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Agile project management approach applied in non-IT industry. A manual to start adopting.

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I hereby declare that the work submitted is mine and that where I have made use of another's work, I have attributed the sources according to the Regulations set in the Student's Handbook.

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Abstract

Purpose
Organizations today need to focus on the implementation of new technologies in their main activities. It is a transition they should make to meet the expectations of the market. Many SMEs face problems with that procedure. Agile project management (APM) may help them think differently to start managing unknown activities like that. The current dissertation aims to deliver a manual to help organizations adopting agile project management at an entry-level.

Design/methodology/approach
Ten unstructured interviews have been taken from experienced business interviewees to create that manual. These interviews aim to evaluate the average non-IT organization's current state regarding technological issues and how technology affects its growth. The interviewees were informed about agile's philosophy and the created manual. They assessed it and shared their point of view.

Findings
The paper reveals that the presented manual is a tool that each organization may use to start adopting APM at an entry-level.

Limitations
The current survey has been conducted in the Greek market with Greek variables in mind. It should be contacted in other cultures and economies as well, to generalize it. The fact that this methodology has not been applied in a real project is a space for further research, while during the application, many issues will appear.

Practical implications
The presented methodology brings agile project management closer to the non-IT organizations that want to innovate and start implementing new technologies.

Originality/value
The paper shows organizations how to start adopting APM step-by-step without any previous experience.

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Keywords: agile project management (APM), traditional project management(TPM), project management (PM)

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Contents

Introduction

Numerous projects begin with good ideas, enormous investments, and great efforts. In any case, most of them do not accomplish much achievement. The absence of comprehension or characterizing the project and product scope at the beginning of the project and selecting the proper management technique to run the project are critical commitments to unsuccessful projects (Muhammad Nabeel Mirza, 2013). A properly selected technique may lead to a quality product, in negotiated cost, and within defined schedules.

In a dynamic and rapidly changing global market, the increasing demand to provide quality products pushed professionals to create agile project management (Fitsilis, 2008). While TPM is used much longer than APM and its success in specific industries is highlighted by numerous researchers (Grundy & Brown, 2004), for high complexity projects, particularly in I.T., TPM can be ineffective, since specifications are intangible and unpredictable. Because of its static philosophy and the linear procedures for planning, execution, and control, the utilization of TPM in these kinds of projects has prompted numerous issues and disappointments (Owen, 2006). APM has arisen as an iterative and gradual procedure in which project teams and stakeholders continuously cooperate to recognize and distinguish what processes should be done and put them in order (Hanadi Salameh, 2014).

Notwithstanding the expanding success of APM in the I.T. sector, it has not yet been widely accepted in other industries (manufacturing, RnD, organization of events) (Aljaž Stare CSPM, 2014). However, some agile processes can be followed for projects that are still being developed with traditional methods. Additionally, papers refer that interacting with the contemporary society, in which the Internet of Things (IoT) network is continuously expanding, and the Things that belong to the network are evolving day by day, a need for creating a new vision over the software project management (PM) is growing (Andrei Gal, 2018). Moreover, there is literature that demonstrates the applicability of APM in the context of product development. It is also known that there are many different agile methodologies. Picking and adjusting a specific method relies upon project types, organization, and personnel. Thus, papers introduce strategies for transforming and executing the APM methodologies following the project and the team (Arturs Rasnacis, Solvita Berzisa, 2017). This study aims to create a manual that will help all kinds of industries use APM to develop in-house I.T. products. This manual will give guidelines, so the decision-maker will understand if APM is the right approach for a specific case. What steps should the organization take to apply the APM, the changes that should be made, and the key points to transition to the APM way of thinking successfully.

The literature review analyzes the techniques and characteristics of traditional and agile project management and the differences between the two methods. It is also discussed which cases are suitable for applying APM and the constraints for this approach. The Methodology chapter analyzes the literature review's key points and examines what a company should do to apply APM techniques. The empirical approach of the subject took place through a case study. This case study plans the development of a new product in an existing company with an agile approach. In the last part of the dissertation, the results and other approaches are discussed and summarized.

LITERATURE REVIEW

Before analyzing further what industries should do to transition to APM, let us first examine what literature says regarding the characteristics of traditional and agile project management techniques and tools.

TRADITIONAL PROJECT MANAGEMENT TECHNIQUES

Traditional project management (TPM) is a setup approach for managing projects in a consecutive cycle: initiation, planning, executing, monitoring, controlling, and closing. There are tools and procedures for every step, like the ones written in the PMBOK®, which is the standard strategy for TPM. Many techniques belong in TPM. Each technique has each own characteristics, and below we will analyze them, and we will have a better understanding of the differences they have (Kamil Ramisovich Bibarsov, 2017).

1. Classic Project Management

The classic technique is the best fitting in many cases. This simple approach needs nothing more than evaluating the tasks required for a completed project and a mechanism for tracking its completion. Managers offer instructions, information, and evaluation of personnel that works on the project. That type of basic PM approach fits better in small teams where participants do not have to stand by for each other's completed duties to continue their tasks.

2. Waterfall Project Management

TPM in an upper level is the waterfall approach which emphasizes making a solid plan and viable execution. That is the reason why this methodology is the least complicated and most straightforward to comprehend. It is sequential, while one task should be finished before the next starts. Regularly, in that approach, requirements are specified at the beginning of the project. From that point, the tasks are executed like that of water falling through the process of planning, execution, performance/monitoring, and project close. Numerous waterfall methods can be followed utilizing Gantt outlines that represent project timetables and dependencies. (Izak Wilhelmus van der Merwe,2017).

3. Rational Unified Process

The Rational Unified Method has taken the business's name where it was initially applied and fitted the repetitive type of software development projects. Those projects work well with iterative projects that incorporate feedback for potential development iterations from end-users. Despite that the RUP method may look like waterfall projects, RUP focus more on the "transition" stage at the close of a cycle, where the product is delivered to the end-users for feedback and potential upgrade (Kruchten, P., 2004).

4. PERT Project Management

Cold War pressures push the governments to look on a different way for big-scale PM with the armed forces. Named the Program Evaluation and Review Technique, this PM type fits with processes of unique production or development procedures that can gradually change or extend. Utilizing that technique, project managers separate between cases that evaluate improvement and actions that get things done. The basis of both timelines and budgets is carefully formed by estimating the amount of time between events. Managers monitor the development of the project with a PERT chart (Eugene David Hahn, 2008).

5. Critical Path Project Management

Critical path PM depends on task length calculates and dependences. Critical path focuses on speeding up tasks by evaluation and prioritization, based on similar concepts to the PERT approach. By breaking down the estimated time to accomplish an assignment, managers can perceive the whole project's big picture. By outlining ways between tasks that depend on fulfilling prior undertakings, managers can pack a venture into the briefest conceivable measure of time (D.R.Kiran, 2019).

6. Critical Chain Project Management

The Critical Chain approach, a progression of PERT and Critical Path techniques, helps project managers reshape their groups and priorities around budgets and other constraints. Project managers utilize the information to calculate likely expense investment funds and take advantage of modifying or removing processes instead of using Critical Path projections to decide the shortest possible project duration. Critical Chain management has been well known by managers in dynamic sectors, such as automobile manufacturing and hardware development (Krystyna Araszkiewicz, 2017).

7. PRINCE2

PRINCE2 is utilized in projects with Controlled Environments. It is a PM technique that is comprised of fundamental and standard procedures. A project is divided into several phases, and each phase has its own set of plans and procedures to be followed. PRINCE2 is very precise and has a system fit for developing large projects. This methodology gives the team the advantage to better control the resources and the risks of the project. It focuses on identifying the specifications, actions and ending up managing a realistic project and result goals. (Sandra Matos, Eurico Lopes, 2013).

AGILE PROJECT MANAGEMENT TECHNIQUES

An Agile project is composed of three elements. The product owner, the primary stakeholder, is the product expert and organizes the whole team. The scrum master is responsible for executing all the procedures to complete the project according to APM principles. He is responsible for the iterations and their completion. The team individually plays a critical or nonsignificant role in software development (Hanadi Salameh, 2014). Regularly utilized for in-house teams, they work in loops of preparation, execution, and measure results toward the end. Agile focuses on adjustability to modifying situations and continuous communication by everyday cooperation both within the team members and with the project stakeholders (Francisco Loforte Ribeiro, 2010).

