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Final Thesis

**Diffusion and opinions by Italian non-IT
companies concerning Agile Project
Management for IT projects**



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0. Abstract

The business world is facing nowadays three big tendencies:

- the proliferation of IT systems, useful to sustain business in a plenty of ways;
- the projectification, that is the recent trend to operate the business activities through projects, especially the ones which add something new to the life of the companies;
- increased speed of every aspect of business, driven by new technologies.

Agile Project Management methodologies could be the right answer to all these issues, but it is needed that these are used in a proper way; indeed, these methods, despite of what is sometimes believed, will be effective only if their rules are strictly followed and consistently enforced.

The main goal of this thesis is to examine the current utilization of the Agile methodologies for IT projects by Italian companies, both in terms of quantity (how much is used) and quality (how is used). Finally, an interpretation of the results will be done, suggesting different proposals for the enhancement and the refinement of Agile project management methodologies.

Note:

For what concerns the quotations and the references it has been chosen to insert in the footnotes the sources that are not strictly academic or anyway concerning the literature of the main themes of the thesis (like articles from on-line journals or similar). That kind of references have been done mostly in the first chapter, to help the prosecution of the introductory part. The official literature, to which is dedicated the entire chapter 2, is quoted following the Harvard style, with a section in the end of the work containing all the used sources.

Acknowledgements

I would like to thank all the people that has led me to the construction of this work, which will probably state the end of something and the beginning of something completely different.

Of course, I thank Prof. De Marco for the time that he was able to find for the completion of the work. The thanks extend also to all the professors of Politecnico di Torino that have accompanied me in this path that have led to this moment. Deep thanks go also to Engineering-Ingegneria Informatica for the knowledges and the experience shared, especially to Fulvio Masuero and Paola Di Bella for their patience in my regards.

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1. Introduction

Most of the aspects in our life nowadays can be said to be related with the IT (Information Technology) reality. Indeed, if we refer to the definition of IT, - the science and activity of using computers and other electronic equipment to store and send information -¹, and we think a little about it, we can suddenly understand how much we are involved with IT; let us just think on how a “simple” smartphone has completely changed the lifestyle of any of its owner, or reflect also on the tragic amount of information that we produce (and that are potentially shared) everyday through the use of those devices.

The extension of this concept becomes huge if we also think that we are only at the beginning of the smart objects’ era and generally of the IOT (Internet of things) conception, which is the idea of - a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies-²; it means, simplifying, the concept of a world interconnected through the use of objects that become “intelligent” and that communicate each other through the use of sensors and connectivity with the Internet. This led to quite infinite ways of usages in everyday life, that can start from a supermarket where you can pick anything and go away without steeling because of an automated system of paying³, to a smartphone-enabled gene sequencer⁴, not forgetting of course the huge amount of data potentially available to the companies for marketing⁵.

Talking about business reality deeper, not even quoting how much important IT has been in the banking⁶ or in the healthcare⁷ industry, new business models are also emerging, like the one of “product as a service”⁸. This means essentially to provide a sort of rent in which, bundled with the product itself, during the subscription time are acquired all the related services (maintenance,

¹ Cambridge Dictionary: “Information Technology”.

² ITU: “Internet of Things Global Standard Initiative”.

³ Amazon. Amazon Go, <https://www.amazon.com/b?ie=UTF8&node=16008589011> (accessed April 16, 2018).

⁴ Wired. Oxford Nanopore: we want to create the internet of living things. <https://www.wired.co.uk/article/clive-brown-oxford-nanopore-technologies-wired-health-2015> (accessed April 16, 2018).

⁵ The Guardian. The internet of things: unlocking the marketing potential (by Liat Clark). <https://www.theguardian.com/media-network/media-network-blog/2014/jun/20/internet-things-marketing-potential-data> (accessed April 16, 2018).

⁶ LinkedIn. The Impact of ICT in Banking Sector (by Martins Ugochukwu). <https://www.linkedin.com/pulse/impact-ict-banking-sector-martins-ugochukwu/> (Accessed April 20, 2018)

⁷ UKEssays. November 2013. ICT in health services. [online]. <https://www.ukessays.com/essays/information-technology/ict-in-health-service.php#citethis> (Accessed April 20, 2018).

⁸ The future of customer engagement and commerce. Commerce trends: Moving from goods to services (by Micheal Vax). <http://www.the-future-of-commerce.com/2015/04/10/commerce-trends-moving-from-things-you-sell-to-services-you-provide/> (Accessed April 20, 2018)

improvements...) that enable that product to work properly along its usage lifetime; those models have their foundation mostly on IT systems.

This overview was intended to give a taste about the complexity that companies need to face nowadays, both in terms of opportunities and threats. Indeed, it is undeniable that in this technological generation everyone competing in the world of business have to deal with IT systems supporting their core processes, otherwise the risk is to be left behind by the rest of the market.

Talking about IT systems for business, its value chain can be imagined as a set of processes involving three players:

- **Software vendors**, that are those who provide the software or digital platforms but which are (usually) not made *ad hoc* for the final customer: it is a bundle that it is available as it is for whoever wants to buy and use it;
- **System integrators**, which contrarily to the formers, act generally under a preliminary commission made by a third party. These actors usually take the generalist products that can be provided by the vendors described above and modify them to make the final product available for the needs of the customer.
- Finally, there are the **IT users**, that contrarily to the two elements explained above, don't have IT systems production as core business. By the way, those have a fundamental role, especially in the age of modernity, to make their business effective.

The above value chain is visually resumed in Figure 1.1.

