

The challenges of implementing agile project management practices in an enterprise of the Brazilian automotive sector

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Abstract: Currently there are different approaches to project management such as agile and waterfall ones. One way to improve management is by selecting practices that are more favorable to each project and there are diagnostic tools that seek to characterize projects and facilitate this adaptation. The objective of this research is to comprehend the diagnosis process of the project management practices utilized by an enterprise of the Brazilian automotive sector, contrasting with the recommendations found in the literature. The study presents three cases of visual project management practices adaptation, from agile management, in distinct areas of the same company, leader in the auto parts sector. It is described how the professionals of the company identified their needs of visual management and how they proceeded in the implantation. It was identified the absence of a systematic process for the project management practices diagnosis, and the barriers and challenges faced. Good practices are also identified, such as the use of other diagnostic tools and the involvement of the whole team in the definition and elaboration of visual management boards.

Keywords: project management, agile project management, diagnostic tools, project management practices, hybrid project management.

1. Introduction

Challenged by the changes in the markets and because of the aggressive competition, the companies learned to be flexible in order to quickly answer the competition (PATAH; CARVALHO, 2009). The need for new products, constantly evolving technologies, increasingly dynamic environments, among other factors, forces organizations to adapt to this new context of product and service development in order to respond to these changes and thus take advantage of the opportunities that arise in the market.

Project management is closely linked to this scenario in order to ensure that organizations meet these stated needs and deliver products that add value to their customers. Each project of development may show specific characteristics and a unique background (CARVALHO; MELLO, 2011). Because of these changes, so-called “pure” project management approaches (waterfall and agile) often may not meet these needs. The novelty in order to overcome these new challenges has been the innovation in project management models, being called hybrid models. These models aim to combine project management approaches to achieve the advantages of both, promoting flexibility, productivity and meeting company procedures (BOEHM; TURNER, 2003; VINEKAR; SLINKMAN; NERUR,

2006; BATRA et al, 2010; CONFORTO; AMARAL, 2010; BARLOW et al, 2011; BINDER; AILLAUD; SCHILLI, 2014).

The definition of hybrid models according to Conforto et al. (2015) is “the combination of principles, practices, techniques and tools from different approaches in a systematic process that aims to adapt the management to the business context and specific type of projects. It aims to maximize project and product performance, provide balance between predictability and flexibility, reduce risk and increase innovation, deliver better business results and added value for the customer”.

Particularly when large and complex environments involve innovation, there is a difficulty in using pure practices due to the size of the project team, the integration of complex tasks and geographical distribution, affecting the communication and documentation so as not to compromise the project. In this context, the ability to create hybrid models and adapt them is necessary for companies and professionals in the project management area (CONFORTO et al., 2015).

This is an organizational challenge for companies when it comes to achieving high market competitiveness. The question is how to develop such models, what practices we should combine, how to balance the two approaches, what tools we have to use, and so on. Each project is a

different situation, so analyzes and adaptations must be carried out. Within these analyzes, there is the realization of diagnoses related to project management, in order to analyze the project particularities in a specific situation and intervene to ensure their quality, since projects are unique and temporary (PROJECT..., 2013).

2. Diagnosis in project management

The concept of diagnosis can be found in many areas of knowledge such as organizational, environmental, social, biological and medical, although each acts in accordance with a specific goal and direction. A diagnosis makes it possible to obtain knowledge about a particular problem, faults or dysfunctions, analyzing its composition, according to its particularities and nature.

When a diagnosis is made in an organization, the intention is to obtain new directions that benefit the organizational environment, implying operational and strategic changes. As reported by McCulloch and Cronshaw (2008), the diagnoses realization in organizations is an action of great relevance and pertinence, crucial in the organizational change process. According to Bushe and Marshak (2009), organizations take the form of entities that need prior assessment and observation in their structuring, when oriented to intervention processes. The authors also affirm that the diagnosis promotes the improvements achievement at the organizational level.

The diagnosis allows the identification of a problem based on the organizational and project environment history, with the purpose of designing and schematizing an adequate planning, accompanied by a prognosis for the monitoring of its evolution.

In this context, there is a need for tools that involve these diagnoses, in order to support professionals in the project management area to identify the particularities of each project and help in the development of an appropriate management.

2.1. Diagnostic tools in project management

Diagnostic tools enable the knowledge of a given problem through its analysis. According to the PMI (PROJECT..., 2013), a tool is useful in performing some activity to achieve a product, a result. A tool can be conceptualized as a procedure that acts as a contribution to a specific activity, improving its execution capacity. In this way, the tools increase the performance in the execution of a certain activity.