1. Scrum

Scrum is an Agile software development methodology, which has acquired fast acknowledgment (Schwaber and Sutherland, 2017). In that technique, a small team(scrum team) is driven by the subject matter expert (SME) who creates a productive cooperation path. The scrum team operates in a multi-level, while team members have discrete operation abilities. Additionally, it is regulated by itself, is self-directed, and is independent at a high level (Moe et al., 2009). The Scrum teams work in iterative loops that last two weeks and are defined as 'sprints.' The third formal role is the scrum master, the facilitator, and his role is to coach and coordinate the team. Scrum master guides the team to increase its productivity, perform at a high level, and show how to adopt Scrum practices (e.g., events, artifacts, roles, rules). The dedication is to enhance interaction, team spirit, and quick development (Nico Holtzhausen, Jeremias J. de Klerk, 2018). While it is created for software development, it is a challenge for other innovative or tactical teams to exploit and adapt it according to their requirements fully. Therefore, the majority of the teams use a combination of Scrum with different techniques. (Marcelo Morandini, 2020).

2. Extreme Project Management

For many businesses, especially those focused on developing web-enabled software, Internet distribution has changed project management.XP is an APM technique that seeks to deliver a high-level product (Pekka Abrahamsson, 2002) and emphasizes adaptability than predictability. XP is primarily differentiated from traditional approaches. Extreme project management is an agile technique that follows agile Manifesto and principles, like pair programming, weekly cycle, continuous integration, and code testing (Beck & Andres, 2004). That approach is implemented in four stages with the following order explore, plan iterations, produce and release (Amber, 2018).

3. Kanban

That technique emphasizes preparing the expected deliverable at the right timing, considering the developers' abilities. Developers can have several skills and work paces. Project developers begin by completing project components that add value to the project. Consequently, that technique reduces waste at every move and is proper for software projects. Its primary goal is to reflect the schedule, identify and continually review opportunities to produce work more efficiently and with greater features. It is unsuitable for sectors where priorities regularly adjust (Howard Lei, 2017).

4. Lean

Lean directs on decreasing waste and not negotiating overall performance. Lean focuses on achieving the best possible with the least cost (Glenn Ballard & Gregory Howell, 2010). It encourages a breakdown of the work process so that "Muda" can be detected and removed, symbolizing all types of waste, delays, and bottlenecks. Muda is discharging what is not giving any benefit to the project, i.e., waste. Mura is discharging the expenses or anything that leads to any set of inconsistencies in the scheme. Muri associates any unnecessary pressure or responsibility to personnel. That is triggered by Mura and numerous factors in the procedure. The primary argument managers choose Lean above others is how it supports them to do more with less human resources, less capital, and less time (Howard, W.R.,2010).

5. Scrumban

Scrumban is, as the name implies, a hybrid methodology for project management with two other techniques, Scrum and Kanban. It uses Kanban's versatility and combines it with the framework of Scrum to design a different approach for cross-project management.

SCRUMBAN = SCRUM + KANBAN

In Scrumban, we can plan iterations at regular intervals and synchronize them with a review, as the main priority is to load the free slots. That primarily leads to offer a framework that facilitates teamwork and saves time. This combined technique can be useful for RnD departments and project management teams (George Ellis, 2016).

6. Crystal

It is an agile technique that belongs to a group of approaches. Those approaches are Crystal Clear (maximum eight-person per team), Crystal Yellow (maximum ten to 20 person per team), Crystal Orange (maximum 20-50 person per team), and Crystal Red (maximum 50-1000 people). Crystal directs on principles such as Personalities, Communications, Community, Talents, and Skills, trying to produce the highest possible software development procedure. The heart of this method is communication and symbiosis, which must survive between the teams of the projects and processes(Pekka Abrahamsson, 2002).

7. Feature-Driven Development (FDD)

Another Agile framework specific to software is feature-driven development. This methodology involves developing software models each couple of weeks and demands a design and development layout for each software model's characteristic. It also has more precise specifications than XP. Therefore it is best for organizations with specialized expertise in design and planning. FDD separates initiatives into five fundamental operations. Produce an overall model, create a feature list, plan according to the feature list, design by feature, and build by feature (Adila Firdaus, 2014).

8. Dynamic Systems Development Method (DSDM)

DSDM involves the user throughout the project and rapid delivery. Other main focuses are the team's empowerment for the choice method, direct on repetitive project delivery, and entertainment changes. Using DSDM can develop projects dynamically, and it is the best fit for a system where specifications are not determined in advance. It is possible to go back to a previous state of the software development life cycle. Testing is conducted throughout project development. DSDM created the need to implement a standard industry structure for fast software delivery (Aiman Khan Nazir, 2017).

COMPARISON BETWEEN TRADITIONAL AND AGILE PROJECT MANAGEMENT

All projects are not possible to run with one perfect project management technique. Choosing the most appropriate method for the management of a particular project depends on several factors. The most important factors are the degree of complexity and the type of the project, the team's experience in carrying out tasks, the client's willingness to participate in the project, and the industry's norms(J.R. San Cristóbal, 2017).
Table 1 shows the most significant differences between the two methodologies.

Table 1: Comparison between APM and TPM.

Characteristics	Traditional Project Management	Agile Project Management
Organizational structure	Linear	Iterative
Project scale	Large-scale	Small and medium scale
Development model	Life cycle model	Evolutionary delivery model
User requirements	Clearly defined before coding or implementation	Interactive input
Client involvement	Low	High
Restart Cost	High	Low
Development process	Life cycle model	Evolutionary delivery model
Development model	Fixed	Easily changeable
Testing	Once coding is done	Every iteration
Architecture	Creates current and predictable requirements	Creates current requirements
Requirements	Standard and known in advance	Emergent with rapid changes

Below is an in-depth analysis of each methodology's different approach in the most crucial issues during project execution.

Ownership and accountability

One of the most significant differences between APM and TPM is the degree of ownership and accountability that each methodology provides. In TPM, the project manager carries all the responsibilities. During the planning process, clients are still involved, but their engagement terminates at that point. In the agile methodology, each team member carries a level of ownership and has an active role during the whole project. Contrary to traditional project management, each team member has easy access to the project's progress (Burgan, S. C. & Burgan, D. S. 2014).

Transparency

In agile methodology, everything is completely transparent. All the stakeholders are actively involved during the whole project. Whereas the project manager keeps the project's reins in the traditional approaches, other member teams are not authorized to make critical decisions. APM allows the team to see the project's progress, and that

creates a healthy work environment. The accessibility that the members have to essential elements of the project helps in the project's progress by supporting the team members to make effective and well-informed decisions (Müller & Turner, 2007).

Problem-solving

Individuals are required to pass the issues with unexpected barriers to their executives. Nevertheless, managers are not possible to be always available. Additionally, increasing overall costs can lead to undue delays and exceed the delivery time. In APM, teams have the skills and authority to make their own decisions. To avoid delays, they focus on overcoming all challenges internally. By being deeply involved in the process, their expertise helps them overcome some of the problems that hinder their progress. If drastic choices are not required, team members seldom need to escalate minor matters to the upper management. (Katarína Buganová & Jana Šimíčková, 2019).

Checkpoints and Monitoring problems

At the analysis stage of each project, TPM requires planning to a great extent. The focus is given on the optimization of operations than on the final product. When planning finishes, the team starts implementation with limited instructions. After the project has finished, without regular check-ins, success is assessed. On the contrary, there are checkpoints at frequent intervals in agile methodology as there are simpler and shorter variations. It is easier to determine success by people retaining responsibility in their job. Teams participate in regular meetings to follow what work was completed, the next step's plan, and face any critical issue. The business environment continually changes, and sticking to agile practices is a way to be always updated (Katarína Buganová & Jana Šimíčková, 2019).

Project complexity

TPM is best fitted in small and simple projects, while modifications or any other significant issues can stop the whole project and force the team to return to phase one and begin the project again. Agile is an efficient alternative to adopt for massive and dynamically change projects. A complicated project has many connected stages, and each step usually relies on several others. Thus, APM is best fitted in high complexity projects, as it performs best in such structures (Hanadi Salameh, 2014).

Flexibility

When modifications are needed in the project, APM's responsiveness is at a higher level than TPM's. When working, the agile approach encourages team members to explore and try something besides what is scheduled according to their beliefs to create another path. The great idea regarding this approach is that it focuses on the result rather than adopting a defined procedure. On the contrary to TPM, the agile approach is not following a linear path. Any modification that should be done is welcome in every stage of the process. Thus, the final product and the project schedule are not affected at a critical level(Hanadi Salameh, 2014).

Adaptability

In TPM's philosophy is that reviews take place only after the completion of a task. As a result, it is not possible to adapt to constant adjustments or anticipated circumstances. TPM fails to adapt to any modification that may be needed from the side of a stakeholder. In that case, the change is evaluated, and if it is critical, the project stops and starts again with the new requirements.

APM is not following a linear approach, and the adaptability factor is quite significant. Projects with high complexity have many connected phases, where a modification in one may affect another one. In APM, managers are authorized to undertake small risks in cases like this, while high adaptability can be offered (Katarína Buganová & Jana Šimíčková, 2019).

