, we have that same structure in place; at least as I'm aware."* (Interview #4)

The genericity of the project organization also relates to the previous discussion on temporality where I evoked the possibility of having a permanent project execution organization that would deliver and cover all project. The project factory principle could be Implemented within the unit and we see that this would not drastically change each and every specific project organization as they are all built on the same model and would integrate easily in such operating change.

2.2.1.3. Scope

Table 54: The scope attribute within the Dutch Unit

	Definition 1930's-**2010**'s	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Scope	Unique	Standard	Standard	Standard Partially customized	Standard

In term of scope, it is obvious that project do not execute the contract requirements but try to fulfil, contract liabilities while either developing the company product policy or use existing product that may fulfil the contractual obligation but being either over engineered or not 100% aligned with customer expectation.

The south American project for example shows the scope was not fully aligned with customer expectation and the unit used standard product. They also used project available budget to over-deliver scope wise in order to reinforce and develop the company product policy.

For the D-X project, initially a development project, we find out that a lot of existing building blocks from the company product policy were used. It also appeared that unit and the business Line were seeking international commonality by using the same Building blocks in the French and the Dutch development.

It is clear that the unit is already in a product and project mode where standardized product are prioritized. The scope of each and every project is not unique anymore even for development projects. In that sense, for the Dutch projects the Scope attribute is in line with current project paradigm and is categorized as "Standard". Nevertheless the K project is one example were the

Dutch pragmatism has been used. The unit agreed to develop specifics for this important customer that would open the door for future large new contract. The project manager in place convinced the organization to dedicate key resources to the project within the engineering organization to develop and implement those customization. This specific case does not question the overall Dutch organization moving from a one off type of product to standard product but also demonstrate the adaptability of the unit to fulfill important customer requirements;

2.2.1.4. Processes

Table 55: The process attribute within the Dutch Unit.

	Definition 1930's-**2010**'s	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Processes	Specific	Standard	Standard	Standard tailored	Standard

The analysis shows the Dutch unit has set up a strong set of rules and guidelines that people are committed to respect. *"Automatically, you are forced to come up with standards, because if you don't have standards, you cannot do a standard measure. So the more you try to optimize on those attributes, the more standardization you get. So the less freedom."* (Interview #3) The Interviews in general gave the feeling that the authorized level of tayloring was enough for their needs and that standard processes was not an issue for them. Several references have been made to Chorus, the Group process platform where all local and group processes, rules and guidelines are stored. *"What I like about what the group does… is that, in essence, they have a very detailed process, the whole Chorus process and everything which is described. But I think what we sometimes forget that we can tailor it... and it sounds stupid and we can complain about what the group has, but I think the group has rather well described how to do it"* (Interview #6)

Overall, in the Dutch unit, the project organization are following the standard process issued either by the group or by the unit. A minimum level of tailoring is accepted by the standards that is sufficient to the project teams. From a process standpoint as well the project organization within the Dutch unit is well aligned with the current project paradigm.

2.2.1.5. Resources

Table 56: The resource attribute within the Dutch Unit.

	Definition 1930's-**2010**'s	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Resources	Dedicated	shared	Shared	Shared	Shared

The analysis of the 3 project of the Dutch units demonstrates the resources are not dedicated to a single project but shared and manage at unit level. This is the case for technical resources as well as for the project leadership team or for the support functions. *"All the people in the management of the organization of the project had multiple programs in itself and it doesn't work… because if they tell me: "No I have to do something else for another project", "so you're working on my project?", "no no no I have more projects"* (Interview #2).

This drives tension within project and between projects that are competing for the same skills, the same resources. *"So, we are not only sharing but we're also competing for them and all of those resources are in our critical paths so the moment that you swap you are hurting the project that you're swapping it from but you also hurting the resource because they're so little that they're getting on to burnout very fast."* (Interview #5). As metioned by the Interview the concern is not only the potential lack of resources but also the loss of productivity when a team member swap from one project to another, he needs time to ramp up every time he reconnect with one project he left.

The escalation process when project are competing is well in place and is manage at the unit level. This is questionable from a project standpoint but makes obviously a lot of sense at unit level. The unit management will measure the potential of each and every project potentially impacted an will deceide for the best interest of the unit not for the best of a dedicated project. *"…it is. I think there's a total lack of autonomy in the project team for staffing. Staffing is fully decided by the structural organization; constraints that the program team is encountering, they can address it to this escalation meeting and, there, the structural organization decides".* (Interview #10)

To summarize, the resources are shared within the Dutch unit, aligned with current project attributes. The resources sharing process is driven by an escalation method managed at unit level which can be detrimental to a project vs another one. The level of autonomy of the project in term of resource management is by choice of the unit very limited and each project is tightly coupled to its parent entity.

2.2.1.6. Budget/schedule/Quality

Table 57: The golden triangle attributes within the Dutch Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Budget	Not limited	Constrained	Constrained	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent	Stringent

The budget of the project are constrained in the Dutch projects. There is an initial budget the project team needs to monitor and respects. Nevertheless, we clearly also see the project Manager are not autonomous in the budget management which is also subject to Management "interferences". In the south American project, the Project team had to suffer from a budget variances following the instruction to include in the project financials the development of one part of the product policy of the unit. One of the project team member reported this during its interview and complained about it.

The schedule is also intricated to the overall schedule of the project portfolio. Depending on the decision made by the units in term of resources allocation, product development priorities and the eventual subsequent financial impact of any delay, the schedule of the project may vary drastically whatever actions the project team could make.

This lead also to quality issue where in the K project and the South American project, some schedule impact led to low quality delivery that had to be overcome later during the project execution; "… *Because we have no resource or not enough resources, and the schedule is important so they already started with the work. But, now we see that the quality is not good*." (Interview # 8)

As a summary, within the Dutch units, the projects are aligned with the current project paradigm and the level of autonomy left to the project teams is minimal as most of the decision are taken at the unit level. (Product priorities, resources allocations, financial scope etc etc…)

2.2.1.7. Execution Approach

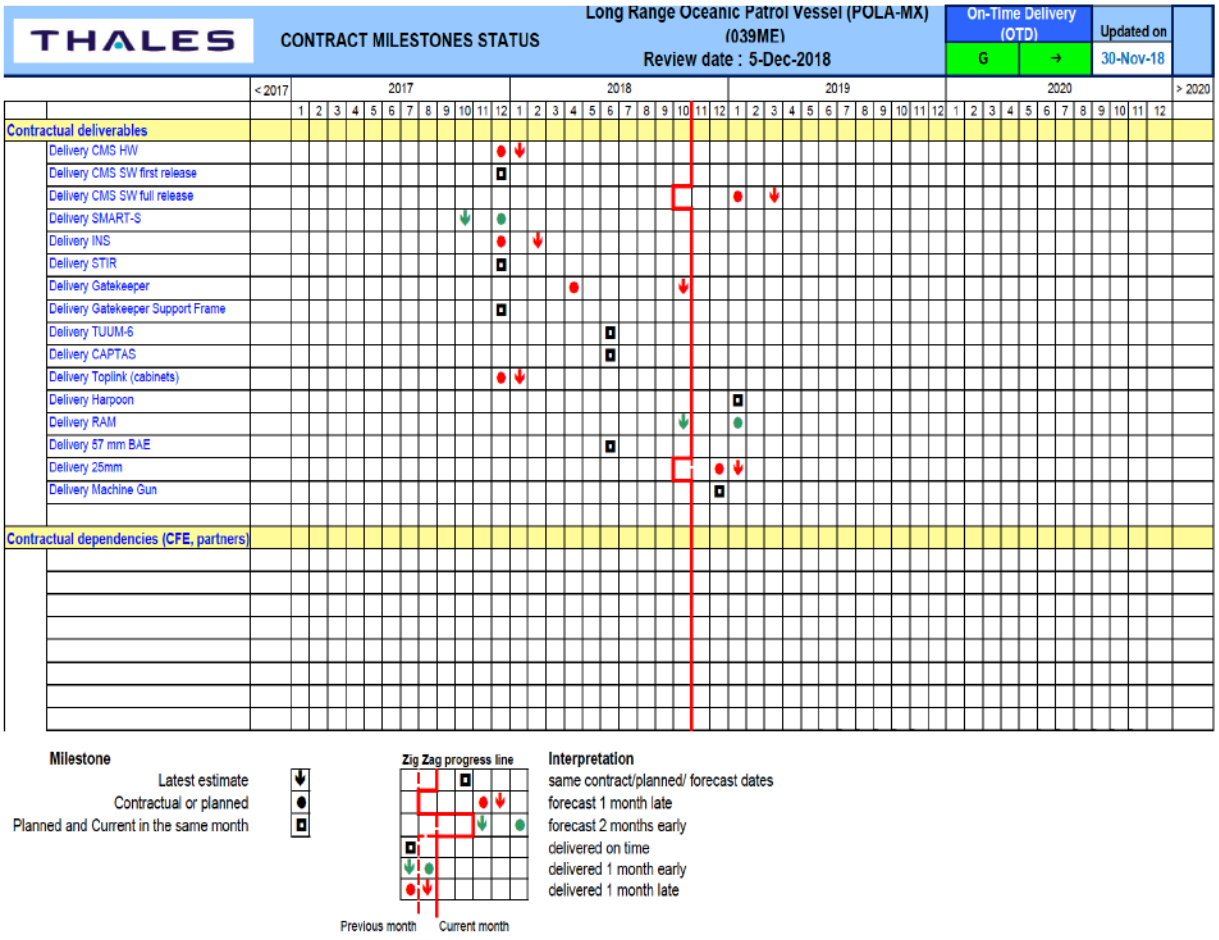
Table 58: The execution approach attribute within the Dutch Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The South American Project	The K Project	The D-X Project
Approach	Trial & Errors	Phased Concurrent	Phased	Phased	Phased