We can define diagnostic tools as something tangible used to obtain knowledge about a particular problem, analyzing their characteristics, composition, behavior, or nature, in order to evaluate it and help in the solution of found dysfunctions.

In project management, the diagnostic tools allow to identify the project particularities, thus providing help in the development of better forms of management, related its characteristics with the project management practices, techniques and tools. From a systematic literature review (SLR), the diagnostic tools present in the project management area were raised.

Two types of diagnostic tools for project management were identified: The first assists in identifying the style of management (between agile or waterfall) more appropriate to each project. The second type assists in the identification and treatment of uncertainties for each project. The latter presents a step-by-step process that seeks to identify and treat, especially, unforeseeable uncertainties, which are more present in innovative projects and are generally not identified by traditional risk management. Unpredictable uncertainties are conceptualized as the problems about which the variables and their relations are unknown (LOCH; SOLT; BAILEY, 2008; RUSSO; SBRAGIA, 2014). The tools identified, as well as their characteristics and objectives are summarized in Table 1.

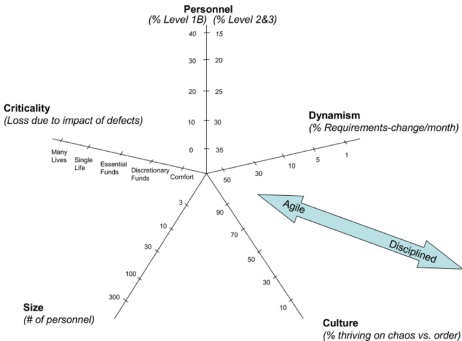
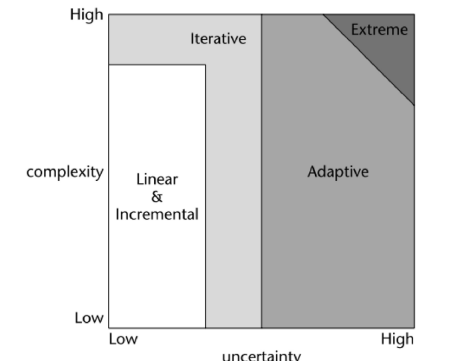
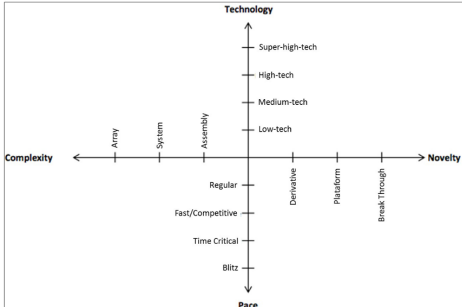
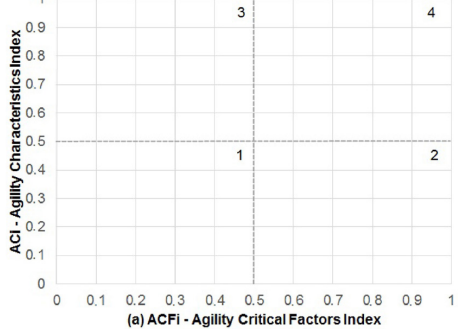
3. Method

The method applied in this research was a single and descriptive case study. According to Yin (2003), the case study is adequate for studies intending to investigate phenomenon that cannot be disassociated from its context, and for investigating how and why decisions have been made. More than that, the author affirms that descriptive case studies are able to identify a sequence of events and its key phenomenon. This research aims to comprehend how the decision of implementing visual management practices for project management were implemented in a multinational company from the automotive sector, in Brazil, and to contrast the case with the literature.

Initially, a literature review has been made on project management diagnosis tools together with a brief literature review on uncertainty diagnosis. The results were presented in Section 2. Then, a field research was realized in the multinational company from the automotive sector.

The data collection occurred in a single visit to the company, realized in June 2016, with an approximate duration of four hours. During the visit the authors were presented to three cases in the company, all of them related to visual management. The interviews were guided by a previously developed script and were conducted in an informal manner. Five employees were interviewed: one technician (case 1), the leader of the Project Management Office (PMO) (cases 1 and 2), one project leader, one intern and a specialist in continuous improvement (case 3). More than that, the interviews were realized in the employees' work environment, allowing for the interviewers to observe closely the practices applied by the company.

Table 1. Diagnostic tools in project management.