Scope for feedback and changes

In TPM is accurately defined every step of the project before the launch. As soon as the project starts, there is no process to handle modifications or feedback that demand changes in the procedures. The project's deadline and budget are specified from the beginning, and any alternation is almost impossible to occur.

APM uses flexible approaches and seeks continuous feedback to update the deliverables within the deadlines. In software development, agile methods are preferred due to the strong acceptance of feedback and the immediate response to clients' requests. In agile methodology, each iteration is validated by the client, and that gives the organization a critical advantage to offer a high-quality product (Katarína Buganová & Jana Šimíčková, 2019).

As stated above, the two fundamental methodologies are traditional and agile project management. TPM is the oldest one and is applied in the most static and less complicated projects. In those cases, all the projects are linearly executed and delivered. The project's success is specified when the product is delivered on time and within the budget. APM is more suitable for projects with high volatility and creativity factors and with several possible challenges and uncertainties. In those projects, an iterative approach is required to minimize the dangers and take full advantage of opportunities that may appear.

DRIVERS OF APM

In that chapter will be reviewed the APM's drivers. More specifically, will be analyzed the main reasons to use agile techniques in a project. That methodology believes in a manifesto with four values which are the following. Individuals and interactions are over processes and tools. Working software, over comprehensive documentation. Customer collaboration, over contract negotiation. Responding to change over following a plan (Francisco Loforte Ribeiro & Manuela Timoteo Fernandes, 2010).

Agility offers adaptability to changes

There are increasing cases that projects' requirements need changes and adjustments during the execution phase to keep up with the market conditions. On occasions like these, TPM approaches face problems on following the developments of a project and benefit from any opportunity that appears, while the linear philosophy is not adaptable. On the other hand, APM approaches give a significant advantage in projects with unpredictable and inconstant factors (David W. Parker, 2014).

To handle complex projects, break them into parts

Agile projects are split into parts that are called iterations. The development of each project depends on the execution of each iteration. When an iteration finishes, it is presented to the client, and constant feedback is given. The result of each iteration assembles the success of the project. That philosophy removes the need for detailed upfront planning (David W. Parker, 2014).

To be quick, be self-organized

Agile's philosophy is splitting the management of the project and create self-organized working teams. Each team works on a different part of the project. Thus, multiple working teams develop a single project without instructions from outside. The teams communicate only to discuss the task's progress and how to link each part. Otherwise, they work independently (David W. Parker, 2014).

Continuous feedback creates customers' engagement

One of the leading agile's goals is to enrich customers' experience. The client is part of the project at every stage, while after each iteration, feedback is generated, and the team acts accordingly. In each phase of the project, all the stakeholders cooperate with the teams that work on the project. In this way, stronger bonds with customers are formed, and the product that will be delivered in the end is at a value that a customer will appreciate at a higher level. (Geir Kjetil Hanssen & Tor Erlend Fegri, 2006)

No need for upfront planning

There is no need to plan the whole project from the beginning since it involves frequent iterations. The project is divided into short sprints, using adaptive planning and continual improvement (David W. Parker, 2014).

Share ownership and accountability

If there is a need for sharing ownership, the agile methodology is the best. Every team member who is actively involved in completing the iteration can easily access the progress and the project's state, which leads to a higher level of communication and equality that drives a more free and creative project management method (David W. Parker, 2014).

Transparency

When ownership and accountability are shared, transparency is the direct result. The transparency level that agile offers creates a healthy work environment while all the project participants may follow the progress done from the beginning to the termination (David W. Parker, 2014).

Quick problem solving

The continuous access, tight collaboration, and the freedom that agile offers make the problems be solved quickly without referring to the upper management if it is unnecessary (David W. Parker, 2014).

Often checkpoints

The concept of short iterations to manage a project leads the teams to checkpoints often. Thus, control is frequent, and feedback is constant. Updated information is available to the project teams to use them in the best way for the next iterations or even make changes in the previous ones (Pekka Abrahamsson, 2002).

Flexibility

All the referred drivers above lead to the most important thing that a manager needs to accomplish a complex and dynamically change project, flexibility, and is offered when feedback is embraced even at the last minute (Francisco Loforte Ribeiro & Manuela Timoteo Fernandes, 2010).

CONSTRAINTS OF APM

Organizations and the kinds of projects determine the most suitable methodology to be selected. Cockburn et al. (2001) propose that the known methods must be modified to meet the team's culture. Nevertheless, the company should be cautious in adapting the technique before gaining experience. Alistair Cockburn proposes firstly choosing a method that is closer to the organization's culture, following it as much as possible, and adjusting it according to the organization in the next step (2001).

Going agile needs knowledge of the managers, the executives, and buy-in from the owners that the organization's philosophy will change. It is necessary to consider the modifications at an operational level that this approach will bring and the role upper management should have (Miller Gloria, 2013).

It is a prerequisite that all the organization should be coordinated before adopting agile methodology to prevent or at least moderate any communication issue that may arise. Many regular operational conflicts can be avoided or mitigated by providing team members with expertise in the agile approach. Teams that apply agile techniques should be trained in that way of thinking and be experts in their field (Miller Gloria, 2013).

According to VersionOne (agile management tool), the most important causes for failing to adopt APM are the insufficient familiarity with agile processes, the lack of comprehension of the necessary wider organizational transition, and the organization's culture and standards that are not aligned with agile's principles.

The main constraints that agile has are the following:

1.Not cost-effective for small projects

APM approach requires many resources and developers to create the necessary teams, sufficient experience to solve any issue that appears quickly, and heavy technology to support a project. Thus, the starting cost for adopting APM is not worth it for a small project that is easier to complete under TPM.

2.Not the best to ensure security

TPM guarantees integrity and confidentiality. During the implementation of the project, it supports a robust security mechanism. On the other hand, APM promotes transparency and shared ownership. That is creating possible security issues that may affect the privacy of the project.

3.Not fitted in Remote Projects

Since Agile values face-to-face communication in top priorities, the different geographical positions create a significant problem for more extensive and complex projects. It is challenging to synchronize teams when there are differences in working hours and even in sleeping hours. TPM is suitable for remote projects because it can be developed by smaller groups and does not require intensive communication to overcome the appeared difficulties.

BARRIERS OF APM

In APM, an organization's management faces barriers that are not the same as those faced by applying TPM. These barriers include challenges regarding (1) communication; (2) handling everyday operational issues; (3) ensuring support from executives, clients, and the project teams; (4) modification in culture and mentality; and (5) acquiring the necessary experience to bring results. It is a fact that some of the problems and challenges are unique because of the organization's differences and idiosyncrasies or the project. Though, there are critical barriers that may be faced in every attempt to implement APM (Miller Gloria, 2013). Those barriers are shortly reviewed below.

1. ***Lack of broader buy-in around agile***

The adoption of APM is necessary to come with the awareness and support of the whole organization, not only the project team. There are cases in which personnel not involved in the project can help the development team eliminate any obstacle that appears. The executives and owners should also realize agile's philosophy and the role they must play to adopt APM successfully (Sindhwani R., 2019).

2. ***Resistance to change***

When organizations trying to adopt new operations, there is a natural resistance from those who used to work in the old way. APM implementation is probably altering the employees' roles, especially the ones of TPM. In particular, managers who are used to making decisions and directing work should now share their experience with the team and follow more transparent management in their new role. Those positions must realize the importance of their new roles and adapt how they work to offer the maximum possible. If they miss understanding the new environment they are challenged to work in, transformation to APM and the project itself will probably fail (Mukherjee A., 2015).

On the other hand, the development team should realize that the projects' accountability is not only in the manager's possession but is shared with the whole team. (Sindhwani R., 2019).

3. ***Lack of open communication***

Open communication is a crucial aspect of agile development's successful coordination. If that level of transparency is not achieved, the issues that appeared will not be raised instantly, and problems will not be solved in time. It is important to create teams responsible for the final result and be aligned with the organization's goals. Individuals little can achieve without sharing information (Moradlou & Asadi, 2015).

4. ***Being too risk-averse***

Agility is offered to the development team through small experiments that create products and services by repeated iterations. To do it effectively, a company must recognize the possibility that not anything the team does will make it to market.

That philosophy is not about making excuses for failures or wasting budget. Spending a small, regulated amount of money on researching with unknown benefits is well-invested money, while the experience gained will be used to finalize ideas that not worth spending more on them (Sindhwani R., 2019).

5. ***Attempting to scale before the core culture is established***

Community culture is so vital to agile adoption that it is pointless to establish it on a broader scale before a well-integrated proof. Nonetheless, a healthy agile culture can be developed by beginning with experienced individuals and using a training model to expand the expertise. It is essential to be accepted that this procedure will bring results in the long-term, but it is possible to be achieved (Moradlou & Asadi, 2015).