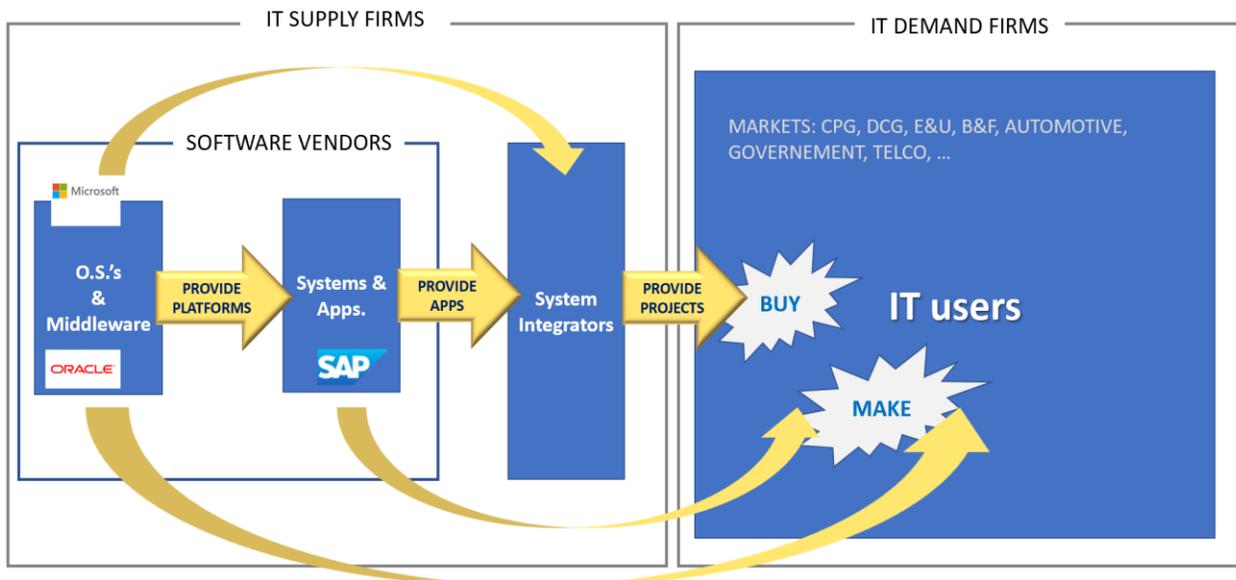


Figure 1.1 Value chain for IT systems production.⁹

⁹ Graphic provided by "Engineering-Ingegneria Informatica"

All the three categories of actors are very important and many important representants of each category can be listed as great players in the market. However, seen that the focus of the thesis wants to be on the pervasiveness and on the effective implementation of Agile methodologies (the main problem and the goal of the thesis will be explained deeper at the end of this chapter), what seems to be more interesting are the dynamics of the last category introduced, the IT users.

Indeed, if vendors and integrators have a more or less stable environments in which act, the firms that does not have in IT production their core business have to face a much more dynamic environment, considering also that many of them are involved in B2C (business to consumers) transactions.

It should also be said that non-IT producers very rarely will have the competences and the qualified people to develop or innovate an IT system, and that this will probably be outsourced to another party which very likely will fall in the categories of vendors or system integrators. The occurrence of a “Buy” project will instead bring other dynamism and complexity for the IT projects, because two different entities should cooperate in order to bring value for both. However, also considering the difficulty of the specific IT project, this can be made internally by the firm (“Make” project), if the internal capacities are considered to be enough.

This chapter will give an introduction on the dynamics that are present in the production of an IT support project, focusing on both the reasons to start it and the role of Project Management once begun. The reasoning will lead to the elaboration of the problem that has conducted to the existence of this work, that is to explore the state of implementation of Agile practices for supporting IT projects in Italian companies.

1.1. Profitability of an IT project for the user

Any kind of project, and particularly the ones concerning Information Technology (IT), is not initiated because it is fancy or because “everyone does it”, but in order to achieve a result or, better, a profit. Nevertheless, profit is, all in all, the *raison d’etre* for all the firms acting in the business world; indeed, also the non-profit organization act for a return, intended as welfare for the society in most of the cases. So, the question can be: is a project always profitable? Answer: no, of course.

Said that, it should be also considered that every kind of project needs money to be run and, as explained before, a return higher than this cost is expected. So, a project is nothing less than an investment, with all the features that it usually has and, probably, with an even more variable chance to obtain a profit from it; in fact, a lot depends on how smoothly and accurately the project is managed. For instance, the cheating of Volkswagen on government norms for carbon emission

was one of the biggest automobile project failure in recent years, that has led to fines of almost 20 billion \$ and of course sale losses due to a decrease of customers' trust¹⁰.

Returning on projects of IT support, the above reasoning applies for all the parties involved which must choose, following different criteria (that can be the expected ROI, effort and money to be deployed and so on), in what project or project portfolio they should to invest in. Nevertheless, “assess the future value for an IT project is not trivial, considering the relatively low maturity of this field and the lack of tools to consistently predict, plan and measure progress and productivity of the future software”¹¹.

The following sections will analyze the possible return of investment for of an IT project, discussing the main criteria and attributes that this should satisfy to be profitable, both for the contractor and the vendor point of view. Choosing to start a project is in fact the genesis for any kind of project management methodology, main subject of this thesis, to be applied. The main source for the next part has been an article named “Forrester - A Disciplined Approach to Quantifying Technology Benefits (by Boris Evelson and Martha Bennett)”, that briefly represents the main outcomes of IT projects, schematically represented in Figure 1.2.

¹⁰ The Guardian, VW emissions scandal: misconduct, process failure and tolerance of rule-breaking blamed – as it happened, <https://www.theguardian.com/business/live/2015/dec/10/volkswagen-vw-grilling-emissions-scandal-bank-of-england-business-live#block-56696fd4e4b06ee4b1c1b960> (accessed April 18, 2018)

¹¹ Terry Wright (2000)