Name/Author	Characteristics
 <p>Risk Approach/ Boehm and Turner (2003)</p>	<p>Risk-based approach for structuring projects, incorporating agile and waterfall practices, depending on project need. It uses five dimensions of analysis, which span conditions where agile and waterfall methods are more likely to succeed:</p> <p>Personnel: consists of the different skills required to manage projects;</p> <p>Dynamism: consists on the percentage variation of requirements per month;</p> <p>Culture: analyzes if the organizational culture has well defined rules and procedures or provides greater freedom for those involved;</p> <p>Size: number of people involved in carrying out the project; and</p> <p>Criticality: evaluates the critical level of the project, loss due to the impact of defects.</p>
 <p>Software Development Project Management (SDPM)/Wysocki (2006)</p>	<p>Focused on the project management and software development integration, enabling professionals to learn about best practices to support their projects.</p> <p>The authors present a scheme involving two dimensions to be considered: Complexity and Uncertainty.</p> <p>Through the analysis of these dimensions, five types of approaches to software development are presented: linear, incremental, iterative, adaptive and extreme. Each of the five types of software development approaches can be supported by consistent project management approaches.</p>
 <p>Diamond Approach/Shenhar and Dvir (2007)</p>	<p>It address that that each project is unique, therefore, must take into account the project characteristics in order to adapt the project management. It is based on four dimensions:</p> <p>Novelty: evaluates how new the product is for the market and its users. This dimension represents the extent to which customers are familiar with this type of product, how to use it, and its benefits. Includes three levels: derivative, platform and breakthrough;</p> <p>Technology: measures the level of technology used in the project and the Organization's knowledge about this technology, encompassing four levels: super-high-tech, high-tech, medium-tech and low-tech;</p> <p>Complexity: assesses the complexity of the project, it's defined using a hierarchical structure of systems and subsystems. Three levels are included in the dimension complexity: assembly, system and array; and</p> <p>Pace: evaluates the time available for the project development. Four levels are part of this dimension: regular, fast/competitive, time-critical and blitz.</p>
 <p>Agility Diagnostic Tool/Conforto (2013).</p>	<p>It aims to diagnose the level of projects agility and evaluate the performance of the project management practices in different project types and environments. The results make it possible to take corrective actions in order to improve the project management. It is based on three dimensions:</p> <p>Agility Characteristics (AC): Essential characteristics that differ the waterfall project management practices from the agile ones.</p> <p>Agility Critical Factors (ACF): “internal or external factors to the organization that are directly or indirectly related to the implementation of the agile-project-management approach that may impact the performance and use of a given practice, technique or tool” (CONFORTO et al., 2014, p. 25); and</p> <p>Agility Performance (AP): Efficiency of the team in performing activities related to the main points of agile project management.</p>

Source: Complementated from Bianchi, Conforto and Amaral (2016).

Table 1. Continued...

<p>Diagnostic Framework and Health Check Tool for Projects/ Kennedy and Philbin (2014).</p>	<p>Diagnostic tool proposed to evaluate the health of an organization's projects. The tool is an integrated view of project systems. It involves six dimensions:</p> <p>Processes: encompasses the adoption and implementation of structured procedures and processes-oriented guidelines throughout the project life cycle;</p> <p>Technology: evaluates the information and communication technologies (ICT), and the specific technologies to the project;</p> <p>Resources: involves the necessary infrastructure for the full development of the project, as well as the personnel involved;</p> <p>Impact: involves the general results of the project, including the initial project outputs and the wide range of benefits arising from the delivery of the project;</p> <p>Knowledge: involves data management activities and information that enable the effectiveness of the projects, as well as the planning and control of these; and</p> <p>Culture: relates to the standards of work and behavior patterns, as well as the levels of trust and reciprocity, both in relation to the benefits and risks of the main project stakeholders.</p>
<p>Unpredictable uncertainty diagnosis/Loch, Solt and Bailey (2008).</p>	<p>The diagnosis in this case is an iterative process and consists of four stages. The first stage consists of learning about the problem in question, in which one should seek to know the variables of the problem and their relations, which can be done through interviews with those involved and documentary analysis. This process culminates in the second phase: the problem division into parts, sub problems. Then, in the third stage, we try to classify the type of uncertainty present in each sub problem, and finally, in the fourth step, we treat each identified uncertainty. Each sub problem must be treated according to the level of unpredictable uncertainty and complexity. Traditional risk management can address those sub problems with a low rate of unpredictable uncertainty and low complexity. Already the others need to be treated by learning or selecting (LOCH; SOLT; BAILEY, 2008).</p>

Source: Complemented from Bianchi, Conforto and Amaral (2016).