6. ***Attempting to 'standardize' at the wrong level***

Genuine support to the agile way of working is not attempting to enforce a particular working style on others, rather an agreement that teams instinctively follow the working methods that better serve them. Agile's philosophy lets the "How" to those closest to the challenge, encouraging them to select the right strategy for achieving the desired result. All standardization can be extended to the outcomes (via quality control) to ensure that the results are the desired ones. (Kumar R, 2020).

APM'S OPPORTUNITIES

Twelve principles follow the agile Manifesto. These principles are presented below and offer great opportunities for transitioning to agile project management methodology.

Client loyalty is a top priority and is achieved with prompt and constant delivery of useful software. As a result, the customer is more confident throughout the project's development and is more likely to engage with the organization.

Continuous evolving specifications are desired in each stage of the development process. APM practices tend to perceive them as opportunities even late in the development process. Giving that opportunity to the client differentiate the services that the organization offer and creates a competitive advantage.

Functional software is provided regularly, varying from a few weeks to a few months, with a shorter timeframe preference. Through that philosophy, the organization gives quickly and constant value to the client, and if the organization sets it on the negotiation table can claim early payments.

According to APM's advocates, the software cannot be prescribed with a set of features, unlike physical products. To produce a complete and desired outcome, all software engineers, top management, and business people must collaborate. When something like that has been achieved, the product's quality will be at the top level.

Motivated people are at the core of all projects. They are supported with the infrastructure and resources needed, and they are trusted to accomplish the mission. This procedure engages employees with the organization and offers them the safety they need.

Agile supports that the most productive way of transferring knowledge between the project teams is with direct communication. Software development projects are usually complex, as specifications, structures, test procedures, and interfaces are modified during the development process. Thus, the team must cooperate during the project to achieve transparency and quickness.

Functional software is considered the most significant indicator of success. When the target is evident in software development, it can help the whole team focus on the goal.

Agile methods are considered to facilitate long-term sustainable progress. Stakeholders, the development team, and clients should all permanently keep up with the pace. APM processes are built around inspired personnel and provide them with the independence and versatility needed to be effective and "think outside of the box." That philosophy offers a great working environment to whoever is a part of it.

Consistent emphasis on technological competence and good architecture is thought to increase agility. Following that belief, only quality products can be produced.

Simplicity, or the art of reducing the unnecessary workload, is considered critical. It will be easier to keep designs simpler if excessive overhead is minimized. Time and money will be saved, allowing the organization to concentrate on bringing more value to the clients.

Self-organizing teams are considered to create the best structure, specifications, and prototypes. The flexibility of team members' duties and tasks facilitates innovation and imagination.

High performance is accomplished when teams focus on ways to evolve at frequent intervals and change and improve their actions accordingly. That provides the personnel with the ability to develop every day. (Subhas Misra et al., 2012).

PROMINENT VERDICTS OF THE LITERATURE REVIEW

TPM approaches focus on deadlines, costs, and processes. Thus, it is the right choice for a fixed-price project that needs to be entirely outlined from the beginning. That means if there is only one shot at something, and it is a fixed price, traditional is probably the best fit. A skyscraper, for instance, is built with TPM. Nevertheless, when the final product is not possible to be fully specified from the beginning, the outcome may not be adequate to satisfy clients' required demands under the continuous market modifications and new globalized expectations.

On the other hand, APM is useful when a project has a series of releases. If an idea does not make it first, it can be developed in the next update. An agile project develops in editions. The edition is created, controlled, and presented to the project's key stakeholders at the end of each iteration. If approved, it can be integrated into the final deliverable. In every case, feedback is produced and is used in the next iteration. Projects follow this process and are finalized when the final product is created, or the budget is depleted.

Since no approach is possible to guarantee the best result, the most suitable strategy is developing a project management methodology that suits the organization's culture and goals. It could be a tricky undertaking to select the most appropriate project management methodology. Different project management methodologies fit with particular projects, depending on the development team, the project's nature, and the organization's philosophy.

METHODOLOGY

The literature review has identified that agile project management is still at the beginning of its era. It is a tool for every modern organization that wants to develop a project with the constraints and barriers on the one hand, but with the drivers and opportunities, on the other hand, that agile offers. In this survey, there is an effort to create a manual that will lead the user to evaluate whether agile project management is a proper methodology in each case and how to implement it in a project without previous experience.

STATE THE PROBLEM

The need to create that manual arose from our days' necessity that wants all the organizations to be updated regarding technological issues. To meet the market's expectations, organizations, regardless of the nature of the product or the service they offer, should step into the world of technology. The internet of things era is close, and whoever misses being updated will be at a disadvantage. Especially nowadays, that the pandemic of covid-19 is plaguing the whole world, all the governments try to find solutions through lockdowns to control the virus' spread. In that era, technology looks like a dead end to even exist as an organization.

THE APPROACH

The current dissertation's approach in this issue is that each organization should start implementing technology more and more regardless of the sector it belongs. It should take several steps at an entry-level and agile project management methodology that may help them achieve it. The manual presented in this dissertation is a tool that each organization can use to start adopting agile project management techniques in-house.

EXPECTED OUTCOMES

As stated in the introduction, the objectives of that research are the following. Analysis of the criteria that reveal the need to implement agile project management. The steps that an organization should take to apply agile project management. What are the changes required to be done within an organization. What are the key points that the organization should focus on while adopting agile project management technics.

DESCRIPTION OF METHODOLOGY

The dissertation's central concept proposes a manual to non-IT organizations, like small-medium enterprises, regardless of their sector. These organizations, following the manual, will be able to evaluate their potentials for implementing agile project management and get directions on how to perform their first steps.

Data collection

The approach to the above research objectives has been made through literature review and the exploratory study through interviews. The data collection has been done through 10 semi-structured personal interviews with either I.T. or business experts. The semi-structured approach enabled the discovery of unforeseen information as interviewees could express themselves more freely. The interviewees' selection has been made with the bellowed criteria:

The interviewee should have at least five years' experience as a manager. The choice of that criteria focuses on experienced business individuals who will evaluate the market's current and short-term future.

The interviewee should work in an SME with at least ten employees. That prerequisite is set to ask the interviewee to evaluate the methodology proposed and consider if the organization he performs would apply it.

Each interviewee should work in a different sector. Each interviewee represents a diverse selection of other markets and sectors; thus, the results will be from a varied sample.

Each interviewee should work in a different position. These criteria aim to check the variable points of view that each position may have.

Each interviewee should know the basics regarding project management. It would be time-consuming to inform an individual about APM while he has no experience in project management

Before the interview, a briefing is taken place to educate the interviewee about agile project management and its principles. It is also presented a summary of the manual to have a clear picture of the whole concept. The questions are split into two categories. The first category has questions regarding the interviewee's perception of the business world and its relation with technology. Those questions try to capture the interviewee's opinion regarding the connection that businesses and technology have and should have in the future. In the second category, the interviewee is asked to talk about the organization that he currently works. The current technological maturity of the organization. is also discussed, in that category, as the interviewee perceives it. The interviewee is also invited to propose the direction that the organization should have regarding the technological issues. The next step is to express his opinion regarding the APM. Finally, he is asked to evaluate the presented manual and answer if he would consider using it to apply APM for a project. Each interview with the briefing lasted between 40minutes and 1hour.

Reporting

All interviews were written down shortly after they were conducted to ensure the actual meaning of interviewees' answers. The overview of the results is below:

All the interviewees believe that "it is crucial for the existence and expansion for every SME and organization to be updated regarding the technological issues" and that organizations today face problems because they are not technologically updated. That indicates that technology is an important element in every organization.

Regarding the scale of importance, 80% of the interviewees stated that SMEs should follow the technology and implement what fits the company. Through that answer is stated the level of awareness that a company should have. It is not enough to follow the technological issues but to insert technology into the organization's activities.

On the one hand, according to the research, the organizations that miss being technologically updated suffer a severe disadvantage today. That disadvantage, medium, and long-term will be extended, and it is possible to affect an organization's existence. On the other hand, if an organization manages to implement technologies in its main activities, its impact will be great. That impact will be increased in 5 to 10 years. 40% of the interviewees believe this may eliminate even competitors that miss being updated.

Regarding the problems that organizations have in adopting technological issues, the interviewees detected that culture (70%) is the main barrier. The next critical issue is knowledge (50%) and then follows capital (40%) and other resources(10%).

In the question if an average non-IT organization should try to implement technology in-house or outsource, the answers are split in half. Many interviewees stated that it is not critical to have it inside, and concerning the high cost for doing that, outsourcing is an adequate solution. However, an interesting point is given in the next question where all the interviewees stated that medium and long term, the implementation of technology should entirely pass in-house. That gives a clear sign of the intensity that technology will have in an average organization's everyday routine.