The execution approach within the Dutch unit is a phased approach. The schedule is based on milestone to be achieved to enable the project team to go to the next milestone. There is some initial thinking on de-risking the project execution by what they call the left shifting. Some tasks are anticipated earlier in the project schedule to ensure the right technical maturity of the solution as well as to release some available time to the schedule.

The following figure, provide another typical Milestone tracker used by the Dutch team; It provide an overview of the Milestone trend versus the contractual date and the evolution overtime of the milestone delivery forecast. This demonstrate the phased approach used by the unit.

Figure 41: Milestone Tracker



2.2.1.8. Conclusion

Table 59: The attributes categorization within the Dutch Unit.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The Dutch Unit
Temporality	Temporary	Permanent	Temporary/ Permanent
Object	specific	Generic	Generic
Scope	Unique	Standard	Standard*
Processes	Specific	Standard	Standard
Resources	Dedicated	shared	Shared
Budget	Not limited	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased

* The Dutch unit has moved from a product specific to a genric produt policy but remain open to develop specific feature when requested by major customers.

The analysis of the Dutch projects shows a strong alignment with the current project paradigm. This also shows a strong coupling of the project organization with the parent unit. Using the 9 attributes framework I was able to demonstrate the low level of autonomy left to the project team as well as the high level of standardization. The project organization or project object, the scope, the process or the project execution principle are highly standardized and follow the group and unit project execution guidelines. The tight coupling of the projects with their parent units relates to the decision principles taken by the unit: Every decision is made in the interest of the unit more than in the interest of one project over the others.

Now that we have demonstrated the high standardization level of projects and their tight coupling with the Dutch unit, we will demonstrate in the next part the willingness of the unit to improve the adequacy of this operating model with the supervision principles applied in the unit.

2.2.2. Adequacy between project execution and project supervision

2.2.2.1. Project execution

The Dutch unit has a long history of project management and project monitoring. The previous organization was project centric and was monitored as such starting in 2015, we see a transverse focus from the unit with the implementation of a strongest product policy, and the reinforcement of the matrix organization where Project Manager is becoming an orchestrator but rely on

functional organization to execute its project. At the time of the study, this process and cultural change is still new for this one-hundred-year-old unit. Project managers are still looking at the good old days when they were supposedly more autonomous and "in charge". "*Yeah in my previous project, I had the autonomy. People were appointed to the program and within the program we could say: "let's do this, this and that…/… That's changed three-four years ago with the change of the Naval organization. When a product organization pops up, without a proper announcement of what the projects are, but they organize a product organization with line managers who get an appointment: "you're responsible for the products". And suddenly they are responsible for the budgets, for the risk, for the budgets for the deliveries."* (Interview # 2).
Resource are now multi project and prioritization is mostly at unit level. The line manager are in charge of the resources and the product organization is in charge of the product roadmap and delivery. Project manager are considering themselves as firefighters and customers interfaces but do not have the feeling of being in charge.
As previously demonstrated the Dutch projects are now very standardized and are tightly coupled with the Dutch Unit.

2.2.2.2. Project supervision

The Dutch unit is part of the group and in that sense they implemented and follow the group guidelines in term of Project monitoring and supervision. The group recommends a monthly project review at unit level. Depending on the project complexity, quarterly project review with the GBU or at corporate level are also required. The project is monitored and supervised using a group standardized project Dashboard. The Dutch unit is following the group standard and each of the project studied were reviewed and monitored according to the group guideline. Each of the project studied had also a Project Dashboard that was maintained by the Project manager.

When the Dutch unit set up the new organization in late 2015, one of the main goals was to increase the focus of the product axis and the reinforcement and strengthening of the product policy. The unit realized that customized products were expensive to develop and to maintain and decided to refocus the organization on standard cheaper and more universal products. The second axis the unit wanted to reinforce was the customer axis. The Dutch unit has a long-lasting history of export business and is recognized for its international customer base. Switching from a customization culture to a standardized product policy would require some energy and strong investment from the sales team to promote the change all over the world. A transversal organization has been put in place to ensure another focus on customers and their need. The "customer Account team" (CAT)

is composed of sales, bid, finance, project manager and other support functions and are monitoring a region of the world they were assigned. There are now six CAT within the Dutch unit that cover all the customer base worldwide.

At the time of the study, the Enterprise Information management team (EIM) in charge of the data governance and the reporting factory was developing standard dashboard through Power BI to monitor and supervise those 2 axes the current ERP being not set up for and unable to provide.

In addition to the group review guideline, the Dutch unit implemented a Monthly Business Review at unit level where the unit operations are reviewed through 3 different axis. The figure 39 hereafter presents the agenda, where, project, product, other functions and Customer side (customer Account Team (CAT)) are addressed.

Figure 42: MBR Typical Agenda

MBR Naval Agenda November 5, 2020 – location "Amsterdam" /Office

Participants:

Geert van der Molen (VP Naval, Chairman)
Rene de Jongh (Standard Solutions Mgt)
John Alfrink (Sales)
Ernest Sombekke (Projects)
Olaf Hooijen(Engineering)
Romain Vovard (Supply Chain)
Rob Hille (Finance)
John Jansen (Marketing)
Charles de Leeuw/Monique Kedde(Quality)
Peter van der Linde (HR)
Karin Nijhof (scribe)

Guests:
Marie-Cecile Stutvoet (Dir. Legal TNL)
Robert Hermans (COO TNL)/partly
Francois Delestre (CFO TNL)/partly

Time	Topic	Presenter(s)
	Generic operational status	
09:00	Opening & assigning evaluator/start up	Geert v.d. Molen
09:10	HR Topics	Peter v.d. Linde
09:30	Quality Assurance	Charles de Leeuw/Monique Kedde
09:50	Sales: scenarios '20 & '21	John Alfrink
10:10	Engineering highlights (incl. workload)	Olaf Hooijen
10:30	- break –	
10:50	Product highlights	Rene de Jongh
11:10	Projects highlights	Ernest Sombekke
11:30	Financials	Rob Hille
11:50	Supply Chain highlights (incl. workload)	Romain Vovard
12:10	Marketing	John Jansen

12:30 – 13:30 - break –

1

MBR Naval Agenda November 5, 2020 "Amsterdam" /Office

Time	Topic	Presenter(s)
	CAT	
13:30	NL - Communication about technical issues during COVID'	Bas van der Schaaf/Armando Spinosa
13:45	Europe - Services Pricing in a framework contract	Edwin Kloese/Wim Verwoerd
	Operations	
14:00	Offset	Marie Louise Aaskov
14:30	Conclusion & Evaluation	Geert v.d. Molen
14:45	Closure	

Next MBR Naval: Thursday 8th December

2

The figure 40 is an example of the executive summary of the Monthly Business Review where the activity is reviewed through customer angle, Product angle and Project angle. Interesting to note in the Product part of this summary, the mention of the project that require such product confirming the 2 axis angle (product and Project) of the reporting.

Figure 43: Management Business Review Exec Summary

MBR

1. Executive Summary

Purpose: overview of key messages for presentation to MBR.