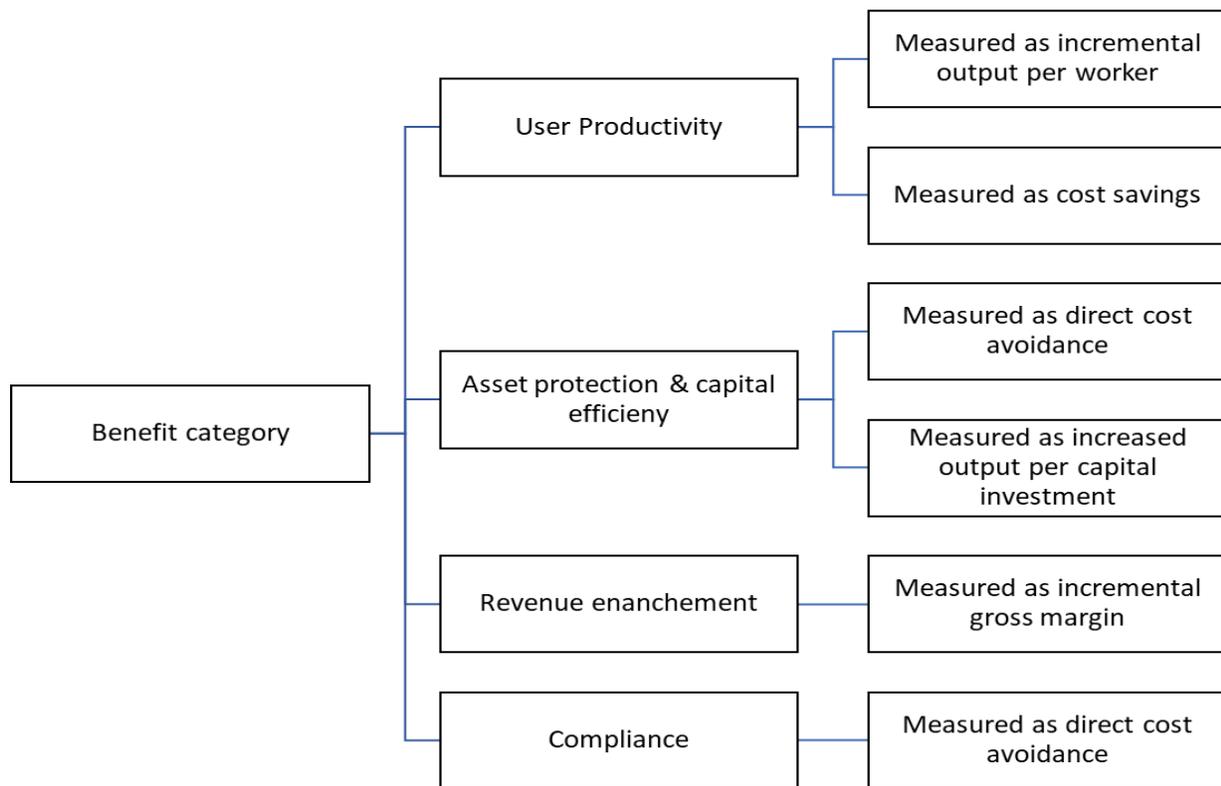


Figure 1.2: Categories of IT benefits¹²

1.1.1. Productivity enhancement

From the start of humanity one of main goals of the technology evolution, from the wheel to the computer, was to simplify the work for those who will have used that technology, hence, to augment the productivity of the subject involved.

Productivity enhancement can be considered as one of the main purposes of projects concerning information technologies: as basic example, think to the amazing amount of time saved that the presence of a well-developed and structured database permits to achieve in any kind of working context. Besides time saved, improvement of productivity can also be given by a direct increase of the output produced, which is a definition that applies mainly, but not only, to manufacturing activities.

As measurable indicators when a productivity enhancement occurs, we can have:

¹² Adapted from “Forrester - A Disciplined Approach to Quantifying Technology Benefits (by Boris Evelson and Martha Bennett)”

- For direct increase in output, the value of achieved benefit will be the difference, higher than zero, of outcomes produced in the same time.
- For time savings, the measurable value of improvement will be the augmentation of productive time, that therefore is almost surely will be not all the time saved; it is estimated that assembly line, call center, data entry, and other administrative support employees are more likely to convert time saved into increased output, for a conversion factor of around 75%. This value goes down to 50% for employees in less structured roles¹³.
- Another measurable indicator for a productivity enhancement can be also the reduction of Full Time Equivalent (FTE), that can be considered as the result of the two achievable improvements explained above. The FTE is also more flexible, considering that it is an indicator used for plenty of industrial activities, including the measuring for the project's duration.

For every indicator listed it becomes much easier to assess a monetary value and calculate the return on the investment done, to finally compare it with the costs sustained for the project itself using the most suitable method for the case.

However, it must be said that the introduction of a new tool or product given as result of an IT project will be not an immediate and sure straightforward improvement. Indeed, it should be taken into consideration that:

- The installation of the tool must entail that someone will use that; if an employee continues to do the exact same job after the technology has been implemented, then no benefit is created and there can be the risk that the investment will be no longer an opportunity but a sunk cost. That said, the IT project should also include a more or less solid period of training, depending on the size of the project, to maximize its value.
- Any increase in output or savings in time needs to be measurable and pretty considerable: there will not be any effective improvement if less than a 15 minutes time saving will occur for those that will use directly the final product, as well as there won't be a significant increase of any kind in production. Thus, it is necessary that the project to be undertaken must highlight in the business case the effective improvements that are estimated to happen; it is also needed that those features will be enforced during the effective course of the project by both the parts, vendor and client. And of course, as said also above, an effective training is necessary to perform valuable goals. In many cases, training can be a valuable service offered by the vendor.

To make an example, Engineering has developed systems for many delivery services and postal offices, involving also around 8000 Italian municipalities, that enables to calculate the best path for the courier and so improving straightly the delivery time.

¹³ Forrester - A Disciplined Approach to Quantifying Technology Benefits (by Boris Evelson and Martha Bennett)

1.1.2. Protection of assets

In a so IT oriented world, it is obvious that those technologies can become crucial for assets' protection and for capital efficiency. Indeed, software can be developed in order to prevent breakdown of physical systems, directly or through external maintenance; indeed, this is facilitated by the improved monitoring provided by certain technologies, which can also prevent not easily observable and assessable phenomena. Engineering, for instance, has developed many systems that permit the customer to make effective predictive maintenance for mechanical components, taking as input the factors that mostly stress the system involved, increasing considerably the MTTF (Mean Time To Failure).

The topic of asset protection can be extended also for virtual assets, that need maintenance to keep their efficiency and to grant their protection, especially if the assets considered are systems that gather data other people or customers. One of the most recent biggest assault of this kind is the one towards Equifax, that have affected sensible information like Social Security numbers and driver's license numbers for about 143 million American consumers¹⁴.