In the last part of the first questions set, the researcher briefly presented the manual approach and asked the interviewees to evaluate it and propose changes. In that part, various proposals are given. The 30%, though, stated that control points should be added between several steps. That would help the user of the manual to evaluate the progress achieved. The control points are proposed in two ways. Either like stop points or like feedback loops. In the first case, the stop points will terminate the process if serious problems appear. In the second case, the feedback loop will start the process again from a previous step if the evaluation detects critical issues. Another notice was to compare the agile and traditional project management regarding the project. That activity would be taken place in the first phase of the executed methodology before adopting APM. The meaning of that action would be to evaluate the better way to work and give points to one or other methodology to present it to the upper management. Another proposition to achieve that result was to test APM on a small scale but a real project.

In the next part of the interview, the topic refers to the organization that the interviewee works in. The first question was about the direction and maturity that the organization has regarding the technology. 80% of the interviewees have stated that their companies need to step more in the technological issues. According to an interviewee, Alumil s.a., a big and innovative organization, does not cover the whole range of

technologies, even if she is capable. That interviewee is a manager in the marketing department of Alumil and spots there is room for improvement in that field. Only two of the interviewees claimed straightforwardly that their organizations are leaders in the technological field. An I.T. company from the USA and the other one is a manufacturing company from Germany with a highly sophisticated product. The rest of the interviewees spotted that they all need to step more in the technology and insert it either in their final product and services or in their processes, methodologies, marketing, and industrial equipment.

Regarding the APM and its philosophy, 90% of the interviewees marked that agile Manifesto and principles may help them develop their businesses. Even the ones that marked that this may work under certain conditions stated that they would try to implement that methodology. One interviewee marked that his company already worked in that way, while another reported that they tried to implement APM in his company, but they failed.

The interviewees that would try to implement agile had certain projects in mind. An interesting point was about the variation that each interviewee had in mind as a project. As they stated, APM would help them implement projects around the organization's computerization, creating a marketing department in RnD processes and generally when there are no standard operating processes. The drivers the interviewees highlighted to apply APM were self-organization, quick problem solving, continuous feedback, and the lack of the need for upfront planning.

RESULTS

Interviews have concluded the severity of the issue and the extent to which it will have in the future. It appears that the organizations should start implementing new technologies on a larger scale to satisfy the market. According to the survey, organizations should start changing the culture of managing the processes and investing in the technology to gain a critical advantage. That advantage will be more significant as the A.I. and IoT go deeper into the markets' culture.

The focus should be on implementing technologies in-house to achieve the required integration. APM is a way of doing that transformation, and the presented manual is a tool to help organizations implement technologies through that technique.

The interviewees noted that agile Manifesto and principles are possible to help them develop their businesses and try it if an opportunity is given.

The manual steps are a path that can help the organizations transition to a different way of working.

The limitations of the current dissertation are the absence of execution experience that would give great feedback. Also, the fact that the interviews are mainly focused on the Greek market is another limitation. The research should be conducted in other countries as well to draw a generalized conclusion.

In the next chapter, the suggested methodology is analyzed, and a real example is presented to make it easier for the reader to understand each step.

DATA ANALYSIS (DESCRIPTION OF METHODOLOGY)

As referred to above, a real example will be presented simultaneously to guide the reader. The example refers to a company that manufactures automatic gates and safety systems with the brand name KATEE AUTOMATIC DOORS. It is a small company with 35 employees located in Thessaloniki, which is in north Greece. The company consists of the manufacturing, sales, installation and service, procurement, and account departments.

KATEE is willing to develop a platform where private parking spots will be available to rent for a predetermined time. There will be two kinds of users: the host and the guest. After that, the host will be registered, and he will be able to list one or more parking spots in his possession. On the other hand, the guests will create an account to access the available parking spots.

That is the central concept of the project that KATEE wants to develop. It could be related to the famous Airbnb platform concept, but in this case, the hosting place is a parking spot. To accomplish this project, KATEE should take some steps that it has never done before.

Step 1-Determine main requirements of the project

For KATEE to accomplish the whole project and release the "Airbnb parking" platform, it should first make many smaller steps. Below are the steps that are needed to be done.

- Develop the Software/Hardware.

These parking spots can be protected from an automatic garage door, while the concept refers to private parking spots. Today it is common to use special transmitters and receivers that operate the doors with proper synchronization by technicians. To that project will not work while the guest should open the door with the host's permission but without having that particular transmitter. That means that a new system should be developed with a receiver and a transmitter.

The company, which today manufactures its electronics, should create a new product. Probably an application with a particular receiver that will open a garage door using a mobile phone. The guests will download this application, and they will be able to open the garage doors when they have permission from the host. This step, even by itself, will give extra value to the company, while it will be a new innovative product that the company will own. This step is considered a sign that agile project management should be applied, but it will be analyzed extensively later.

- Develop the platform

The platform where all the listings, the bookings, the payments, the reviews, the map, and the communication will take place should be developed. That would be a difficult task with many changes and problems that should be solved quickly. Flexibility and adaptation should be one of the main characteristics that this development will have.

- Cloud server

When the platform is ready, it should be uploaded to a reliable server with the requirements and the possibility to be expanded adequately.

- Marketing

Marketing should start analyzing the market's needs from the first moment and give the management feedback to direct its implementation. As soon as the platform is uploaded and tested several times, it should promote the service and make it known to the people. Marketing should also be in continuous communication with the users and seek possible platform updates to improve customer experience.

Step 2- Match requirements with Agile's drivers

These are the main requirements for the real-life example that is used. Going back over the literature review and the drivers that lead to Agile project management, this company has many reasons to follow this technique to develop that project. Table 2 below shows how the drivers of agile methodology give solutions to the requirements of KATEE's project.

Table 2: Agile drivers matched with KATEE's project requirements.

Needs-Drivers	KATEE's project requirements	Agiles' methodology Solutions
Adaptation	Marketing's continuous feedback	Several interconnected stages
Complexity	Many steps to be done without previous experience	Break projects into parts
Quickness	Short delivery time	Self-Organized
Customer's engagement	A mature company developing a new innovative product	Continuous feedback
No upfront planning	Not a clear picture for the whole project.	Iteration's planning
Shared ownership and accountability	Several interconnected stages to be developed simultaneously	Active roles to complete the sprints to each member
Transparent project	Communicate the vision to gain experience	Clients and team members actively involved in all project stages
Quick problem solving	Many issues will appear during the development in different parts of the project	Each team have the authority to resolve their problems
Often checkpoints	Small steps will be needed to control the whole project	Short iterations
Flexibility	Development with dynamic requirements in a dynamic environment	High acceptance for feedback and changes

Step 3-Analyze the limits of Agile and how to overcome them

CONSTRAINTS

In table 3 is presented the constraints of agile's methodology and the plans of KATEE to overcome them.

Table 3: Agile's constraints and KATEE's Plans.

Constraints	Description	Agile Fit	KATEE's Plan
Skills and experience of the project team	The team's depth of knowledge and familiarity dealing with technological issues. The less experienced the development team is, the more the upper management will have to guide and coach the inexperienced members. The team will be less effective than if it had all experienced people.	Highly experienced	Hire an experienced Agile project manager
Constancy of requirements	The probability that the criteria will change in the next two or four weeks. Involve regular feedback intervals, for example, innovative ventures. Customer-driven projects where they just know what they need after seeing it.	Low constancy	Follow the flow of the project
Client accessibility	The customer's accessibility and intensity of communications. The more the client can be reached in everyday operations, the more effective collaboration and the need for intermediary papers will be minimized	High accessibility	Inside software development no need for interaction in the first place
Culture of management control	The level to which a company's culture can accept and respond to delegating decision-making, allowing for negotiations on delivered functionality, and embracing a degree of doubt over what will be provided	Low management control	Willing to agree in a certain amount of uncertainty
Cost-Effectiveness	The degree to which something is productive concerning its cost. In Big projects, heavy technology and machinery are needed. A lot of resources working simultaneously (managers, developers, hardware)	Not cost-effective for small projects.	The project does not require heavy machinery and technology in the early stage
Security of the project	In what levels of security and privacy is a project being built. In a transparent project development with shared ownership, the trust of the team is more significant. The same is the risk that the management takes regarding the ownership	Low levels of security for the project	Trustworthy partners
Remote projects	Communication and different geographical position become a significant	Not suitable for remote projects	Development of the project without remote

	challenge for more extensive and complex projects.		

Step 4-It is a milestone (Decide if you will use agile project management)

Since the constraints are evaluated as manageable, and the drivers are well-fitted with the requirements, the upper management should decide if the project will run with an agile method. The moment the organization chooses to implement agile project management, it should be clearly stated that the organization needs to start following agiles' Manifesto.