According to Malhotra (2006), qualitative researches are not structured, are exploratory, based in small samples and allow for perceptions and comprehension of the problem's context. In order to achieve this comprehension, intends to interact with people while keeping a neutral perspective in the research (VIEIRA, 2009). This research follows the characteristics of qualitative research.

As reported by Malhotra (2006), qualitative research is classified as a direct or indirect approach. In direct approach, the project's objectives are revealed to the respondent or are evident during the interviews. On the other hand, in indirect approach, the project's object are not revealed to the respondents. This research fits in the direct approach classification, since it is a non-structured research, direct and in a personal manner, in which a respondent is interviewed and it is aware of the research's objective of gaining knowledge on the cases.

In qualitative researches the interviews are not based on structured questionnaires, or statistical, but in a non-structure guide. There is also the indication that the interviewer should receive instructions of what should inform to the interviewee. This approach allows for the interviewer and interviewee to talk freely (VIEIRA, 2009).

The elaboration of the interview script involved the definition of this research's objective, the characterization of the respondents and the time available for the realization of

the study. According to Vieira (2009), a questionnaire written without a pre-defined objective will have unnecessary questions. Therefore, the objective of this research's questionnaire was defined as: identify if the company have utilized diagnosis methods in order to choose its project management practices. The respondents were defined as members of the company whom have experience working with the project management practices involved in the study. Finally, the time available for executing the interviews were defined as one and a half hour for each of the three cases, including the presentation of the practices by the company's member and the interview per si, which lead to the definition of seven questions, maximum.

The questions are specific and open. Specific because intend to investigate specific practices of the company, and open because no alternatives were offered to the respondent, that should answer using his/her own words.

The elaboration of the questions were based on the guidelines proposed by Vieira (2009), which include aspects such as: investigating one aspect per time, avoiding negative sentences, avoiding words that do not have an exact meaning and with double meaning, avoiding undefined questions, and avoiding abbreviations. An initial version of the script were created and analysed by a project management specialist, who recommended some alterations. After applying the suggestions, the final version was defined, and the questions are exhibited in Table 2.

Table 2. The interview questionnaire.

Number of the question	Question
01	How was the process of selecting practices to be utilized, that is, how did you diagnose the necessity of such practices?
02	How was the implementation of the practice? (Process of implementation, people involved, pilot test, time utilized)
03	In case of having utilized a diagnosis method, how did the team take advantage of it?
04	In case of having utilized a diagnosis method, were there a systematic procedure of how implementing the selected practices?
05	Among the practices utilized so far, is there any that have not added value to the project?
06	How does the team manage the project's risks?

Besides the questionnaire, the interviewers were instructed to observe and take notes during the interviews, to every possible aspect related to the adoption and use of the project management practices in the company.

The analysis of the answers was based on the study of Vieira (2009), which presents four steps:

- 1) Read the answer;
- 2) Take notes on the main ideas, which describe the essence of the interview;
- 3) Analyse, grouping the ideas with similar meaning; and
- 4) Search for expressions that describe any of the main ideas.

The cases are described in separated subsections inside section 4, and, at the end of the work, some considerations are presented regarding the process that the company uses for selecting the practices studied.

The objective of this research is to comprehend the diagnosis process of the project management practices utilized by the company, contrasting this practice with the recommendations found in the literature.

4. Business case

The organization is a privately held company, leading global supplier of technology and services, ranked among the top auto parts suppliers. Headquarter is located in Europe with a global presence through its subsidiaries and regional companies in several countries. In Brazil, there are seven subsidiaries located in four Brazilian States, counting on circa eight thousand associates.

The analyzed business sector is located in São Paulo State, evaluating the following departments: design, engineering test center and cost reduction. The following three business cases take part in the product development process (PDP), which the Project Management Office (PMO) is the focus into the PDP and current analysis.

4.1. Case 1

This business case refers to a visual board called SCRUMBAN used at the engineering test center. The two interviewees, a technician and PMO group leader, lasted

around one hour, in which both attended jointly the interview. According to them, the board is a tool, which fosters the agile project management.

The application environment of this board is a laboratory test for components and products' design validation. During the development of a product or component, several functional and durability tests are performed according to the design and validation plan (DVP) raised by the project manager, as well as the other departments' demands. This center of engineering tests is seen as a service provider inside the organization.

In addition, the trade-off to balance laboratory resources (technicians and machinery) and several DVPs (sequence of tests) due dates is in some way supported by the SCRUMBAN, improving the alignment of those resources and tests planning.