HIGHLIGHTS	LOWLIGHTS
1. Customer satisfaction	**1. Customer satisfaction**
• Meeting held with **Product Management to create more awareness on their role in customer complaints solving**, separate product view on complaints dashboard delivered for them.	• **2 potential customer complaints 'on hold' for >2 months due to no priority.** • **Escalation on potential customer complaint for Indonesia** (quotation takes now 10 months, and now customer has to pay for quotation?)
2. Alerts & vetoes	**2. Alerts & vetoes**
• **Human factors K130** SATISFACTORY Team members have found a way to deal with the pressure. However this is a fragile balance that can easily be broken. Naval-MT: discussion started about team development. Next step to be taken. **Give the next step priority to help this team forward** • **Palamida** SATISFACTORY Progress is made to assure ownership and execution of SW dellivery. **Keep going and keep the current progress**	⚠ **Mismatch Capacity – Customer Commitments** UNSATISFACTORY • Several QA advices ask to **progress faster on this Q-alert.** • Different actions have been taken for the long term solution (S&OP actions) • Short term focus started with improvement to get critical resources correct in Primavera
3. KPI's: OTD, conformity and CCR	**3. KPI's: OTD, conformity and CCR**

4. Bids	4. Bids
	⚠ 797DU_F124: Short reaction time, critical engineering **resources** should be made available during BAFO phase ⚠ 793DU_SMART_L_MM_HADR: enough skilled **resources** should be allocated during the BAFO phase ⚠ 133SG BID + ??AD: INsufficiant **resources** to executes these projects
5. Projects	**5. Projects**
✓ 108NE AWWS: Customer (DMO) expressed their admiration about the Corona measures of Thales and the resulting progress of the AWWS-project!	⚠ 108NE AWWS: Focus on solving the issues with resource management **before signing the MKS contract**; integrated product roadmap still missing, also required input for MKS180 in order to identify (and close) possible gaps between project and product organisation. **(linked to Q-alert Mismatch)** ⚠ T-31: **CDR on tight schedule and high pressure to execute CDR.** ⚠ 773DU MKS180: Follow up Q-alert Mismatch is urgently required! **Ensure that Tacticos (Füwes HW/SW) is able to followup their commitments towards MKS180 (mainly HW)** ⚠ 779DU K130: Keep resources allocated to K130 (linked to Q-alert Mismatch) ⚠ 004NE SMART_L MM/N: **involve senoir management in penality claim discussion**
6. Products	**6. Products**
-	✗ NS106: IFF deliveries by TGSF delayed, impacting all projects (161EG MEKO, 101NE NGIS, 118NE and 228FR) and hampering progress on NS106 (HwPDR continuously postponed). **FAT October for NGIS delayed** ✗ AWWS-FCS: **Complete mismatch between amopunt of work and availability of capacity. Mid-term forecast requires an unrealistic team growth** ✗ **Apar Blk2: only accept Launch Review MKS180 at 4-12 there is committed masterschedule** in primavera (with CRDL's & DDQS milestones) **and a clear understanding of resource commitment delta's.** ⚠ STIR: Current status quo on where we standing is unknown. Invest in making a umbrella planning. ⚠ MIRADOR: Overrun reported. Complete impact is currently being analysed

The project director is presenting an overview of the project execution, this being mainly a summary of all project review held during the month. Then the Product team presents an overview of each product status. The overview presents the product development status and a summary of the product issues within each project they have to be delivered. The bids are also reviewed from each product angle. The project is looked at by the supervisory authority from a second angle.
The following figure is an extract of one of the product presentation during an MBR. It shows the relation between the Product overview and the project to which the product will be delivered to.

Figure 44: MBR product presentation

Finally the Customer Account teams present the activity of their region from a commercial standpoint, from an ongoing bid from a political standpoint. Each major project is reviewed in the frame of the CAT presentation. This is the third axis where a given project is reviewed. Once in

a month, the project will therefore be reviewed by the management of the unit. Customer issues, product issues and product issues are discussed during those reviews.

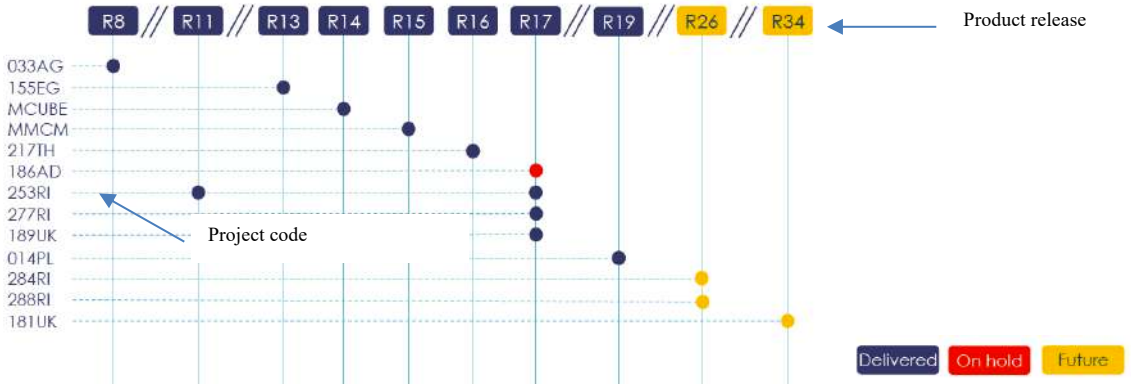
In addition, dome support functions such as purchasing , supply chain or finance present also their hot topics and related issues they are facing (Figure 39) . Very often, project are also reviewed and addressed through the line management/support function view.

2.2.2.3. Adequacy interpretation

The unit is in transition of setting up the new organization. This Monthly business review, as the rest, is still new and require some refinement and adjustment. The unit is still digesting the transition.
New issues arise and the management feel some push back or some skepticism to say the least. This is particularly thru within the project management community. Project Manager have the feeling they lost part of the power and autonomy and they are having difficulty to cope with their new intended role.
Due to the lack of ad hoc reporting, I also noted the product and customer axis are still behind in term of importance but the unit is making real effort to close the gap and reinforce a well balance equilibrium between the three axis.

Nevertheless, this new supervising tool is in my opinion, well aligned with the positioning and the coupling level of the projects in the parent unit. Problem are tackled at the right level of the organization and the revue by product, customer, by project or to a less extent by support functions allow the organization to better categorized the problem the project is facing. When it is a pure project related topic, the organization will help the project team to solve issue within the project boundary. If the problem is common to a product and has been noticed in several projects, the organization will task the product team to solve it. Finally if the issue is noticed within the same region, the CAT team will be able to identify it and will categorize it as a regional topic they will take into account in their customer and regional management. Figure 42 shows a typical product plan release combined with Project impacted by such product release.

Figure 45: MBR extract : Product & Project roadmap matrix



I found this 3 axis review also as very good tool for prioritization and escalation tool within the unit. There is the right forum to assess each and every situation and decide on the way forward allocation each action to the right organization (project, product…)

The Dutch unit assumes this transition from a centric project organization to a more balanced matrix organization, looking at its project more as a portfolio rather than a sum of unique projects. The interesting part is that they went further in this way that any other unit I have been working for. They adequately adapted their supervision practices to align them to the new organization.

3. UNIT COMPARISON

3.1. Unit Comparison through the attribute framework angle

Table 60: The attributes comparison between the two units.

	Definition 1930's-**2010's**	Paradigm 00's-10's	The Dutch Unit	The French Unit
Temporality	Temporary	Permanent	Temporary/ Permanent	Permanent
Object	specific	Generic	Generic	Generic
Scope	Unique	Standard	Standard	Standard
Processes	Specific	Standard	Standard	Standard
Resources	Dedicated	shared	Shared	Shared
Budget	Not limited	Constrained	Constrained	Constrained
Schedule	Basic	Technically convoluted	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent	Phased	Phased

The stances towards the nine attributes of the French and the Dutch unit are almost identical. Both units can be considered aligned with the current project organization paradigm. Project organizations within both units are therefore strongly tight to their mother organization and very little autonomy is left to the project management team. Decisions on resources, schedule, budget, scope are taken at the unit level. The temporality, the object of the project organization and the processes are standardized and followed within each unit. Nevertheless, slight nuances have been observed between the Dutch and the French units. While the French unit does not question project organization and project management processes at all, the different Dutch project organizations and project management teams are having a critical thinking about their role and their place within the overall unit organization. I did not identify, the same critical thinking within the French unit.