Step 5-Prepare the organization

The preparation phase assists the company and development team in getting ready for the project's launch. The agile project management approach necessitates improvements in physical procedures as well as employer thought. Everyone participating in the transition process must be assured of the APM's capability and utility in achieving the project's goals.
ADAPTing, which involves the phases of Awareness, Desire, Ability, Promotion, and Transition, is a suggested restructuring strategy for planning and adopting the APM approach. Below is shortly presented that methodology.

ADAPTing

A-warenes there is space for improvement
D-esire to change
A-bility to work in an agile manner
P-romote early successes to build momentum and get others to follow
T-ransfer the impact of agile throughout the organization so that it sticks

Every part of the team will need to move through the ADAPTing process. Nevertheless, it is not necessary to do so at the same rates. The first adapters will be the leaders-early adapters.

Below are referred few tools that can be used in each stage to achieve the desired result:

- Awareness
  - Make it clear that there is an issue.
  - To illustrate the problem, use metrics, and diagrams.
  - Offer people the chance to encounter new people and have new experiences.
  - Concentrate focus on the most significant causes for improvement.
- Desire
  - Let it clear that there is a better approach.
  - Instill a sense of hurry
  - Build momentum
  - Organize a test session for the team to see how agile works
  - Remove disincentives
  - Align rewards
  - Make everyone part of the transition
- Ability
  - Offer mentoring and instructions
  - Keep everyone responsible
  - Keep transparency
  - Set attainable goals

- Promote
  - Share success stories
  - Draw attention
- Transfer
  - Extend the advantages of mobility outside the present community
  - A team transfers to its department
  - A department transfers to its division
  - Without transferring, the transition will eventually fail

Two ways of adaptation are needed. There is a need to be done in both ways to achieve the transitioning. The Top-down is implemented by influential leaders who share a vision to the team, and bottom-up that a team starts to work in that way and the rest realize the new approach's benefits. The bottom-up way begins with the enterprise transition community (ETC), which starts adopting and collecting improvement backlog. Then this team encourages improvement communities (I.C.) to be formed and offers them energy, support, resources, guidance, and occasionally direction. The mindset that is described above begins when it is decided that agile methodology will be used and never stops. The evolution and the struggle to adapt are always in the philosophy of agile.

To achieve the best results through this method, a specialist in Agile methodology needs to give directions, monitor the preparation, and make corrections in the procedure. This individual needs to be experienced in implementing agile methodologies and have leading skills. Therefore, the first step in the preparation phase is to define who will be the APM expert. With the expert's guidance, the organization will make the necessary changes before its launch. KATEE will also walk in this path by either hiring or cooperating with an agile specialist.

- *Changes in organizational culture*

The shift in organizational culture is among the most significant and one of the most difficult to accomplish types of improvements that must be achieved. The culture must transition from one focused on rules and processes to one based on team members' flexibility in growth and management. Passion and a willingness to change should flourish in an organization's community. They should encourage constant collaboration, information exchange, increasing the degree of integrity and transparency in cooperation in organizations, providing an appropriate working environment, engaging all participants in teamwork, and growing the culture of being responsive instead of predictive. There should be a "right to errors culture," which ensures that mistakes should be allowed in the workplace and personnel should not be punished for them. (Subhas Chandra Misra et al., 2010)

People's beliefs, norms, attitudes, and actions are affected by Agile methods (Cockburn and Highsmith, 2001; Turner and Boehm, 2003), as are decision-making procedures, problem-solving techniques, cultural norms, and employee-manager relations (Nerur et al., 2005). Cultural transitions are difficult to implement since they include modifying the attitudes and mindsets of the individuals they have dealt with over the years. Several scholars have described individual problems that play a significant issue in the implementation of APM. Most developers are used to operating independently in

traditional organizations. These programming patterns that traditional organizations' programmers have built over time can be an obstacle to agile methods' successful implementation.

Pair programming, coordinated decision-making, onsite clients, and mutual learning are also principles found in many agile techniques. The effectiveness in each of these tasks is determined by the team members' perceptions toward each other. Since most agile strategies enable participants to work closely together, customer-centric people concerns are particularly critical in APM. Effective decision-making requires both clients and developers to work together. Consequently, decision-making becomes even more challenging than in traditional organizations, where managers are mainly in charge of most decision-making activities. (Nerur et al., 2005)

In the case study that is examined, the organization is a manufacturing company. That means that little do they know about agile project management while manufacturing processes usually follow traditional ways. The cultural changes that KATEE needs to make will follow the statistical analysis. First, a team will be built to develop the new project. That team will be working together during the project's development, and the main focus will be on this project. The team will consist of the project manager, the Agile specialist, the I.T. manager, the marketing manager, the developers. The whole team should learn and accept the Agile Manifesto, and the Agile specialist will be the one who will guide the team in that world. The project manager should ensure that the development will be customer-centric and team goals will be set. The developers should fully understand what they should accomplish, and they will be evaluated only on the results.

- *Changes in management style*

Agile procedures in conventional organizations involve a shift in the management model from command-and-monitor to leadership-and-cooperation (Beck, 2000; Cohn, 2005; Williams and Kessler, 2002). The project manager's position in traditional development projects is that of someone who develops a well-defined, documented plan that executes and monitors it.

Nevertheless, while the model changes from plan-driven projects to agile projects based on informal planning, the project manager's role must change. The managers should promote the projects' general progress, work similarly with the team, cooperate with them, and organize their efforts to achieve seamless project delivery.

Top management should be providing and open to making improvements, believing their developers, moving to continuous (micro) scope management without micromanaging the activities of the developers

Drive to agile has to come from within the team. Therefore, project managers should create self-organizing groups which will still require leadership. Project managers will be the leaders who will form the teams, and they will be responsible for setting the boundaries that each team will be moving in. A leader to influence how a team will self-organize can create informal groups, clarify or not expectations, insert new members in a team, insert new techniques and tools, enlarge or shrink teams, enlarge or shrink responsibilities, create new teams.

Each team should have agents with different skills, experiences, and knowledge, and all of them will make the right team to achieve the goals. Project leaders who want

to implement agile methods will need to shift their coaching philosophy from centralized to cooperative and democratic decision-making. (Subhas Chandra Misra et al., 2010)

In KATEE, the project's instigator will also be the project manager and the project's primary stakeholder. That is an innovative project with many technological and I.T. parts that the company has no previous experience with them. That means that the procedures' management should be continuous and microscope on the one hand but agile and collaborative. The manager should take constant feedback and show the team's way to ensure smooth progress and completion of the project and let the team decide and take responsibility for issues clearly in their field. Changes and risks will be acceptable while the organization will gain experience in this path and will be led to the best possible result regarding the project.

- *Changes in knowledge management strategies*

Another important issue is the transition in knowledge management techniques from strict reporting to implicit knowledge management, mostly among agile developers. Documentation has commonly been emphasized as a tool for information management in highly process-centric organizations. On the other hand, Agile approaches aim to diverge from a strict documentation-centric development strategy in favor of a development approach that focuses on "presenting working software." If there is no documentation, much of the data is carried by the creators or hidden in the script. As a result, the management of this implicit awareness
leads to a new focus field of agile projects. (Subhas Chandra Misra et al., 2010)

KATEE will also work in that way. In the first place, KATEE will rush the project to launch the product without creating heavy documentation. As soon as developers finish with writing code and pass in the face of maintenance, they will start doing the documentation also. Nonetheless, KATEE wants to keep the people that are hired and open new horizons for the future. When the project will finish and the product will be launched, the company will need people to maintain and handle the system to keep it updated.

- *Changes in the knowledge and education*

All stakeholders should be trained on the beliefs and processes that APM follows, especially the top managers. The same applies to the members of the development team. They should learn how to handle projects using agile methods. In other words, If one person lacks an understanding of the agile approach and is reluctant to try, he could be a significant obstacle in the project, especially the upper management (Subhas Chandra Misra et al., 2010).

After creating the team and before the project launch, all the KATEE team members will be educated regarding the philosophy they will follow during the project's implementation. Basic agile Manifesto will be taught to everyone, and they will be called to work in that way.

- *Changes in development processes*

TPM and APM's main distinction is that the first is heavily process-oriented, whereas the second is much less. Agile techniques, on the other hand, place a greater emphasis on individuals. Development processes need to change from heavily process-centric to short, iterative, test-driven, people-centric development, from lifecycle-based development to feature-driven evolutionary and iterative development (Nerur et al.,2005), from contract-compliant to change-tolerant development, and from standards compliance and measurement-driven development to development under uncertainty. Agile development processes involve plenty of prototyping and continuous builds with regular updates, operational tests simultaneously with coding and constant feedback. It was also suggested that the development processes in ASD require the architects to work alongside the programmers. (Subhas Chandra Misra et al., 2010)

In KATEE, there is no previous experience in software development, so the practical part of the agile practices will be implemented from the beginning. The vital part of the development processes that the organization has to accept, is the culture of the try-and-fail procedure with small iterations that are tested and either approved or rejected. Traditional management is challenging to accept an approach like that, and the managers of the project should handle the issue very carefully.