The team of the laboratory is a multi-task team, which all members are capable to execute any tasks or activities. However, there are some critical issues during the planning in which just the laboratory coordinator takes the lead to solve it at the board.

The project managers send the development tests' demand to the laboratory planning area, including the customers' target dates for receiving the results of the tests. The laboratory planner uses this information from several projects, finding a way to reach all of the due dates through a macro plan into a Gantt chart. The chart triggers the laboratory team, showing up the borderline of the test time window, which is the first prioritization for the team to the tests. The planner raises also a test plan for each project, which guides the detailed plan of the laboratory team.

The SCRUMBAN is a white board, splitted into drawn columns. The activities are described in sticky notes, attached to the board and moved as the status changes. The board is organized in four columns: stories, activities to do, activities running and activities done. The first column, stories, will get information coming from the tests plan. These plans are deployed in smaller activities, which are represented in the column "activities to do". This deployment is done once a week by the laboratory coordinator in a weekly planning meeting, which occurs every Friday or on Mondays, focusing just on activities that the team believes are able to accomplish during the week.

After that, each member of the team choose the activities to deploy, as well as including the laboratory coordinator. During this process, they use the third column of the board, activities running. The interviewees reveal based on experience that the maximum work in process for each member should be five activities. When the activities end, the responsible of the activity transfer the sticky note to the last column, activities done. Besides, when the activity closes, the responsible must fill in the sticky note the time spent at the finished activity. This information is the basis for the burndown chart (performance report) of the team.

The team uses to get together also on Thursdays, evaluating if it will be possible to accomplish indeed the planning raised in the beginning of the week. When there is a need to re-schedule something, this is in some way “punished”. During the daily meeting, the team inform the progress status of each activity. The laboratory coordinator manages these meetings, which lasts thirty minutes in average. Furthermore, the coordinator has the autonomy to change the priorities according to the internal customers’ needs.

In 2011, the laboratory department improved its area using the Value Stream Mapping (VSM) due to the dissatisfied mood of their internal customer, claiming the high performance costs and poor planning performance. As a result of the VSM, a sketch of the SCRUM was born, leveraging the visual management usage in order to achieve better efficiency and effectiveness on cost reduction and faster planning response.

Since then, the board had several changes and versions. The board grew from a Kanban methodology, passing through the SCRUM board, to the current frame “SCRUMBAN”, which merges KANBAN and SCRUM. This last frame has been using since 2014, and being a reference for the local organization. On the other hand, the team recognizes that there are opportunities for improvement of the board and its planning process. Per example, the laboratory still struggles to put ahead some project target date when requested. An analysis of this kind takes normally more than a week.

The analyzed process in practice is different than the one found in the references. The business case 1 did not bring evidences on a formal and systematic process to the project diagnosis as well as the practical recommendation for project management, neither the usage of tools found in the literature. It was also not mentioned any ongoing initiative to implement a process or the referred tools.

Concerning to uncertainties and risks management, there is few evidences. Apparently the planner and the laboratory coordinator acts on risks management during the planning (macro and detailed ones). Otherwise there is nothing mentioned regarding to a systematic process or specific tooling for that as stated according to the references.

One perceives that risk management in this business case depends on the tacit knowledge of the planner and the coordinator, as well as their personal background on lead-time and performance pace of each test activity. Another highlight is the dealing process with internal customer by the coordinator, which increases his/her knowledge on different projects, prioritizing the tests, as well as avoiding conflicts and delays among them.

4.2. Case 2

The second case was the development of a general visual board for the PMO in the new product development area. In order to understand case 2, two members of the organization were interviewed together: a project leader and the PMO leader. This interview lasted 1 hour and a half. We observed the use of a visual board to aid project management.

This board is located in the company’s Project Management Office (PMO), involving all projects in progress in the organization. To the extent that a new project is accepted, it is incorporated into the board. According to the interviewees, all project monitoring is carried out through this board.

The board is divided into five columns and several rows, where each row refers to a project in progress in the company. The first column is related to the macro planning of the projects, containing the milestones and Gates of the respective projects. The information in this column comes from the company’s product development process model, which was developed in earlier stages. The second column involves the micro planning of projects, where work packages are broken into activities to be carried out, which in turn are distributed on a weekly time scale. The third column encompasses the project activities that have already been completed. The fourth column involves the analysis and pointing out of current and future risks of each of the company’s projects. The last column involves project performance indicators, as well as the identification of problems, impediments and opportunities. Each activity receives a self-assigned post-it with its name, responsible person, responsible department, project number and status of that activity. These post-its containing the activity are moved in the board as the project progresses.