Analysis shows that the re organization that occurred mid 2010's in the Netherland drove organizational changes that led the teams to think further on their role within the new unit's organization. The product approach of the Dutch unit is also driving a stronger need for standardization therefore the self-awareness of the teams on their reduce autonomy is high and accepted. On the other end, The French unit, is on the ongoing process of implementing a product policy but becoming a product and project organization does not seem to be the goal of the unit. The French unit suffered from a late development of its standardized generic product while there was an urgent need for the most complex project. Instead of prioritizing the generic product, the unit has chosen the most complex system to become the generic product hence solving the project

delivery issue on the DML Project. Doing that, the French unit delivered over skilled system to the other. Customer such as for the WCC and the Caribbean projects leading to higher cost of maintenance, more complexity to manage and reduce change order opportunities for the unit…As a conclusion, we see the Dutch moving toward a product and project oriented company with full embracement of the team, despite tensions inherent to the change while the French unit is developing a generic product but is willing to maintain its original project oriented company.

In term of resource management, both units are using resource sharing and it is a given and non-questioned practice for both units. Nonetheless the approach for new hires is also different. The French unit allocated all new hires to the DML project and then after few months allocated them to the other project so that other project would receive already trained resources. The Dutch unit did allocate the new resources to the project that needed it the most and trained them on the field leaving the responsibility for training to the project team. The project had those resources for free for 3 to 6 months in compensation. Two different approaches, one project-oriented prioritizing the most important project while the Dutch unit embedded in the structure and in its hourly rate calculation that new resources would be trained on different projects for free for several month. Each project team had the responsibility to train new resources. Once trained, those resources would then be allocated to the most critical projects. This method allowing the integration and the on boarding of a larger number of new hires while not overwhelming project that are already facing critical delivery issues.

Finally the last difference I noticed is the clear adoption of the Dutch teams to the “Best interest of the unit” type of attitude. Each project team is self-conscious of being part of a larger team and even though they are sometimes questioning the management’s decision, they all consider they are taken in the best interest of the unit even if their own interest or the interest of their project may suffer from it. . For the French unit, the decision to focus and prioritize the DML project is coming from the head of the activity and from the business line. The interest of the activity prevailed. From the unit interest. The Scope of the French part came first in the overalls schedule and has been considered as very late and delaying the overall project which in fact was not the case. At the end of the project the real delay was from the signaling but at the time I appeared the French management lost already the control of the unit towards the GBU and the signaling team.

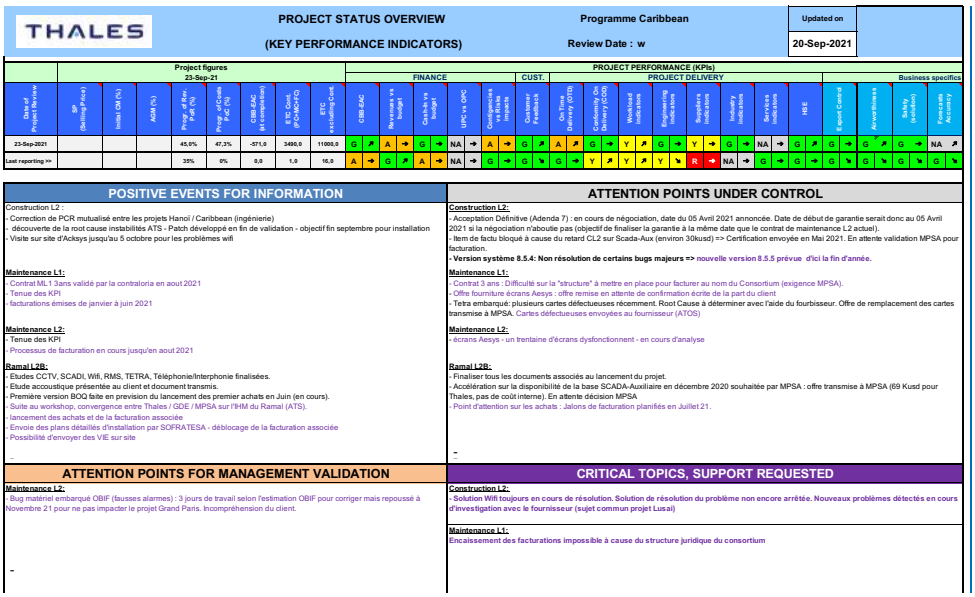
3.2. Unit Comparison through the project supervision angle.

The 2 units are pretty similar in term of attributes categorization and both are strongly tightened to their mother unit. On the other end, the project supervision is very different from one unit to the other.

3.2.1. The French supervision – The traditional way

The French unit is following the Group standard and supervise the projects through the project review. The Project review is held once a month within the unit. Depending on the criticality of the project, the same project review maybe organized at the Business Line level, at the Global Business Unit level or at the corporate level. Most of the time, those meetings are additional to the lower level ones. The lower level ones becoming a kind of dry run for the next level review. The project team is therefore very much involved on internal reviews. The standard tool to review the project is the Project Dashboard. A excel file containing several sheet that is supposed to help the project manager and his team to monitor their project. Most of the time, this dashboard is mainly used for reporting purpose. In addition to the project dashboard, the project team very often prepare a ppt. presentation to ease the review and highlight key message the team is willing to transmit to the higher management. Each review starts with a four quadrant highlights. All highlights are reviewed and presented in the light of the project. Very little attention is given to the project environment. Despite the numbers of sheets available, the largest part of the review is dedicated to this chart and most of the time by lack of time, other sheets are briefly reviewed if reviewed. Reference to other projects, to global resources or generic product issue are most of the time either not discussed or overviewed.

Figure 46: Example of the Four quadrant project highlight



3.2.2. The Dutch supervision. An innovative Process

The Dutch unit, respects the Group standard and monitor its project with the same dashboard as the French unit. Nevertheless, the dashboard is mainly used by the project team for the project team. The Project review unless requested by the Business Line or the Global Business unit, are kept at the project level with few mid-level management attendees from the unit. The unit leadership team is not attending the project review. Unit leaders are attending the Monthly Business Review instead. This review is non group standard and has been created by the Dutch unit in the frame of their new organization and the implementation of their new business model. The unit willing to become a Product and Project company decided to create another instance to review and supervise their activity. During this review each project will be reviewed through, at least, 3 different angles. First of all, the Project Director in charge of all project unit will present a brief summary of the main projects. Then the Head of Product will present the different product status, highlighting all project and bids that are dependent from this product development giving clarity and visibility to the organization. This also gives the opportunity to the leadership team to make decision when issues such as schedule, resources or any others are escalated. Finally, the project and bids are reviewed from a regional and customer stand point. The organization created a customer account team (CAT) which is a multi-disciplinary instance covering a part of the world. Doing that, the regional, customer, and political environment of each project is also addressed from this geographical standpoint.

3.2.3. Same level of autonomy but different supervision approach

It is interesting to notice that the two units are having the same level of strong coupling with their mother unit but are using two different process to supervise their projects.
The French unit respects the traditional way of project supervision that is part of group standard. The project is the center of the activity and the review of the business rely on projects reviews. Nonetheless, the project dashboard is used by the project team mostly for reporting and communication purpose which was not initially the group intent.

The Project teams form the Dutch unit, are using the dashboard primarily for their internal use and their own project monitoring. The format used for communication with the unit leadership team is a simplified power point presentation that summarize succinctly the project status, the issued faced and the decisions expected by the project team from the unit leadership team.

3.3. Conclusion

The case study presented to different units that analysis showed a similar level of coupling with each mother unit. With the two units and the 6 projects studied, the attribute analysis did not show a large difference in their categorization. Overall, in both units, very little autonomy is left to the project team, in term of scope (product policy of the units) resources (shared and allocated by the unit) schedule and budget (direct consequences of the unit decision and outside project team direct influence)

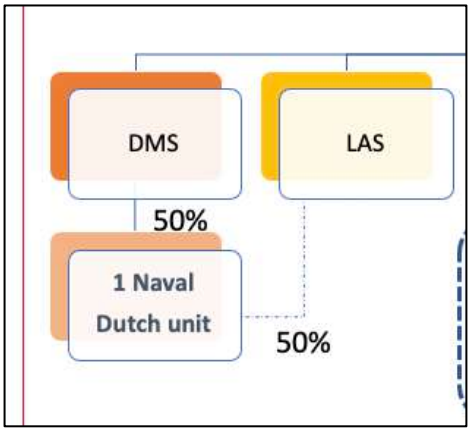
Despite those strong similarities between the project, we demonstrated a difference in the project supervision processes from the different unit. The first unit is following the group standard while the second one, has a implemented a supervision mode that is in adequacy with the need of the unit.

I see 3 main reasons that may explains this difference between the two units.

The French transportation unit is a subset of the biggest French defense unit of the group. This unit is very conservative therefore, Processes and group standard are followed diligently by the unit. The dependency of this large Defense unit strongly influence the transportation unit organization giving very little autonomy in term of operating model.