Seen that projects concerning the protection of assets doesn't have a strictly productive effect but a security one, the evaluation of the benefits incurred can be done considering the usual reasoning that is done for security and prevention measures, like those made in the FMECA (Failure Modes, Effects, and Criticality Analysis). Indeed, three estimates about the current situation (so when the project has still not been undertaken) are needed:

- Estimate the cost of replacing or repairing the asset (**R**): when any kind of asset is compromised, it is almost sure that, once the danger has been identified, precautions will be taken in order to avoid that the threat will occur again in the future or just to make a particular system work again properly. It should be taken into account that this cost is always higher when the problem has already occurred than before this event.
- Estimate the cost of the damage itself (**D**): depending on the type of violation, it could bring different negative outcomes for the entire system that can imply different economic losses, different from the cost of repairing quoted before. In this estimation should be also taken in consideration the time that will be needed to replace the former asset, during which one can be highly exposed to additional dangers or also can face a loss of productive time.
- Assess the probability of the event occurring (**p**): for every possible dangerous scenario it should be assessed a probability value (so, from 0 to 1) which represent the percentage of risk that an event brings with it. Such a rate could be not easy to determine, as it concerns the probability of a not-likely scenario: past history, also of other companies using a similar system, can help giving a clue about it, as well as experts that can also give their contribution to the development of countermeasures.

Once that those evaluations are available for every potential scenario for one system or a group of them, the value given by

¹⁴ The New York Times, Equifax Says Cyberattack May Have Affected 143 Million in the U.S. (by Tara Siegel Bernard, Tiffany Hsu, Nicole Perlroth and Ron Lieber), <https://www.nytimes.com/2017/09/07/business/equifax-cyberattack.html> (accessed May 23, 2018)

$$V = \sum_{i=1}^n (R_i + D_i) * p_i$$

represents the global indicator for the losses that can occur, with **i** being the different scenarios for which the values listed above has been previously computed. This estimate can be compared to the investment required for the asset protection enhancement and if the latter (call it **S**) is lower than **V**, it is highly suggestable to undertake the project. Those amounts can be also being compared with the value obtainable using the same reasoning above for the level of monetary risk (call it **Vf**) once the project is finished and the changes have been introduced. Indeed, given that the values of **R** and **D** are not easily modifiable, the work done should act on the probability **p** which, if an excellent work have been done, should be closer to zero; in general, the following criterion should verify:

$$V_f \leq S < V$$

Risks can occur during the project that reflects in unpleasant consequences after its end; for instance, too much focus can be deployed to decrease the risk for determined threats but forgetting the others, even leading to the opening of new menaces possibility. Anyway, if the job is executed by expert consultants this scenario is very unlikely to happen.

1.1.3. Incremental revenues

As said already many times, the world is shifting toward a society relying more and more on Information Technologies; this implies that most of business is moving to that direction, sometimes finding also “blue oceans”, more or less big niches of unexplored market to exploit; even companies that found their entire core business on IT systems now can exist and prosper : it could be enough thinking that five of the top six companies worldwide for market value¹⁵, Apple Alphabet, Microsoft, Amazon and Facebook (the other is Berkshire Hathaway) are for the most part based on IT.

Anyway, not going so far, it is undeniable that information technologies can give a considerable boost to revenues: it should be clear analyzing how much companies has moved to web-based platforms for retailing and the consequent order of growth of the entire sector of online retailing, as shown in Figure 1.2.

¹⁵ Forbes, The 100 largest companies in the world by market value in 2017 (in billion U.S. dollars), Statista, <https://www.statista.com/statistics/263264/top-companies-in-the-world-by-market-value/> (accessed on May. 28, 2018).

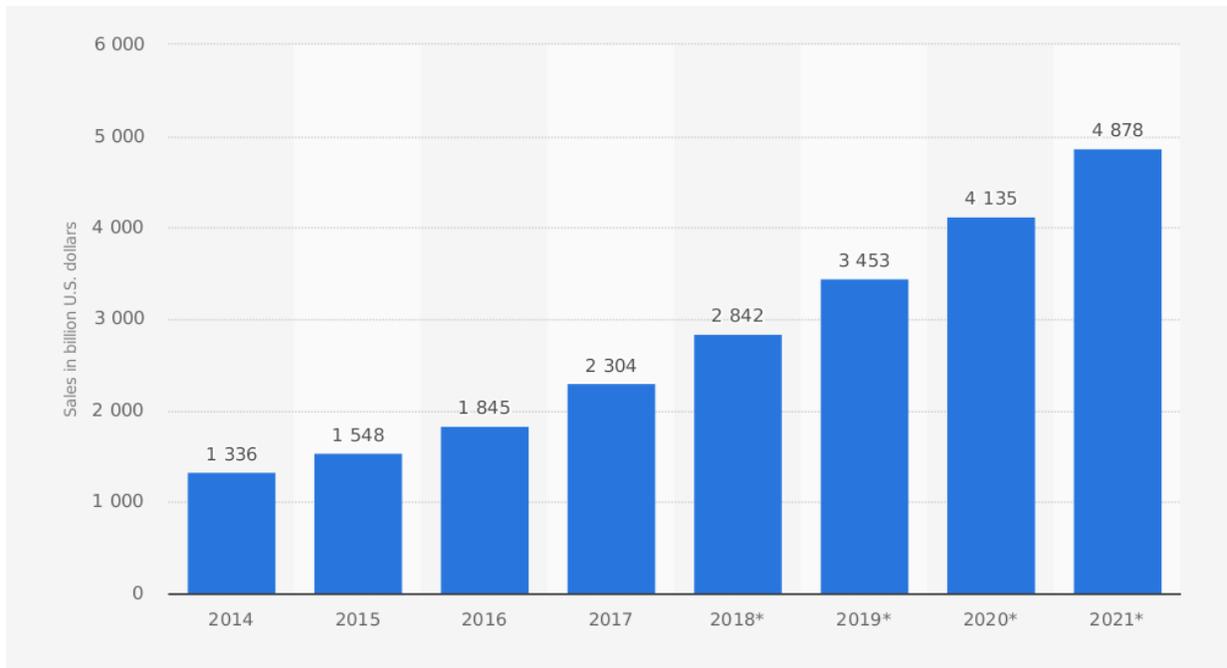


Figure 1.3: Retail E-commerce sales worldwide from 2014 to 2021 (in billion U.S. dollars)¹⁶