The project leaders meet weekly with the team to discuss the board, and the entire team participates in these discussions. When deviations occur in the milestones, they are justified, the baseline is changed and the board is updated. The activities that present some problem are signalized with dots with predefined colors that characterize the level, or degree, of the risk of a certain problem, demanding the executive support. A project management software is used in conjunction with the board to control project costs and hours.

According to the interviewees, the board shows advantages and disadvantages. Among the advantages are the team meeting (project leader and functional managers) to discuss the projects and their integration, allowing a multiproject vision. Among the disadvantages are the discrepancies between the activities duration in the initial project schedule and in the board, generating rework, lack of visualization of the resources workload, difficulty in traceability, difficulty in knowing which activities were completed and which were delayed, activities standardization (description and size) and the need for the project leader to analyze the board, since people who are not part of the project cannot understand the information presented in the board without this assistance.

The implementation of a visual board for project management began in 2015, being done jointly by the PMO and the continuous improvement area of the company. Initially, a survey of the organizational climate was conducted, which resulted in dissatisfaction with communication and integration among the functional areas of the company. Then there was a search in the literature on visual management as well as visual board models. On a theoretical basis, the team talked with the directors and managers of the organization, as well as the entire team and sought to understand what each of the stakeholders needed to know about the other areas and company projects. Subsequently a workshop was held with several departments of the company in order to develop a visual board that would meet the needs identified until then. Subsequently, this board was validated with the company directors.

Regarding risk management, two moments were mentioned in which it happens. Initially, the project leader and his team carry it out, in the planning phase. At the time of schedule definition, they are based on the activities established by the company's product development process model, and analyze the actual applicability of each activity to the project in question. Thus, the risks related to the possible withdrawal of this activity from the schedule, its anticipation or delay are evaluated. The second moment is during the projects execution control. Risk management is present in the board, where the current and future risks of a given project occur, its impact, its respective analysis and actions to be taken.

4.3. Case 3

In case 3 a specialist from the continuous improvement area was interviewed. The interview lasted one hour. The case appeared in the year 2014, due to the circumstances of the sector do not get the planning and the stipulated costs. The demands that involve the initiative always depart from the needs of its clients, which motivated them to use the visual management practice, culminating in the use of visual boards for planning and control of improvement projects. The purpose of the artifacts developed were to

achieve improvements in performance, quality and cost improvements.

The choices of the practices employed came from the manager of the continuous improvement area, his personal motivation to have multifunctional teams and to practice visual management. In this way, the board was elaborated in line with the know-how of the manager himself, not having been used a systematic for its adoption, nor a formal survey of the project needs for its elaboration.

There is no central project management in this sector, being that the teams are self-manageable. Regarding the article's theme, it was verified the lack of a diagnostic tool, evidenced by the absence of a systematic procedure for diagnosis and practices implementation. According to the interviewee, the visual board provides greater engagement and communication among team members, providing a greater participation of the same.

Those involved in the project come from several functional areas: purchasing, costs, manufacturing and quality, acting continuously in full, in order to meet the business requirements and all those involved. It should be noted that there is still a difficulty in the passage, in the energy transfer from internal to external communication.

Regarding the practice implementation, there is a macro planning level, coming from the manager expertise from another international company unit, and another at the micro planning level, for purchases. At times when opportunities for improvement are apparent, the team makes the appropriate adjustments. In the first board are described the work packages per weeks, with a corresponding number for identification in the microplanning and the points that represent impediments to productivity. The team continuously monitors the board twice a week, allowing us to conclude that upgrading the board over time improves communication among team members. Sequentially following this trajectory, planning at the micro level is accompanied by weekly meetings to discuss any deadlock on the timeline, culminating in action plans on a long-term horizon. The purchase board, in turn, receives the information regarding the cost board, and four versions of the board were made based on the trial and error system.

The project has two more visual boards, one for the new ideas generation and the other used after the idea prioritization, in the sense of developing and maturing it. The orientation trajectory that follows originates from new ideas, product demand, benchmarking, ideas discussion, idea prioritization, sourcing, estimation, previous evaluation, macro packages (monitored), being that all changes must be informed to the client, there being an alignment between project, processes and clients. At the end of the project, there are lessons learned and performance indicators (KPIs) to indicate progress in terms of improvements.