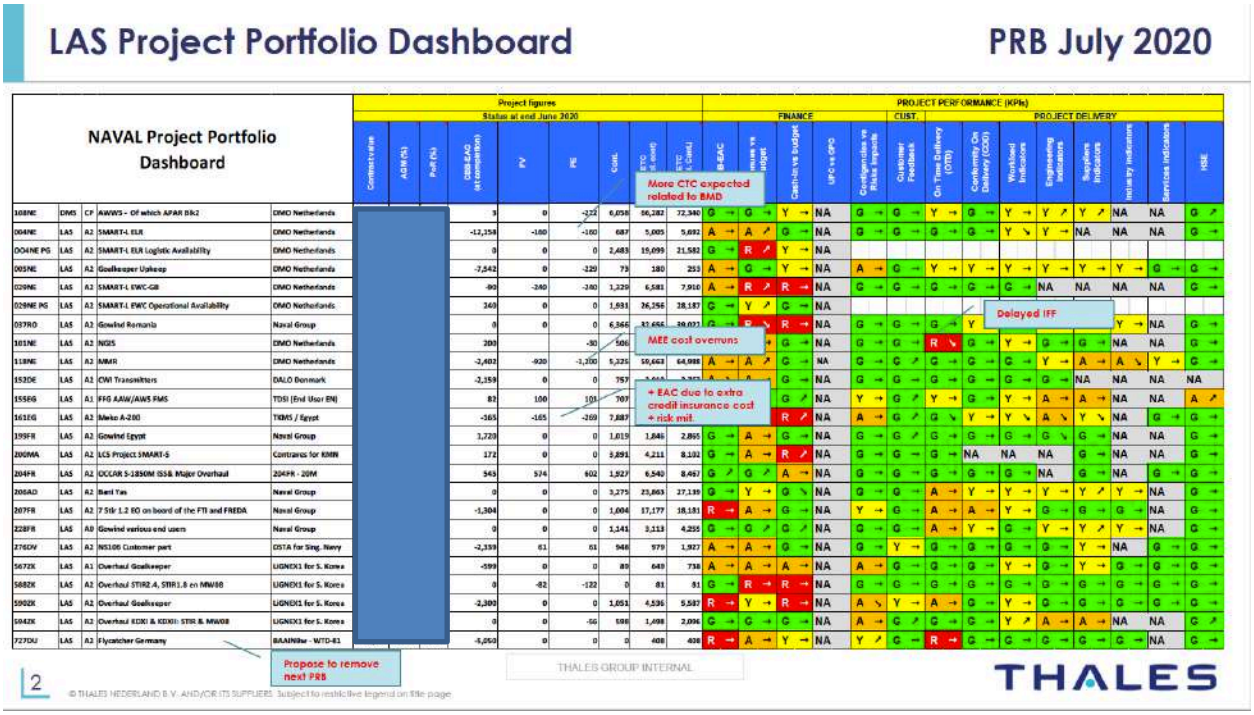
The Dutch unit demonstrated several times its ability to propose nonstandard processes and to defend them up to the highest level of the organization. In 2015 when the unit reorganized, the Unit management presented and defended a new organization (Naval organization) that would merge 2 different domains (activities) reporting to 2 different GBUs. This unconventional organization that was making operational sense received strong adverse reactions from each GBU but the team has been able to convince little by little of the great operational interest for this simplified organization at all level of the Group organization. The figure below is an extract of the case perimeter. Having a unit reporting to 2 different GBU is unique within the Group.

Figure 47: Double reporting of the Dutch unit



Another example of the Dutch ability to innovate as compared to other Group's unit is the setting up of a portfolio review with the 2 different GBU they report to. They organized once per quarter a review of all project with the Global Business Unit (GBU) and the Business line (BL) leadership teams. The following figure is an example of the overview presented to the GBU/BL. With color code and financial information, the GBU has an overview of all project related to their activity and the unit management team can debrief and report on those project in a synthetic way. Financial data have been hidden for confidentiality purpose.

Figure 48: LAS GBU portfolio Overview



The French unit is not at a level of questioning its operational model. The following verbatim is the best example that demonstrates this positioning: "**Well, in terms of process, project management, in relation to the Thales process, we didn't do any Tailoring, we didn't even suggest that the project team do it, and there they followed the Thales process as in most other projects"* (Interview # 13)

The Project has been the center of the operation and this concept is not questioned. All initiative such as implementation of a generic product that could lead to a more balance Product and project oriented unit turned out to be integrated to the DML project. At the end, the generic product was not the one the unit was intending to develop but the one that was required for the DML project that became the standard product. This choice led to additional constraints and higher costs of deployment and maintenance for the other projects that did not required such overdesigned

product. It also impacted the commercial development of the unit as the product was such powerful that no additional features or capabilities were sold to the other customers. From an initial willingness to tend towards a product policy and product organization, the French unit re-integrated the product in its project organization and somehow jeopardize any further organizational evolution.

A the contrary, the Dutch unit is in the middle of its organizational and operating model transformation so all the project team, the leadership team are self-conscious of the ongoing transformation and the changed associated. In fact the change is well receive by the teams even though they may lead to even lower level of autonomy at project level.

The Dutch model is remarkable in the sense that the organization has been set up to better answer the needs of the business and the unit decided while leading the operating model change to also review and adapt its supervision tools and processes. This extra step is very often forgotten leading to operational difficulties as the French unit can attest. The Dutch unit is aware of the strong coupling of the project to the mother unit and this is accepted and therefore taken into the new operating model while the French unit is not yet self-aware of the inadequacy between the coupling level of its projects to the unit and the very standard and traditional supervision model.

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PART IV: DISCUSSIONS & CONCLUSION

Now that we have shown our results in the chapter 4: “Findings” we can take the consequences in terms of both theoretical and managerial implications, in the chapter 5: “Discussion” , I discuss how I believe I contributed to the theoretical and managerial knowledge of the project management field. In the chapter 6: “Conclusion” I am summarizing this research and presents some limitations to the work I conducted. In a last section I provide some point of interests that I would consider exploring in the future.

CHAPTER 5: DISCUSSION

In this chapter, I am discussing how I believe my work contribute to the Project Management academic field. The first section is therefore dedicated to the theoretical contribution.
In a second section, I am presenting how my work could provide insight and advises to some key practitioners and contributors in their approach of project execution but also in project supervision.

1. THEORETICAL CONTRIBUTIONS

This research humbly contributes to the Project management science theory bringing insights mainly in relation to the autonomy of the project organization and the better understanding of the importance of this the autonomy attribute in assessing the overall project contextual environment.

I believe my contribution sheds light on the level of autonomy of the project organization. In a first section I explain how I have been able to demonstrate the loss of autonomy of the project organization and in a second section I propose a new framework to be used to measure the level of autonomy of the project organization vis a vis its parent organization.

I also believe my work provide a better understanding of the Standardization trend within project management as well as a better understanding of the decoupling push between the project organization and the parent organization. My research provides some tools and recommendation on how to better cope with those 2 paradoxical phenomena.

1.1. Project autonomy, the loss of a DNA piece.

1.1.1. Over time, Project organization lost its idiosyncratic autonomy

In my research I was able to demonstrate that the Project Definition didn’t evolve over time while the project paradigm became almost contradictory to the project definition. The project definition

being synonymous of great autonomy for the project organization while the Project paradigm is synonymous of tight coupling and very little autonomy left to the project organization .
This section traces the journey how project lost its natural autonomy while practitioners and academics still see the project as a autonomous organization.

1.1.1.1. Project definition remains the same decade after decade:

Reading one of the most ancient project definition from Gaddis (1959) "*A project is an organization unit dedicated to the attainment of a goal – Generally the successful completion of a developmental product on time, within the budget, and in conformance with predetermined performance specifications." (Gaddis, 1959, p 89)* or reading one from 30 years later*:* "*A 'project' is an organization, which is established for a limited time period to solve a complex (relatively), unique problem.*" (Gareis, 1989, p 243) or finally reading another from the 21th century such as: "*For the purpose of this book we define a project as a temporary organization and process set up to achieve a specified goal under the constraints of time, budget, and other resources"* (Shenhar, 2007). There is not much difference between the 3 definitions despite they have been written within a 60 years' time-frame.
In the three selected definition, the three major idiosyncratic dimensions of the project were there and are still actively affirmed sixty years after. The uniqueness of the project as well as the autonomy of the project organization and its limited lifetime are claimed to be a strong constituent of the project nature.
This confirmation of the stability of the project definition over time is the first part of our demonstration of the gradual disconnect between the project definition and the project paradigm. The second part being the demonstration that the perception of the project, the project paradigm, or the management use the project organization overtime has evolved to a point where despite having kept the same name, the project organization in the 50's and the current project organizations have very limited commonalities. In the fact, we were able to demonstrate the loss of the idiosyncratic dimensions of the project in today's project organization. My intent is not to criticize or not what is now a fact but by demonstrating it, I want to encourage academics and practitioners to embed this fact when supervising a project

Table 61: Project definition stability assessment using the Project attribute Framework

	Project Definition 1930's-**2010's**
Temporality	Temporary
Object	specific
Scope	Unique
Processes	Specific
Resources	Dedicated
Budget	Not limited
Schedule	Basic
Quality	Stringent
Approach	Trial & Errors

1.1.1.2. Project paradigm evolved decade after decade:

Our analysis of several decades of academic literature in Project organization and project management allowed us to demonstrate the project paradigm evolution over time and demonstrate how decade after decade the 3 idiosyncratic dimensions of the project shifted in an opposite way from the project definition.