The advantages for revenues using IT systems, remembering that of course it depends on how they are built and used, can be:

- **Increased visibility:** as said widely, an IT platform (not running necessarily on the Internet) can increase a lot the visibility of the products offered, mostly because the increased organization of contents that the former can give; also, it should be considered the complete disposability of the catalogue and the almost perpetual availability of the platform, considered the possibility to reach places geographically distant at almost any time through a computer.
- **Better information about the customers:** particularly valuable nowadays, information on the willingness of customers have become the most profit-driving factor in many different markets. IT systems can give the possibility to trace, study and also address the behaviors of customers, giving a huge potential boost to revenues and giving also further data and insights on the development of new products that could be profitable in the future and so helping in the decisions on where to invest.
- **Decreased costs:** on the long run, once a new platform is established, many benefits on costs can occur too. For example, the possibility to have pieces of information well-ordered and catalogued avoid waste of efforts that can compromise the efficiency of the business.

¹⁶ eMarketer, Retail e-commerce sales worldwide from 2014 to 2021 (in billion U.S. dollars), Statista, <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/> (accessed on May. 28, 2018).

The considerable advantages listed, as already said, are only potential because they depend strictly on the effective use of the platform. For instance, even though general costs can decrease, additional costs can occur, like training for employees or advertising for customers. Nevertheless, the amount of additional revenue is strongly dependent on how the customers will perceive and use the new system. That said, it could be difficult to identify the overall profit deriving from the development of an IT technology because it can deeply vary. Anyway, the marketing unit should run a proper market analysis to assess an estimate on future revenues for its utilization, and compare this result, as usual, with the carried investment to state if it could be profitable or not.

1.1.4. Compliance

Seen the high pervasiveness of IT systems, it may happen that particular measures, often concerning protection of customers, need to be applied not for asset's protection (see the paragraph above), but because it is imposed by law. It can be the case of healthcare, that is necessarily highly regulated, as well as banking sector. For this last field in particular, after the financial crisis started in 2008, many of its CEOs reported that more of half of their time is spent on regulatory issues, so that they are trying to derive value out of new regulatory compliance processes to not waste that big amount of time¹⁷.

But, in general we talk of compliance when a third party, which can be government but also a security framework or some client's contractual terms, that can strictly require an action of adaptation. The concepts can be similar to the ones of asset's protection, but the differences are:

Security:

- Is practiced for its own sake, not to satisfy a third party's needs.
- Is driven by the need to protect against constant threats to an organization's assets.
- Is never truly finished and should be continuously maintained and improved.

Compliance:

- Is practiced satisfying external requirements and facilitate business operations.
- Is driven by business needs rather than technical needs.
- Is "done" when the third party is satisfied.

At first glance, compliance can be negatively perceived as only doing the bare minimum to be aligned with the external requests, but these efforts can also be very useful for business. Of course, it should be considered that troubles will occur if someone will not comply with rules especially if applied by government, even risking to shut down the company; moreover, it should be thought that adapting to respected but not mandatory industry standards, like ISO:27001 (concerning requisites for security of information management systems) can bring good reputation for the

¹⁷ Forbes, Regulatory Environment Has More Impact on Business Than the Economy, Say U.S. CEOs (by Kasia Moreno), <https://www.forbes.com/sites/forbesinsights/2014/08/12/regulatory-environment-has-more-impact-on-business-than-the-economy-say-u-s-ceos/#6c978336684d> (accessed May 24, 2018)

company and even lead to new customer’s segments. This could also help to identify any gaps in the existing IT system which might not have otherwise been identified outside of a compliance audit. Moreover, be aligned with rules can help organizations to have a standardized security program, in opposition to ones in which controls are executed following the actual will of the administrator.

Nevertheless, the expenditure for compliance can be considered in financial terms an investment too if the future absence of legal or other government penalties and fines associated with noncompliance it is considered as benefit. By matter of facts, especially in banking and healthcare, this kind of financial analysis it is doable but often unnecessary for the reasons stated above.

To make a concrete example, in recent days the theme of the new rules issued by the European Union (EU) in the General Data Protection Regulation (GDPR), which have caused many changes in the information systems of many firms, has been very popular. To avoid the risk in incurring fines for also 4% of the global revenues, great amount of money has been expensed, also for companies not physically located in EU but, for example, in Unites States, as Figure 1.4 shows.