5. Discussion

It was not evidenced, in any of the three cases, the use of tools found in the literature, nor even a systematic procedure for choosing project management practices. However, in cases 1 and 2 other tools were used as diagnostic tools for more general problems. In case 1 there was the use of a Lean tool, the Value Stream Mapping (VSM). According to Tyagi et al. (2015), the main objective to use VSM is the improvements identification, in the sense of waste reduction. In case 2 an organizational climate survey was used, which offered a diagnosis about general problems in the company, not being specifically oriented to the project's needs.

None of these tools lists the dimensions of analysis such as those presented in this paper. It is interesting to note that, although the actual process happened differently than the literature points out, the teams used very well-known tools and were guided by the results they promoted. In case 3, on the other hand, the decision to implement visual management was not based on any tool, but on a guideline of the manager. This does not invalidate the decision, which has proved very beneficial to the team that uses the boards.

Another interesting point is how the teams worked out the boards, once the decision on the deployment was made. In case 1, a method for defining the board was not shown. So, what we had was a trial and error strategy, in which different versions of the board were used over time, until it arrived at SCRUMBAN, which seems to be helping the team work so far. Already in case 2 the interviewees mentioned the search for literature and talks with all those involved in the use of the future board. This point draws attention, since the literature used in this work did not focus on the practices implementation, and it was considered quite interesting the team's involvement, promoted by the PMO, in the definition of the format and even in the board elaboration.

Case 3, like case 1, did not show a procedure for defining the board format. Again, the decision factor mentioned in the interviews was the manager experience, who had already worked with boards for the visual management. Like the first case, the boards used have already undergone several changes. One of them is in its fourth version. It is understood that this rework, evidenced by the interviewees in cases 1 and 3, would possibly be smaller if the teams used a systematic procedure or resorted to the literature to structure the board. The strategy used in case 2, to consult with stakeholders and to promote their participation, could be an interesting way out.

Changes in board formats can be either negative or positive. At first they demonstrate rework and time consumption. But, they may be important and fundamental to guarantee the later use, since they indicate the involvement, the autonomy and motivation of the teams in relation to the board. It is important to note that, especially in case 3, it was evidenced the great team engagement, which in fact

has identified with the visual management practice and, in this way, feels at ease to propose and execute changes in the boards as it perceives needs of change.

Still, in case 3, regarding the generation and prioritization of ideas, the use of visual boards was observed in order to align the stages of generation and conceptualization, its processes and its clients. In this trajectory, the lessons learned and the performance indicators indicate and designate the improvements and process benefits.

In the case of risk and uncertainty management, the use of the tool mentioned in this paper, or another tool, was not evidenced either. In case 1, what was perceived is that risk management is based on the knowledge and intuition of some team members. In case 2, two moments were evidenced in which procedures are used to identify and treat the risks, one at the time of planning the development projects and another during the project execution control. In case three, specific procedures for risk management and uncertainty were not identified.

Thus, it can be seen that the cases do not seek to deal with unpredictable uncertainties, only risks. It is believed that the company could benefit from the use of the unpredictable uncertainties diagnosis presented in this work, especially in the projects involved in case 2, which are often innovative product development projects.

6. Conclusion

The cases evidence interest and benefits in the use of visual boards for managing projects, even considering that the company's product is not a software, the most common application of Agile Project Management. In all the three cases, the boards complement the management practices, contributing for the construction of hybrid project management models in the company.

The time consumption and the rework identified in the personalisation of the boards consist in a relevant aspect for project management researchers. The personalisation seems to contribute for the compromise of the team to utilize the board and also for the effectiveness of its use. However, it also indicates the waste of time and energy. Would it be possible to identify in advance which type of boards previously existent in literature would be the ideal for the project? This study identify this hypothesis and opens the topic for discussion.

The research has also identified that the diagnosis models identified in literature were not adopted or even considered and this might be one of the sources of the problem. There are plenty models in the literature that allows to characterize a project and contribute for the choice of the most appropriate management style. The researchers wonder if these tools could not have contributed for the generation of a more systematic procedure for choosing the project management practices, saving efforts and time and, therefore, costs on the development of the practices.

A propose for future researches include the analysis of the utilization of the diagnosis tool mentioned in this work in companies that utilize them with the intention of analysing and relating the characteristics of the project and the most appropriate practices for managing them. Such analysis could bring insight on the benefits and limitations of these tools.