First of all, the temporality of the project is now questionable. There are several ways to question this temporality. First the common acknowledgment of the project duration can be discussed. Shouldn't we consider the early stage of the idea or the need that would lead to the project as being already part of this project. We very often consider the date of the beginning of the execution stated in the contract as the starting date of the project. Nevertheless there is upfront activities that lie to the project that should be included in the project duration. The fact that companies anticipate some early activity as risk litigation tempt to confirm the project beginning is not so clear anymore and subject to question.

By the same reasoning, due to company organization, after sales activity or contractual support tasks are not included in the project duration despite the company contractual commitments. Why the warranty period is very often left outside the Project official duration? So defining a project duration is not as easy as it seems.

The second reason why the temporality is questioned in the sense that is the project organization a temporary organization or not relates to the emergence of a "project factory" type of organization is set up. It started with the implementation of the PMO (Project management office) team in charge of all support activities related to project executions (schedule, workload analysis …)

Then we also see some Project core team executing one project after another using the same processes, the same tools without any adaptation. We encountered this type of behavior in one of

the unit studied where the project team where kept active when adding new contract for the delivery of the same product to different European customers. The initial project team became a recurrent product delivery team. In that sense the temporality and the temporary dimension of the project is highly questionable.

The second dimension that evolve over time is the autonomy of the project organization towards its parent unit. In other words the level of coupling of the project organization to the parent unit evolve over time from a highly decoupled organization to a tightly coupled organization to its parent units. This evolution stated in the late 50's with the influence of Mc Namara who instituted control and rigor to the defense project execution of the US MOD (Ministry of Defense). Processes, schedule, budget, resources, scope are now dependent to the unit's interest primarily. Resources are shared with the rest organization and are allocated to the best interest of the unit/ company which might not coincide to the project interest. The scope is now very often driven by the unit product policy and trade off are now necessary to align project scope and company product guidance's.

Finally the uniqueness dimension is also questionable. Project that can be considered unique are quite rare. Those are innovative development project delivering a new product or a new system. There are most of the time either Self-funded R&D project or Customer Funded R&D but most of the project are not unique anymore or there uniqueness is very limited that it can only be considered as tailoring of a generic product or System. The norm is now to deliver a standard, generic project with some part of customization while the initial goal of project at the early stage of project management was to deliver unique outcome that current operation would not be able to execute and deliver. (Garel, 2003). In the past, the processes and the project organization was also unique. This is not the case anymore as we were able to demonstrate, therefore even thoug the scope of a project would remain unique, the project organization and the associated processes would not be unique and would be more or less a copy of previous project organization used to develop a new, unique outcome.

Overall, our analysis showed an evolution and a trend on the project paradigm moving from a temporary, autonomous and unique organization at the early stage of the Project management field to a generic permanent and standardized organization.

The following table demonstrate this paradigm shift over time:

Table 62: Evolution over time of the project paradigm using the 9 attributes framework

	Paradigm 30's-50's	Paradigm 60's-70's	Paradigm 80's-90's	Paradigm 00's-10's
Temporality	Temporary	Temporary	**Permanent**	Permanent
Object	specific	specific	**Generic**	Generic
Scope	Unique	Unique	Unique	***Standard***
Processes	Specific	Specific	***Standard***	Standard
Resources	Dedicated	Dedicated	***shared***	shared
Budget	Not limited	**Constrained**	Constrained	Constrained
Schedule	Basic	**Technically convoluted**	Technically convoluted	Technically convoluted
Quality	Stringent	Stringent	Stringent	Stringent
Approach	Trial & Errors	Phased	**Phased Concurrent**	Phased Concurrent

Bold & italic when status change

1.1.1.3. Project definition and Project Paradigm are now fully decorrelated

My analysis of more than 70 years of academic literature in project management allow us to conclude that in 2010's the Project definition and the project Paradigm are totally decorrelated and opposite. One sees the project as a temporary, autonomous and unique organization while in practice, the current management trend is to use the project as a permanent, standardized organization tightly coupled to its parent company. To demonstrate it we use a framework of nine attributes allowing to assess the three idiosyncratic dimensions of the projects asper its definition. The following table show the current status of the project definition and the project paradigm towards the nine attributes of the framework:

My intent in this analysis is not to bring any judgment whether this decorrelation is good or bad, I wanted to demonstrate its existence as I do believe that this drive management decision bias.

There has been a lot of academic papers about the project being part of an environment and this environment should therefore be taken into account when executing or supervising a project. Loch and Lenfle (2010) are among the few academics who questioned the evolution of the project from an execution approach and the autonomy left to the project organization, I do believe that this "lost roots" are not related only to the project execution approach but this is a more global trend that we were able to demonstrate through the proposed 9 attributes framework.

This paradigm evolution as generated several sub-topic in the project management field. The portfolio management is a consequences of this paradigm evolution and further study would be required to demonstrate it. The emergence of new type of organization such as the start-up or what is call the intrapreneurship are also the result of the paradigm shift The flexibility, the autonomy and the limited control necessary for innovation are not found any more in the project organization therefore the need for

new type of organization. Once again, I do believe that this statement could be a further research to this current paper.

Table 63: Project paradigm and definition status using the project attribute framework

	Definition **2010's**	Paradigm **2010's**
Temporality	Temporary	Permanent
Object	specific	Generic
Scope	Unique	Standard
Processes	Specific	Standard
Resources	Dedicated	shared
Budget	Not limited	Constrained
Schedule	Basic	Technically convoluted
Quality	Stringent	Stringent
Approach	Trial & Errors	Phased Concurrent

1.1.1.4. Conclusion

The evolution of the opposite direction taken by the project paradigm and the project definition and the growing disconnect of each attribute Clearly demonstrate that the project lost its autonomy. The project organization, the scope, the processes in place, moving from uniqueness to standardization reinforce the idea of the loss of autonomy.

Reviewing the academic literature, I was also able to demonstrate the transfer of decision making form the project leadership team to the unit leadership team. Budget, Schedule or resource allocation are now manage very often by the unit management team leaving very little autonomy to the project organization.

From an autonomous organization, the project organization became a fully integrated organization within the parent organization that reinforce it power of control and took the lead in term of decision making.

1.1.2. Theoretical contribution to the measurement of project autonomy; Proposal of a framework to measure Project organization autonomy.

Project is a wide term used in many areas (Boutinet, 2015) as already addressed in this research. Nevertheless, to better understand an object the best way is to associate characteristics/attributes to this object that will help us to better define the given object. This is what we did by associating

Nine different attributes to the project organization. We were looking for a scale to measure the process of standardization of the project organization and its coupling level towards its parent organization. I believe the characterization of the project with Nine different objective attributes provided a sound scale to analyze the project organization evolution.

In the first chapter of this research, I define project as: " ***A unique*** (uniqueness dimension) ***standalone*** (coupling dimension) *agile and* ***temporary*** (temporality dimension) *organization dedicated to the execution of a unique goal*." (p 18). By proposing this nine attributes framework , I propose a new grid for a better characterization of the project organization towards its level of autonomy and de facto the level of coupling between the parent organization and the project organization attached to it.

During The literature review we explained how we came up with 9 different attributes and we have been using this framework all along our research.

The Table 64 hereafter provide the framework to define the autonomy status of a project organization. I propose for each attribute a binary question where the yes or no answer will determine the level for autonomy for each attribute. This table represent the 2 extreme case of answer. Some outcome might be a mixed of attribute, some leading to autonomy, others to standardization or tight coupling. I suggest to add a weighting for each attribute depending of its importance as per the practitioner of the academic who use the framework. I did intentionally left this column empty as I believe the weight has to be done on a case by case basis.