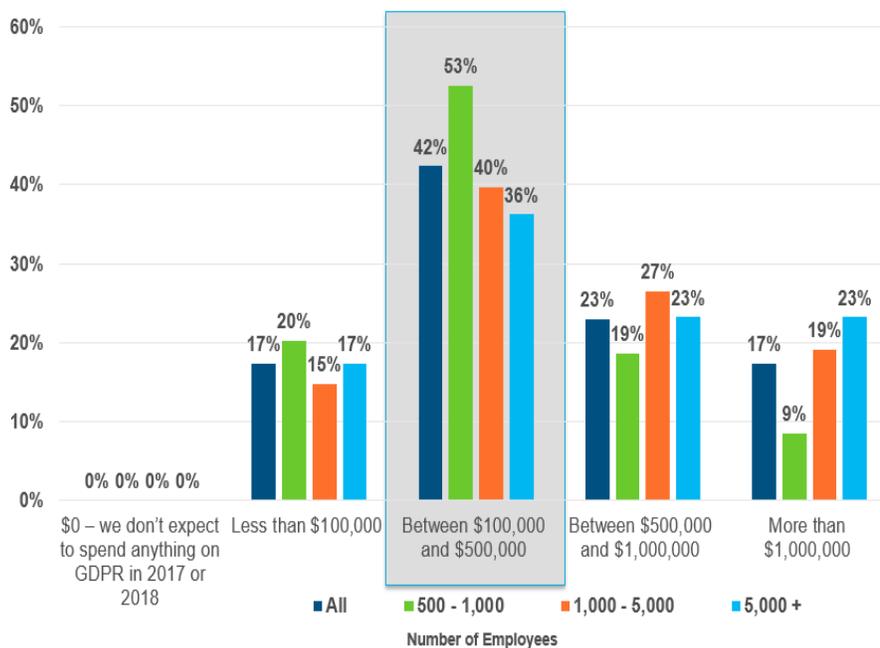


Figure 1.4: US GDPR Spending by Size of the Company¹⁸

¹⁸ Privacy and EU GDPR Research Report, Trust Arc

1.2. Success of an IT project

Once that an IT projects has been started, it is obvious that the main goal is that to make it successful. This statement is not trivial. As a matter of facts, many are the projects that fail to be completed or that result to be useless for the interests of the enterprise because they have missed with one or more elements that were judged to be crucial for its success.

Indeed, there can be many ways of evaluation on how much a project is “good” or in any case successful, and any single company can have their own methods. However, the common ground for any kind of evaluation is the analysis of the three essential dimension that forms the “Project Management Triangle”¹⁹, introduced in 1950s²⁰, that, as it is showed in Figure 1.5, is composed by:

- Time
- Cost
- Scope

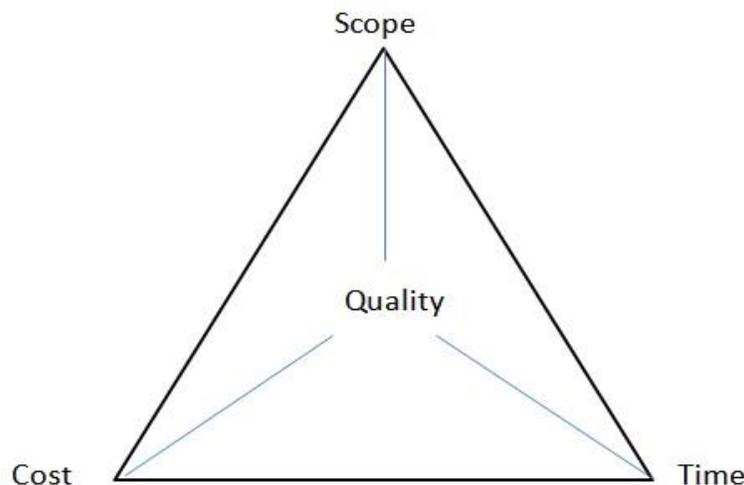


Figure 1.5: Project Management triangle²¹

Those three dimensions, which are also extremely interrelated and affected each other, will lead to the overall project quality, that need to be as much as possible compliant with the client expectations determined at the beginning of the project. Moreover, these are not only requirements

¹⁹ ISO 21500 Guidance on project management - a pocket guide (best practice) Zandhius Silvius Stellingwerf (Vsn Haren), January 2015

²⁰ Atkinson, Roger (December 1999). "Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria". International Journal of Project Management

²¹ Adapted from “ISO 21500 Guidance on project management - a pocket guide (best practice)”, Zandhius Silvius Stellingwerf (Vsn Haren)”, January 2015

that a project needs to satisfy, but they represent four out of nine specific areas of Project Management²².

1.2.1. Time

One of the first activity that a Project Manager must accomplish at the beginning of any type of project is the scheduling of the tasks involved by that project. The document resulting gives many information but the first one is the duration that the project is estimated to have.

This dimension of the project is extremely important for all the subjects involved in it. Some of the possible implications caused by the project's time are:

- For the customers:
 - Time to market: the project can have as outcome the release of a new product which has an important role in the market where the client is competing, and which is required to be developed as soon as possible. This is a very important factor especially in the present, hyperdynamic markets.
 - Compliancy terms: it has been pointed out in the previous section the important field of requests of customers concerning compliance. If the external request is not satisfied in time, huge fines can occur for the client.
 - Efficiency needs: the product can improve significantly the productivity or any other aspect of the requiring company. It is clear that in this case the sooner, the better, especially if the client has changed its structure or he is planning to do it in sight of the implementation of the product.
- For the vendor:
 - Commitment of resources: a longer project implies of course an extended time of utilization of resources deployed for it. This led to higher cost of the project and the starving of other projects may need a crucial and not replicable resource used in another project.
 - Profitability of the project: as outlined before, the customer needs to be satisfied by the specs of the project, and one of them is for sure the time spent on it. Depending also on the type of contract established with the client, the project can be less profitable if unexpected delays will occur.

²² All the nine areas are: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management. Source: PMBOK Guide 5th edition, Project Management Institute (PMI)

- Project indicator: the scheduled time is a very clear indicator of the current state of the project: simplifying the concept²³, a current time longer than the scheduled one should be an alarm for the condition of the project.

1.2.2. Cost

Another crucial feature of a project is its cost; this usually depends directly on the project size, which can be more or less inflated. The activity of cost estimation, done at the start of the project can give, in synthesis, three outcomes for the stakeholders involved:

- It indicates what is the starting point for the construction of the budget for the project, that should include also a part of contingency, related to the field of Project Risk Management. Consequently, it can be assumed as an indicator of effort for those who will run the project itself.
- Continuing to assume that a Buy project is commissioned, the budget required is necessary to begin the phase of contracting, in which the choices of the final price for the project and of the payment scheme are essential elements. Following these steps, it is needed to find a way of financing the project by the management, seen that it is highly improbable that the client will pay if he sees something very far to be finished.
- Also, estimated cost vs. actual one is another indicator of the state of the project. Indeed, especially if the payment scheme adopted has brought to a fixed price, a higher cost than expected can lead to an erosion of the expected profit.