7. References

- BARLOW, J. B. et al. Overview and guidance on agile development in large organizations. **Communications of the Association for Information Systems (CAIS)**, v. 29, p. 25-44, 2011.
- BATRA, D. et al. Balancing agile and structured development approaches to successfully manage large distributed software projects: a case study from the cruise line industry. **Communications of the Association for Information Systems (CAIS)**, v. 27, p. 379-394, 2010.
- BIANCHI, M. J. ; CONFORTO, E. C.; AMARAL, D. C. Diagnostic Techniques in Project Management. In: ISPE INC. INTERNATIONAL CONFERENCE ON TRANSDISCIPLINARY (FORMERLY: CONCURRENT) ENGINEERING, 23., 2016, Curitiba. **Proceedings...** Amsterdã: IOS Press, 2016. p. 747-757.
- BINDER, J.; AILLAUD, L. I.; SCHILLI, L. The project management cocktail model: an approach for balancing agile and ISO 21500. **Procedia: Social and Behavioral Sciences**, v. 119, p. 182-191, 2014.
- BOEHM, B.; TURNER, R. Using risk to balance agile and plan-driven methods. **Computer**, v. 36, p. 57-66, 2003.
- BUSHE, G. R.; MARSHAK, R. J. Revisioning organization development: diagnostic and dialogic premises and patterns of practice. **The Journal of Applied Behavioral Science**, v. 45, n. 3, p. 348-368, 2009.
- CARVALHO, B. V.; MELLO, C. H. P. Scrum agile product development method – literature review, analysis and classification. **Product: Management & Development**, v. 9, n. 1, p. 39-49, 2011.
- CONFORTO, E. C. **A framework and tool for the project management agility assessment**. 2013. 376 f. Thesis (Doctorate degree in Production Engineering)-Escola de Engenharia de São Carlos, Universidade de São Paulo, São Carlos, 2013.
- CONFORTO, E. C.; AMARAL, D. C. Evaluating an agile method for planning and controlling innovative projects. **Project Management Journal**, v. 41, n. 2, p. 73-80, 2010.
- CONFORTO, E. C.; SALUM, F.; AMARAL, D. C.; SILVA, S. L.; ALMEIDA, L. F. M. Can agile project management be adopted by industries other than software development? **Project Management Journal**, v. 45, n. 3, p. 21-34, 2014.
- CONFORTO, E. C.; SILVA, F. B.; AMARAL, D.; REBENTISCH, E. Modelos híbridos unindo complexidade, agilidade e inovação. **Revista Mundo PM**, v. 70, n. 2, p. 10-57, 2015.
- KENNEDY, D.; PHILBIN, S. Diagnostic framework and health check tool for engineering and technology projects. **Journal of Industrial Engineering and Management**, v. 44, p. 1-832, 2014.
- LOCH, C. H.; SOLT, M. E.; BAILEY, E. M. Diagnosing unforeseeable uncertainty in a new venture. **Journal of Product Innovation Management**, v. 25, p. 28-46, 2008.
- MALHOTRA, N. **Pesquisa de marketing: uma orientação aplicada**. 4. ed. Porto Alegre: Bookman, 2006.
- MCCULLOCH, A.; CRONSHAW, S. F. Reinstating the Lewinian vision: From force field analysis to organization field assessment. **Organization Development Journal**, v. 26, n. 4, p. 89-103, 2008.
- PATAH, L. A.; CARVALHO, M. M. The value of project management methodology: a case study. **Product: Management & Development**, v. 7, n. 2, p. 177-182, 2009.
- PROJECT MANAGEMENT INSTITUTE – PMI. **A guide to the project management body of knowledge (PMBOK® guide)**. 5th ed. Newtown Square, 2013.
- RUSSO, R. F. S. M.; SBAGIA, R. Incerteza imprevisível em projetos inovadores: criando sentido com a gestão de projetos. **Revista de Gestão e Projetos**, v. 5, n. 2, p. 24-39, 2014.
- SHENHAR, A.; DVIR, D. **Reinventing Project Management: the diamond approach to successful growth and innovation**. Boston: Harvard Business School Press, 2007.
- TYAGI, S. et al. Value stream mapping to reduce the lead-time of a product development process. **International Journal of Production Economics**, v. 160, p. 202-212, 2015.
- VIEIRA, S. **Como elaborar questionários**. São Paulo: Atlas, 2009.
- VINEKAR, V.; SLINKMAN, C. W.; NERUR, S. Can agile and traditional systems development approaches coexist? An ambidextrous view. **Information Systems Management**, v. 23, n. 3, p. 31-42, 2006.
- WYSOCKI, R. K. **Effective software project management**. Hoboken: Wiley Publishing, Inc., 2006.
- YIN, R. **Case study research: design and methods**. Thousand Oaks: Sage Publications, 2003.