Table 64: The Project Attribute Framework

				Answers	
Project Dimension	Attributes	questions for project charaterization	Wieghting (importance of the Attribute for the assessment) %	Autonomous Project	thightly coupled project
Coupling / autonomy	Temporality	Is the duration of the project in line with project needs?		Yes	No
	Object	Is the Project organization set up as per the parent company instruction?		No	Yes
	Scope	Is the scope fully compliant with project requirement or partially imposed by standard products features?		Yes	No
	Processes	Are the processes used aligned to the unit guidelines?		No	Yes
	Resources	Are the resources shared and assigned by the unit's leadership?		No	Yes
	Budget	Is the project team entirely responsible for the budget of the project?		Yes	No
	Schedule	Are there any external dependencies that impact the project schedule?		No	Yes
	Quality	Are the quality KPIs used, driven by the company guidelines?		No	Yes
	Execution Approach	Is the execution approach the same as all other project of the unit?		No	Yes

In addition to the theoretical interest of the proposed framework, in term of better understanding the project within its environment, I believe this framework will also bring major support to project supervision leaders .

1.2. Monitor project in time of Standardization vs decoupling paradoxical tensions

Our research and the literature review provide a better understanding of the standardization trend within project management. In the literature review, we define what is this standardization trend, we then explain why we face such a trend in the project management field and provide clarity on the reason why the has been and there will also be a strong standardization push in project management coming from the companies, the parent organization, the customers or the professional institutions;

In the same way, the literature review defines the coupling/decoupling principles and provide a better understanding of the decoupling push in the project management field coming mainly for the project organization against its parent organization or by the parent organization itself when they feel the need for more autonomy given to the project organization.

Lastly, in the literature review I explain why those 2 trends are simultaneous and contrary generating therefore a paradoxical tension. I present after the different theoretical ways to manage such paradoxical tension. I believe the literature review by itself is contributing to a better knowledge and better understanding of the paradoxical tension of standardization vs decoupling the project management field.

In my research I demonstrated the existence of this paradoxical tensions looking at it within a framework of 9 attributes. I was able to demonstrate the permanent existence of such tension between the project organization. and the parent organization. Studying 2 different entities on the way both deal with this tension help us to provide some better understanding on a better way to manage it. The full acknowledgment of such tension and its integration in the supervisory practices is one of the way to cope with it. We demonstrated that one of the unit integrated this tension in their reasoning and operational and supervision practices leading to a reduced tension that was therefore manageable.

I believe the demonstration of the permanent existence of this tension and the proposal to reduce its impact to the operational performance of the units is an interesting contribution to the <project management field. The acknowledgement of the tension, the adaptation and the adequacy of the supervising practices is an interesting contribution to the Project management field.

1.3. Avenues for future researches

The recommendation I would give to the academic community is around 2 main ideas.

First of all, academic should recognize more broadly the evolution of the project paradigm and should therefore revisit the project definition that is now in total opposition of the reality of the field. Project organization are not anymore autonomous, temporary and unique organization. Project organization are heavily standardized and strongly integrated to their parent company. This phenomena should lead to academic study about this paradigmatic change and its consequences in term of organization and management sciences.

When searching for academic literature I found that project is intimately linked to innovation in the academic literature. I concur with the relevance of the project organization when dealing with innovation or product development, but there is a lot of contract that companies execute using project organization that do not need particular autonomy and therefore project organization might not be the appropriate set-up. Researcher would help the professional field by proposing new form of organization that would better fit with project execution industrialization that standardization is promoting more and more.

The research led me to think that due to this coupling on going trend the project organization might not be anymore the right vehicle to foster innovation and generate breakthrough innovation. I am wondering if the intrapreneurship is not a consequences of project losing it idiosyncratic attributes, autonomy, uniqueness and temporary. Companies created outside agile new organization to generate innovation at a faster pace than the company and its project organization would allow. Further study on the concurrency of the intrapreneurship arising and the loss of autonomy of project organization in large organization would be interesting for a better understanding of future evolution of both structure. Wil project will soon disappeared and be replace by ad hoc, agile new organization?

The second area were academic may focus is related to supervision practices. Apart from a very interesting article from Loch, Mahring and Sommer (2017) about supervising projects I found very little literature on this specific topic. I believe the project management field would benefit from extensive research on project supervision practices.

I must admit when starting this journey that I did not imagine that I would find such volume of articles and books related to the project management. Nevertheless further study would be required to help having project management evolve and adapt with its new paradigm and the used of project organization by the companies.

The next sections is dedicated to the managerial contribution of the research. In this section I am bringing some recommendations based on my research to the different community of actors in the project management field, academics or professional actors

2. MANAGERIAL CONTRIBUTION

Being a practitioner myself I have been very proud during this research to be a link, a bridge between the academic community and the professional world of the project management field that are not always act cohesively. I learned a lot, when stepping in one foot to the scientific community. I guess I also contributed to bring those 2 world together:
I organize this section by the different actors family/community in order to provide a coherent set of recommendation by community or key actors in the project management field.

2.1. Words to the Practitioners

2.1.1. Words to the Project Management team

The Main recommendation I would make to a project team whether it is a new team or an existing team is summarized in one word self-awareness.
Self-awareness towards the level of autonomy that the team has been given by the management of the parent unit. It's in my opinion very key to understand the level of autonomy. I strongly suggest not to contest the level given claiming for more autonomy. I believe the parent organization. will not allow for more autonomy and the project team generate more frustration and conflictual relationship vis a vis the unit leadership team while a strong support is instead strongly recommended. Most of the project organization are tightly coupled with their parent organization and denying such coupling would negatively Impact the project execution.
Instead of fighting for more autonomy, the project team need to focus on a better understanding of the unit environment so that within a given autonomy they would know how to operate and how to optimize the operation which would highly benefit to the project execution success. Tight coupling is synonymous of dependencies in the sense that each area of tension within the unit, between projects, with the functional organization will impact the project execution. Self-awareness of such dependencies is the first step towards the limitation of their impact to your project.
The second recommendation to a project team would be to use any single part of freedom that the unit is giving. Most of the time the companies allow a certain level of tailoring in their project execution working instructions, processes or guidelines. The Project team should use this tailoring capability for better adapting the project organization to the projects own needs.
The third recommendation is related to avoid being exclusively project centric. Project management team should monitor and execute their project taking into account their external

environment. A significant part of their reporting, dashboard should address the external environment of the project. Trying to cope with an issue within the project while either the source of the problem or the most appropriate solution lives in its environment is a recipe for additional issue. As an example, when a company developed and promote a product policy, any product issue faced by the project should not be solved by the project for the project but by the product team for all projects and customers that might be impacted.

As a summary, I would recommend Self-awareness to the project team. Self-awareness of the autonomy level they are given. Self-awareness of the need to master the external environment of the project and self-awareness on the capacity allowed to the team to use a degree of freedom to adapt the standards to the specific needs of the project.

2.1.2. Words to the Finance community

By finance community, I include the project controllers, financer manager or finance directors that are supervising projects.,

2.1.2.1. Words to the Project Controller

To the project controller, in addition to the recommendation to the project team they belong to on, I would give additional recommendations. I would first reinforce the importance of the environment when controlling a project. You can't have a better understanding of a project without mastering the environment, without gathering formal and unformal information that would become data to help you drive the Project. The controller needs to be part of the project team, but due to its fiduciary responsibilities, such as duty of alert and compliance he is also a key link between the project organization and the unit, the group and the overall environment. (auditors etc etc). Being able to accepted and recognized as part of the project team and a direct link with the unit leadership is a difficult role but required to be successful in the role. Working right at the beginning on this dual positioning, external and internal to the project is a major focus point that controller need to have in mind from the beginning. This bridge builder role of the controller is essential.

Another recommendation in link to the environment but more financially focus is the acceptance and the mastering of 2 parallel schedule that sometimes might be paradoxical. The company runs its financial information following the calendar year and all the budgeting, reporting and fiducial information is ran through a yearly recurring rolling calendar. Each year it restarts. This calendar as many important reporting date, or budgeting steps that the controller needs to keep in mind when releasing financial information about his projects. The project as a contrary, follow a straight

timeline with a project beginning date and an end date that can be several years after the beginning. So the controllers needs to manage those 2 different timelines. The pace and the need of the project as well as the unit financial requirement. This is also why the bridge builder role of the controller is so important.