1.2.3. Scope

Scope Management is essentially the process granting that the project outcomes will satisfy the requests for which it has been started for. In fact, through the collection of the requirements and the subsequent construction of documents like the Work Breakdown Structure (WBS), it will be granted that the project will lead to effective results. This is not trivial at all, especially for three reasons:

- To have a clear overview of what is needed to do in order to accomplish the project is crucial, particularly in big projects where the global focus need to be divided between the different objectives required.
- Being aware of what to do is also essential to determine the effective resources that will be needed and will be gathered during the procurement phase.

²³ An increase of time per-se could mean little: for instance, it can happen that a task is behind schedule but one that has been scheduled for a successive period has been already finished, which potentially means a reduction of the overall duration of the project.

- This phase should also somehow consider the probability, which can be very high in many cases, of change requests asked by the client for the project's outcomes. A well-planned project should be pretty reactive to this kind of event, that can also affect the previous discussed features, time and cost.

1.2.4. Quality

The three dimensions described above are necessary but not sufficient to construct the overall quality of the final product. Indeed, those elements are mostly concerned with the development of the product and that should grant a considerable value for the final user. Definition of quality in fact is *“the group of features and characteristics of a saleable good which determine its desirability, and which can be controlled by a manufacturer to meet certain basic requirements”*²⁴. That said, three of the conditions for a good quality product are:

- Satisfaction of customer needs: the product needs to fulfill properly the needs highlighted in the scope management phase and give concrete benefits to the final user, which implies also a certain grade of easiness to use in the end.
- Product lifecycle: considering that the investment made on a project can be very large, the customer expects to have a product that will boast a good span of life. Depending also on the type of output, it should be granted a certain degree of maintainability, to keep constant the product efficiency through all its useful life.
- Trust of the user: the overall satisfaction on the finished project relies also on the gaining of trust by the customer. Indeed, apart from the absence of problems concerning the usability of the final product, this can be the start (or the continuation) of a business relationship that therefore leads toward long term profitability.

1.3. *Achieve a project in a fast environment*

It has been outlined so far that the digital revolution the world is facing today has brought to the business world an amazing amount of speed that has radically changed the rules of the game for companies and their markets. Two of many consequences²⁵ are:

- Hyper competition: if one corporation is not sufficiently fast it is highly probable than the competitors will leave it behind in the race for the bigger market share. Between many examples, the case of Blockbuster's immobility against the speed of companies as Netflix, who now dominates its market, is pretty significant.

²⁴Business Dictionary (Accessed June 7, 2018)

²⁵ Inc., 4 Reasons Speed Is Everything in Business (by Adam Friedman), <https://www.inc.com/adam-fridman/4-reasons-speed-is-everything-in-business.html> (Accessed June 7, 2018)

- Consumer expectations: people of the end-markets are nowadays used to near-instant gratification. This has led to the need of constant and fast innovation, with the risk to lose important amounts of customer base.

The answer of the business world to these needs has been the so-called process of “projectification”, meaning that most of the aspects of the firms are now managed by projects. Indeed, a project is defined as a “*temporary endeavor undertaken to create a unique product, service or result*”²⁶. For this reason, it is viewed as a more or less a flexible instrument, depending also on the methodologies adopted for one particular project, and that has the adequate answer to the new necessities of the corporations.

Plenty of different methods has been developed through the years to satisfy efficiently the various requests. In fact, those methodologies have different rules that should lead to the optimal development strategy and to the fulfillment of the elements of the Project Management triangle explained before. Moreover, the aim of any methodology is to reduce the overall variability of the elements involved in the project to achieve the efficiency needed in a well-constructed product. This is doable only if a certain expertise is reached in the defined Project Management practices; indeed, the major strength of Project Management is to know where to apply a standard, or at least pretty stringent rules, for situations, the projects, that have potentially a lot of uncertainty, in order to reduce and manage it.

To expand this concept, in the next paragraphs the two most important approaches, that represent conceptually the far points of the Project Management, will be discussed. Considering the purpose of the thesis, it should be clear that the following paragraph will have only an expositive aim, to outline the main frameworks utilized, although the number of total methodologies adopted is very large. However, their detailed study is not the purpose of this work.

1.3.1. Waterfall approach

The waterfall methodology is probably the most widespread conception of Project Management and the one implied (at least in the earlier versions) in the PMI-PMBOK of Project Management Institute. As the name can suggest, it represents a linear and progressive method of management of the different phases of the project, widely using the concept of milestones. The progress is mostly unidirectional and downward; every different phase of the project is treated as stand-alone, with the exchange of information between them guaranteed only by production of formal documents. The different steps are in fact usually approached by different people from different departments, in order to have a final product complete in all its features. Finally, the various steps are strictly consequent and usually one phase is not started if the previous in the schedule is not completed.

²⁶ PMBOK Guide 5th edition, Project Management Institute (PMI)

For what concerns this method when adopted for IT projects, that has been inherited by manufacturing and construction industries, it usually follows the model designed by Royce, which implies this strict phases' order²⁷, represented also in Figure 1.6:

- **Collection of system and software requirements**, that implies a heavy production of documentation concerning all the requests that the final product need to satisfy;
- **Analysis** of those requirements to elaborate models and business rules;
- **Program design**, which lead to the software architecture decided for the fulfillment of the requests;
- **Coding**, which represent the work of developing and effectively integrate the software;
- **Testing** in a systematic procedure the developed product, with consequent debugging of the defects;
- **Operations** that efficiently implement the final software, including tasks like the installation and the maintenance.