- *Changes in personal characteristics*

Team members' attributes should also change. Each member should be self-motivated to continuously improve, informed about the market, confident, establish the culture of mutually managing the issues, win clients and other stakeholders' loyalty, and have a positive attitude. Furthermore, the technical people in the teams should have sales skills while they are going to interact with the customers. (Subhas Chandra Misra et al., 2010)

In KATEE, almost the whole team that will be part of the project will be new members. The members' choice will be carefully made, and for the key-positions, there might ask help from a human resources provider.

- *Changes in customer attitude*

Clients' expectations and habits should also be differentiated due to agile strategies, such as believing in the implementation team member. In an agile environment, developers should not be expected to justify each assignment they complete. If they produce the necessary working software, it should be enough. (Subhas Chandra Misra et al., 2010)

In the case we are studying, KATEE will not have a specific client, while the organization will be the one who will use the software to offer services to the people.

During this phase, except for the cultural changes, some resources need to be updated. From human resources to essential hardware and software resources. All these will be specified and will be sorted according to the needs that the project will have. An agile specialist and an I.T. specialist will help in that phase

Step 6- Selecting the transition community (T.C.)

During this phase, the organization should build the team to implement the first project using APM. In this way, the management should select between 2 paths. The team will either be made from the company's employees or from people out of company hired for that specific project. In the first path, the company should analyze the employees who work in the organization to gather details on employees' incentives, interpersonal relations, micro-groups, official and unofficial leaders, and the future responsibilities each one will have. In the second path, the project manager and the agile specialist will be responsible for finding new employees who satisfy the requirements to build the T.C.

In KATEE's case study, as mentioned before, the company select the second path while there are no I.T. people in the company. Many small-medium organizations will phase that issue, but that does not mean they should not try to get into the agile project management world. On the one hand, creating a new team with members outside of the organization will be more expensive due to the high hire cost. On the other hand adaptation and implementation phase will be easier to handle and will bring earlier results.

Step 7- Select the proper agile project management methodology

During the APM methodology selection phase, the organization should determine which of the current agile PM methodologies are best suited to the institution, team, and goal. In most cases, it is better to adopt an established technique than to develop one from scratch. Current methodologies have been used on various programs, so their benefits and drawbacks in multiple contexts are well known. In this step, there are different established practices for selecting the PM technique that can be used.

KATEE will make the safest choice and launch the project with an existing technique. It Will probably follow the selected agile specialist's advice, but a possible choice will be the Scrum methodology that is the most famous.

Step 8- Adaptation phase

Following the project's requirements, the team, and the chosen methodology, the organization should step into adaptation. Disagreements between the selected approach and organizational values or personnel character could arise through this process, requiring adaptation to be applied. During the adaptation process, the APM approach's following aspects must be examined: functions, procedures, and activities. Restructuring existing positions into new roles, adding agile roles to current positions, and adapting agile roles to existing positions are three ways to apply agile positions. Before implementing a new post, it is necessary to review the selected position and its adaptation options thoroughly. Procedures and activities are all subjected to the same adaptation mechanism. There are different established practices for adaptation that can be used.

Step 9-Implementation phase

The implementation process ensures that the protocol is implemented according to the model selected. Begin low and then escalate. It is recommended that for an effective introduction to a new approach, ShuHaRi (Ivan F, 2015) principles may be followed, which aid in the quality assurance of the implementation process.

In KATEE, steps 8 and 9 will be implemented after executive boards that will especially take place between agile specialist, project manager, and the I.T. specialist for these decisions.

Step 10-Launching the project

When everything is sorted and the project is ready to be launched. At that moment, the organization should have done all the above steps to set the necessary basis for a successful project. It is not critical to have finished all the processes before the launching but should be in the executing phase.

DISCUSSION OF RESULTS (OTHER APPROACHES)

This chapter will review other approaches regarding adopting agile project management and compare them with the methodology presented above.

Francisco Loforte Ribeiro and Manuela Timóteo Fernandes (2010), in "Exploring agile methods in construction small and medium enterprises: a case study, "look at ways by which SMEs are managed based on the empirical data collected from 12 case studies. Finally, it is subjectively assessed the adoption of agile methods as a potential contribution for improving small and medium construction firms' business processes. The findings indicate that agile methods offer benefits well beyond any individual company, but **there are significant hurdles to its adoption in the actual phase**.

In another paper, Khaza Nawaz Mohammed (2020) designs a controlled framework for the construction's dynamic nature by introducing Scrum project management in managing construction projects. The proposal of that framework has been made to accept and manage the change in construction projects. The principle of sprint planning has addressed the problems which are arisen by change order, design criteria, delaying documents. The paper dividing the project schedule into small sprints, and gives a clear idea about the time and cost of those sprints. The author concludes that the design framework is **applicable in the planning and designing phase,** and some minor changes are possible to happen in the execution phase.

Pedro Serrador and Jeffrey K. Pinto (2015)[3.3] examined the relationship between agile methodologies and success through a global survey and found a positive relationship between them. They also observed that time, budget, and scope goals are improved with agile methodologies and that agile is most effective at enhancing stakeholder satisfaction. They also refer that although agile developed for software development, its success has now **spread to non-IT projects**.

Dasari Venkatesh and Manik Rakhra (2020), in the article "Agile adoption issues in large scale organizations: A review," showed how agile methodology is implemented in large scale organizations. They looked at all the problems reported by large-scale companies when they implemented agile methods in their products. One of the main issues stated in this article was that there is no guide or a manual that helps organizations adopt the agile methodology and **a research gap in that issue**. Other difficulties reported by companies in that article are choosing the method, training and certification, team member spirit, and attitude.

Amr Mossalam (2018), in the paper "Projects' issue management," explores the awareness status and level of implementation of the project issue management within the project management environment. The paper started with the statement, "Almost no project can be delivered smoothly without facing some obstacles and issues during its lifecycle from the concept till closure." That statement is aligned with the point of view of agile project management looking for quick adaptation in any issue that appears during the whole life. The conducted survey **revealed that project management is immature and needs to be fostered through awareness, training, institutionalizing automation, and standardization.**

Carina Loiro (2019) has written a paper that proposes a team that deals with Agile Project Management. That team is composed of a product owner, a team leader, team

members, and a communication workflow proposal concerning the conjunction of 3 momentums (requirements analysis, planning, and design) along with the Agile Project Management. The proposed model is being implemented in a lightning manufacturing company in a very early stage. In that paper, Carina Loiro **refers to the challenges of implementing agile principles. She notices that "many companies adopted and try to adopt agility, but some failed to implement the agile principles due to company behavior and culture, teams are still not prepared for this challenge**."

Danijela Ciric (2019) conducted a study that "aims to provide academics and practitioners with a coherent overview of the strategies to introduce APM in a traditional project management environment, available in the literature, in this new and still under-explored area." In the empirical research, Danijela Ciric answers the reasons for introducing APM and its application challenges beyond software development. The most common reasons for implementing agile project management for software development are accelerating project/product delivery and enhancing the ability to manage changing priorities. On the other hand, the most critical challenges encountered by respondents using APM in and beyond software development are work prioritization, alignment among stakeholders on what to build next, insufficient time for testing, long feedback loops, incompatibility of agile methods with organizational processes and functions. In the conclusion of the paper, Danijela Ciric encourages **broader empirical research on the use of APM outside software development and states that future research should examine how to effectively adapt the APM to a specific organization or specific project.**

Stephen Denning (2013), in his paper "Why Agile can be a game-changer for managing **continuous innovation in many industries**." is dispelling myths regarding the APM. He tries to promote it in industries that still have not been persuaded that this methodology will maximize customer value. Stephen Denning is an agile supporter even in big-scale manufacturing, in mature companies, and big projects. He also states that because U.S. manufacturing did not use agile methods, millions of jobs and industry sectors were outsourced to Asia.

Kate Dohe and Robin Pike (2018) presented a case study that UMD Libraries began a complicated, newspaper, digitization effort as the Maryland state partner in the National Digital Newspaper Program (NDNP), national collaboration with the Library of Congress, funded by the National Endowment for the Humanities. In that effort, the focus has been given to APM. That paper also refers that **agile methodologies are increasingly (Collie, n.d.) being adopted and promoted in many academic libraries**, both within technology departments (Darby, 2014) and in other areas (Forsman & Hansson, 2014) library. That case study is another example of the wide acceptance that APM has achieved.