2.1.2.2. Words to the Finance directors

In addition to the words. To the supervisory leadership teams, presented in 2.1.3 of this section, I would add those additional words:

Finance manager of finance Directors should no mix financial constraints and the way operational issues should be solved. They need to segregate the funding issues to the operational problem they are trying to solve. This will increase the value they would bring to the unit. When a problem is project related, they should push for its resolution within the project. When a problem is product related or from external environment consequences, they should push to resolve the problem where he belongs. Very often, the funding issue is the main decision driver on how to solve the operational issue. I believe, Finance directors should advocate to first act in the interest of the unit and have the problem fix at the right place, project, product or functional organization. Then the role of the Finance director is to manage the financial consequences of such decision to influence the decision process by imposing financial rules or financial constraints.

I would also recommend the Finance directors to implement several supervision axis in order to better assess the operations of their units even though the unit does not organize those review. Keeping an eye, on Engineering, performance, Product development, supply chain, customer feedback is compulsory for the Finance directors. He needs to advocate for reducing the importance of the project axis while increasing the other supervisions axis.

2.1.3. Words to the supervisory leadership teams

My research shows the growing coupling of the Project organization with the parent organization. Leadership team needs to align their supervision practices to their acts and decisions. It is useless to consider a Project management team solely responsible of a project execution if all operational decision of the unit are towards standardization, product policies, control and synergies of resources of any kind. It is also not appropriate to supervise à project as if the Project would be fully autonomous and all issues and responses reside within the project boundaries. Project is part of an eco-system, fully or partially integrated to the parent organization therefore project supervision should include contextual and external environment for a better understanding of the project status and to take decisions and provide solutions at the right level of the organization.

Leadership team should not look at the project team as a autonomous organization if this is not in synch with the coupling level they implemented between the project and the unit organizations. Don't expect autonomous behaviors from a project when in parallel you impose a high level of standardization.

Supervision practices need to include the external environment of the project such as Product development status, customer environment, overall staffing issues etc etc. Once again the idea is not to question the level of autonomy given to the project organization but to adapt and adjust the supervision tools and practices in adequacy with the given level. The added value of the unit leadership team will improve when tackling execution and operational issues at the right place of the organization.

Another recommendation to be given to the leadership team is not to stay in the middle of the bridge. Very often organization move towards standardization, product policies etc etc and leave the project organization in the center of the operational processes. If the willingness is to remain a project centric organization the unit should not invest extensively in standardization, industrialization of operations or in product policies. At the contrary if the unit wants to move from a project centric organization to a product centric organization as many companies tend to do these days, they should then question their project organization and investigate how to industrialize project execution. In the research I talked about project factory and I believe the unit leadership would benefit from moving towards the automation of project execution.

In conclusion, I would recommend to the unit management team, operational and managerial consistency in term of project team empowerment, organization, operational processes and supervision practices.

2.1.4. Words to professional institutions

Professional institutions such as IPMA and PMI play a key role in the project management field. They are recognized institutions to establish rules and guidance related to project management such that some countries used those standards and refer to those standards instead of creating their own set. My research showed the responsibility of those institutions in the g rowing standardization of project execution practices over time. I am not bringing any judgment but I am questioning the positioning of the professional institution when advocating heavy standardization in project management practices while still defining Project as a unique, temporary and autonomous organization. Alignment on their stance should occur to avoid confusion and managerial bias. it is interesting to note that institutions develop a complete set of standards that they recently created a new one related to standards tailoring. Tailoring is now standardized…

As a conclusion I think the institutions would bring value to the project management field if they align their positioning and keep a level of consistency between their vision of the project and the proposed set of standards. I believe they would also benefit to collaborate with scholars instead of promoting/lobbying the academic world to promote their standardized vision of the project management field.

CHAPTER 6: CONCLUSIONS

1. SUMMARY OF THE RESEARCH:

The genesis of this research comes initially from my questioning about project success. I was wondering why the project failure rate in general and in my company in particular was so high and was not improving over time. I had the intuition that Organization were very much project centric and that they were trying to fix project issues within the frame of the project without taking into account the project environment that could also be responsible for project failure. This lack of environment consideration was strange to me but I quickly came with the idea the management are still seeing the project organization as a temporary, autonomous and unique organization and therefore problem inherent to project should be fixed within the project. Management practitioners did not integrate the evolution overtime of the project organization being more and more an integrated organization tightly coupled to its parent unit where standardization of processes, execution approach and organization structure has become the watchword.

In the first part of the literature review, I demonstrate this dichotomic trend between the project definition and the current use (the project paradigm) of the project organization. I propose a framework composed of nine attributes to assess the evolution of the three idiosyncratic dimension of the project organization, being a temporary, autonomous and unique organization. I review and assess the evolution of the project definition and the project paradigm decade after decade from the early 30's to the 2010's most recent academic papers. At the end of the period studied, the temporary autonomous and unique status of the project is still in everybody's mind and in academic definition of project but do not appear as a contemporaneous reality. Standardized, multi-purpose and tightly coupled project organization are the most frequent organization.

In the second part of the literature review, I focus on the tension created by to opposite but simultaneous trend in project management which are standardization trend and decoupling trend. I decide to review use a paradox approach to. Review and analyze the tension in project management. The paradox theory is interesting in that case as it recognize the concomitance of 2 opposite phenomena and propose ways to cope simultaneously with 2 antagonist trends.

After the literature review, I use an embedded case study where I study 6 project coming from 2 different units to observe the standardization and coupling level of the organizations and the adequacy of the supervising practices to this level of coupling. The case is a well-known international French based group specialized on high technology and security activities. <the unit studied are located in France and in the Netherland. They have both been brought to the group

through merger and acquisition. I have supervised both unit. The French one between 2013 & 2017 and the Dutch unit starting in 2017 till 2021; During the study I made sure to limit the influence of this proximity to the unit while observing and analyzing data received from both units.

2. LIMITATIONS OF THE WORK

I believe my supervising roles in the units studied might be seen as a limit or a potential source of bias. I have been part sometimes of the decision taken or might have influenced them. This is obviously a limit but also as strength as it allowed me to better understand the organization, the problem the project faced and access to key player and data more easily, nevertheless research design, the data collection and the analysis process have been set up in order to limit at its bare minimum the potential impact of this acquaintance to the case.

Not being a researcher may have also led to some bias, once again I tried to follow a restrictive process in order to limit this impact. I have sometimes been under the impression that those methodological constraints were heavy but I came quickly to the conclusion that such design was the best and unique way to comfort and validate the solidity of this empirical research.

The research is related to a specific case. I study and observed some phenomena within the context of this case. In no case the intent is to generalize the findings. Nevertheless I believe that this research bring lights to the project supervision practices and project organization autonomy that can be exported to other cases and that contribute to a better understanding of those phenomena.

3. NEW PERSPECTIVES AND POINT OF INTERESTS TO BE EXPLORED.

Conducting this research opened me up to new perspectives and point of interests that I would consider exploring in the future.

Firstly I found very interesting the study of the project paradigm evolution. I believe it would be beneficial to the project management field to continue monitoring the project paradigm and to compare it to the project definition. I would also like to propose the study of a new project definition and would promote the primacy of the project paradigm over the project definition as of today. The project organization need to reinvents themselves and adapt their execution practices to take into account the different level of autonomy left to the project organization left by the unit's leadership teams.

The case studied is related to customer project not innovation driven projects. Looking at the same phenomena for innovative project would be interesting. I believe the outcome especially on project autonomy and standardization level would bring other conclusion but further research are required

before drawing any anticipated conclusion. Though I am wondering if innovative project keep their original level of freedom or if the standardization and tight coupling trend also reach innovative project but maybe at a slower pace or more recently. While looking at the autonomy of innovative organization. I'd like to study the intrapreneurship organization and compare the two. I n a further research. I'd like also to demonstrate that the intrapreneurship organization is the project organization that is needed to drive technological innovation. I would like to answer the questions whether or not the entrepreneurship organization is the project organization as it was used in the 40's by the US.

While many company strengthen the coupling level between the project organization and the parent unit, I would recommend to further study the concept of project factory. Parent organization foster standardization over autonomy over all the organization. they develop strong product policy but they remind project centric organization which does not make sense anymore. For customers project I would like to study how to industrialize the project execution practices. I believe an even more integrated project organization would make sense as the company tend to externalize project decision making at the unit level and develop product policy that would certainly adapt to such industrialized project management practices.

As a CFO I would also be very interest to measure the influence of financial rules in project accounting and the influence of such financial rules to the unit and project organization. IFRS 15 had and still have an huge influence on project execution and Project accounting. I'd like to investigate the intuition that I have that financial rules are influencing the project organization and project execution. Financial standards for the sake of comparison between different business worldwide, generate a lot of complexity that project organization have to cope with. As an example many contractual closes when signing with q customer are directly driven by the right application of the IFRS and IFRS 15 in particular. Studying the Impact of financial rules to project organization and project execution is a topic that I'd like to research on.

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