Vebjørn Berg (2020), in the paper "Achieving agility and quality in product development an empirical study of hardware start-ups," proposed **an integrative model of agility and quality in hardware start-ups that follows APM methods**. An exploratory study has been conducted with 13 hardware start-ups, collecting data through semi-structured interviews and document analysis. The conclusion was that hardware start-ups need attention to hardware quality to allow for evolutionary prototyping and speed. It is proposed that future research should focus on defining quality-driven practices that contribute to agility and strategies and mindsets to support long-term quality in the hardware start-up context.

Madeleine Marcella and Sheonagh Rowley (2015) studied the extent to which project management tools and techniques can be applied across creative industries through a study of their application in the fashion industry in the North East of Scotland. Their paper marks the need for a flexible and reactive method of project management, and they point to APM as a methodology that can help creative industries like fashion. In the paper's results, the authors state that **understanding the role of agile project management is a way that might lead project management to adapt to the needs of the fashion industry**.

The paper "Agile Project Management Approach and its Use in Big Data Management" (Patrícia Franková, 2016) aims to document agile approaches to project management and suggest ways of using them in projects related to Big Data management. The paper provides a table to measure the suitability of the agile approach compared to the plan-driven process. It is also described how to apply the agile Manifesto for the management of Big Data projects. The conclusion is stated that for the management of Big Data projects is preferable to an agile approach and is recommended to **start on a small scale, accept small failures, and continue the iterative process**.

The article "Estimation of the tasks complexity for **large-scale high-tech projects** using Agile methodologies" describes the method of relative estimation of tasks used in Agile methodologies. The paper concludes that the considered approach makes it possible to apply Agile techniques to large projects without violating the rules and requirements of methods.

One more interesting topic that the paper "Implementation of Scrum in the Construction Industry" examines is how to extend APM in the construction industry. More precisely, that research tries to find out if Scrum can be implemented in the design phase of the construction industry, what adaptations are needed to use that methodology, and how and where could Scrum be used by the design and planning department in a construction company (Thomas Streule et al.,2016). A case study and Scrum methodology are used in a construction project to find out the issues above. The study concludes that the **successful application of Scrum in the construction industry is possible.** The paper shows that no significant adjustments are needed to the original Scrum framework. Finally, this paper gives recommendations about the use of Scrum in the design phase and proposes an outlook to implement Scrum in other stages of construction projects.

The paper "Agile manufacturing: a systematic review of literature and implications for future research" is presented the literature related to various dimensions of agile manufacturing. Three hundred scholarly articles are collected, analyzed, and presented. According to the paper, the researchers have emphasized performance measurement and process analysis through empirical and descriptive research, whereas **its implementation issues are neglected**. In the conclusions, the Automotive and electronics product manufacturing industries have been the focus of AM implementation, but other sectors have also adopted it. It is also referred that academicians are working in coordination with industry personnel for the performance of AM. Finally, in the future research section of the paper is clearly stated that any researcher has ever put the focus on developing a generic framework for the implementation and performance analysis of AM.

The analysis above revealed two main issues regarding the current dissertation. On the one hand, many papers referred to the gap of agile methodologies implementation and that there are significant hurdles to adopt the agile principles. On

the other hand, some documents discussing a wider use of APM outside software development. The current dissertation has been widely referred to both issues and tries to contribute to the literature regarding them. More precisely, concerning the adoption issues, the current manual's creation aims to help organizations without previous experience implementing APM, even in projects beyond software development. In that section are mentioned many case studies that APM is experimented in large scale organizations, in manufacturing companies, in the innovation field, creative industries, big data, and even in education and construction sectors. The current dissertation's alignment with the presented papers' point of view leads to a more straightforward path in implementing agile techniques.

CONCLUSIONS

According to the research, organizations should realize the necessity of introducing new technologies in their main activities. IoT and industry 4.0 have arrived, and the business world is changing. To meet the market's expectations, we need to follow agile practices and adapt to the new continually evolving environment. Agile project management is a methodology that leads organizations in that direction.

The current paper proposes a manual that each organization may use to start implementing agile project management at an entry-level. That manual is a tool for every SME that wants to follow the agile path without previous experience. The survey has been contacted in the Greek market, and extended research beyond that will give generalized results and a more significant overall aspect. Also, applying that manual in a real project will reveal many issues that cannot be predicted.

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APPENDIX

PERSONAL INTERVIEWS

Knowledge should be known to participate in the interview.

WHAT IS AGILE[1]

AGILE MANIFESTO[2] (source: https://agilemanifesto.org/)

AGILE PRINCIPLES[3] (source: https://agilemanifesto.org/)

STEPS OF THE MANUAL[4]

Steps of the manual

BEFORE ADOPTION

Step 1-Determine the basic requirements of the project.

Step 2- Match requirements with Agile's drivers

Step 3-Analyze the limits of Agile and how to overcome them.

Step 4-It is a milestone (Decide if you will use agile project management)

PREPARE FOR ADOPTION

Step 5-Prepare the organization

Step 6- Selecting the transition community (TC)

Step 7- Select the proper agile project management methodology.

ADOPTION PHASE

Step 8- Methodology adaptation phase

Step 9-Methodology implementation phase

Step 10-Launching the project

Interviewees' profile

Interviewee	Company's Sector	Company's Employees	Role	Background
1	Trade	15	Manager	Sales manager
2	Manufacturing	55	Branch manager	Engineer
3	Big industry	100	Manager	Marketing
4	Service	45	Manager	Technical consultant
5	High-tech company	40	Manager	Project manager
6	Big industry	1000	IT-manager	IT
7	RnD	10	CEO	Engineer
8	Consulting	10	Consultant	Managing director
9	IT company	300	Developer	Developer
10	Manufacturing	500	HR Manager	Economist

Introduction Questions

1. Is it crucial for the existence and expansion of every SME and organization to be updated regarding technological issues?

a. Yes

b. No

2. On what scale should the SMEs and organizations be updated regarding the technological news?

a. Ignore the technological news.

b. Be informed about the widely known technological news.

c. Trying to learn about the last updates.

d. Follow the technology and implement what fits in with the company.

e. Force their activities in that direction

3. Are there organizations that face problems because they are not technologically updated?

a. Yes

b. No

4. To what extend is the average organization facing problems as far as you concerned?

a. Just missing some information.

b. Suffer a small disadvantage.

c. Suffer a medium disadvantage.

d. Suffer a significant disadvantage.

e. Fail to meet expectations of the market.

5. In 5-10 years, what will be the future of an organization that will fail to be updated?

a. Just missing some information.

b. Suffer a small disadvantage.

c. Suffer a medium disadvantage.

d. Suffer a significant disadvantage.

e. Fail to meet expectations of the market.

f. Will not exist.

If in question 2 the answer was ''d'' or ''e'' please answer below:

6. What are the main problems that a company face to adopt technological updates?

a. Knowledge

b. Culture

c. Capital

d. Other resources

e. Other (specify)

7. If an organization has managed to implement technologies in its main activities, what will be the gains?

a. Easier functions but not critical in the end

b. Gain a small advantage (comparing to an organization that has done nothing regarding the technologies)

c. Gain a significant advantage (comparing to an organization that has done nothing regarding the technologies)

d. Extinguish the competitors that have not been upgraded.

8. The same as above in 5-10 years?

a. Easier functions but not critical in the end

b. Gain a small advantage (comparing to an organization that has done nothing regarding the technologies)

c. Gain a significant advantage (comparing to an organization that has done nothing regarding the technologies)

d. Extinguish the competitors that have not been upgraded.

9. Should an average non-IT organization try to implement technology in-house or outsource?

a. Inhouse

b. Outsource

10. If the above answer is "outsource" in 5-10 years, will it be sufficient.

a. Yes

b. No (better Inhouse)

11. Suppose that a company wants to examine the possibilities to implement agile project[1, 2, 3] management. Do you consider that the steps of manual[4] are in the right direction?

Answers table

Question/Interviewee	1	2	3	4	5	6	7	8	9	10
1	a	a	a	a	a	a	a	a	a	a
2	e	d	d	d	d	c	d	e	d	d
3	a	a	a	a	a	a	a	a	a	a
4	d	c	c	c	d	c	d	d	c	d
5	e	f	d	c	e	d	f	e	e	e
6	a/b/c/d	c	b	a/b/c	a/b	b/c	a/b	b	a	b
7	c	c	c	b	c	b	c	c	b	b
8	d	d	d	c	c	c	d	d	c	c
9	a	a	a	b	a	b	b	a	b	b
10	b	b	b	b	a	b	b	b	b	b

BUSINESS QUESTIONS

1. Would you consider that your company needs to step more into technological issues?

2. To what extend?

3. Do you believe that Agile Manifesto[2] and principles[3] would help you in your business?

4. Would you try to adopt agile methodology?

5. Do you consider a project that the presented steps would help you develop through APM?

6. If yes, why. If no, why?

7.Any suggestion regarding the steps presented?