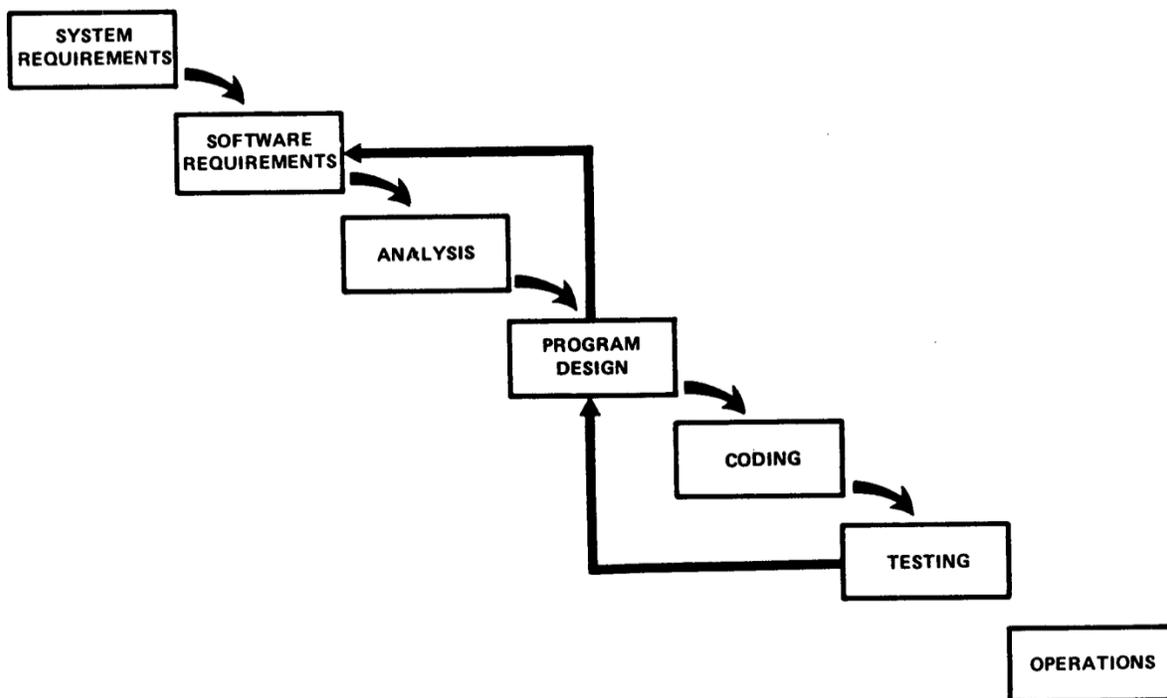


Figure 1.6: Implementation steps to develop a large computer program for delivery to a customer²⁴

The waterfall approach during its long life of utilization in many fields has emphasized many characteristics, both positive and negative:

²⁷ Royce, Winston (1970), "Managing the Development of Large Software Systems"

- Pros:
 - The **requirements**, including also basic features like times and costs, are **well established** and agreed since the very beginning of the project;
 - The very strict time boundaries and the extensive documentation produced allows an **easier monitoring and control** in terms of effort as well an easier maintenance process, once the resulting IT system will start to be used;
 - The **high detail** of the different phases described by the documentation enables to deploy less skilled workers for the jobs.

- Cons:
 - Waterfall approach can require **plenty of time** for the complete development, especially for the length that analysis and planning processes can reach;
 - The **requirements**, once that have been decided and set up, can be **changed** only **with extreme difficult processes**, because it could imply the return to previous and already completed phases;
 - The **low communication** given by the distinct phases, which are usually taken by different people, can lead to problems detectable only on the testing phase that, as showed also in figure 1.4, could be solved only returning to far distant phases, with a huge rise of the costs, that have an upward slope during all the project, with a deep peak during the last steps.
 - Customer usually will see the deliverables only at the end of the project. This can lead to various problem, including the **no-more actuality of the product, low levels of satisfaction** or even requests of changes that probably will lead to worse situations, primarily in terms of further time and money to be deployed.

1.3.2. Agile approach

The Agile Project Management methodologies has taken his inspiration directly from the Information Technology world. The first expression of the Agile paradigm is the so called “*Manifesto for Agile Software Development*”, a programmatic document issued by 17 software development practitioners in 2001. Those people gathered to formalize the values and principles of the new development methodologies that were born during the 1990s to face the changing business environment. Their reasoning has led to those conclusions:

“We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation

- **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.” (Beck, et al., 2001)

As said in the Manifesto itself, the importance of the elements after “over” is not neglected, but to improve the overall quality of the final output and to be reactive to the changes occurring in a growing speed environment the elements on the left are considered more important. The statements above have led to 12 principles²⁸ to support the Agile thinking and that remark the core values of those methodologies, of which the most important are the **satisfaction** of customer, a **stimulating environment** for the team and the **continuous delivery** of working software through different **iterations**, usually managed in time-boxes (sprints, in Scrum).

Keeping in mind this, a short examination of the various points can be done:

- The first focus is posed on **individuals and interactions**, because in the end people are the ones that effectively develop and are involved in the project. In fact, this sentence has the intention to stimulate a better communication between the team to promptly react to any change request or other instability events instead of scheduled, specific and in some cases not useful communication sessions. Also, it is implied that, lacking the “safe harbor” of the pervasive and standardized processes, high specialized people and small but multi-functional teams are usually required for Agile development. By the way, there is no intention of create anarchy, rules continue to exist and are important to not deviate from the goal of the project.
- It may seem obvious, but what the customer wants is a **working software** instead of surely important documentation, useful for developers and stakeholders to keep track of the activities, but almost worthless for the final clients²⁹. Indeed, “User stories” are considered more, which are essentially the result of the division of what should be the final product into functional increments; those are elaborated with the advises of the Product Owner, a representant of the interests of the final user³⁰. These, for Agile framework, are enough to start working, saving time from no-value documents’ composing and studying and which is converted in valuable developing time.
- Following the ideology of the focus on people and interactions, **customer collaboration** is one of the main points of all the Agile Methodologies: in fact, considering that the subjects of the project are the customer needs, it is requested his involvement in all the phases of the project. Achieving this cooperation, many risks are minimized, and the consequent costs for variations required when the project is already finished, opposed to the behaviors in traditional methodologies where the final user is involved only at the start and end of the project. Nevertheless, the contracting phase is very important because the final contract

²⁸ More contents available at <http://agilemanifesto.org/principles.html>

²⁹ Many authors highlight that the focus also on the point that is not important the product itself, but the results that that product give to the user. For instance, Clayton M. Christensen says: “People don't want to buy a quarter-inch drill, they want a quarter-inch hole” (Christensen, 2016)

³⁰ Complete definition available at: <https://www.agilealliance.org/glossary/user-stories/>

need to support these methodologies, which are not easy to formalize. Many formats of contract are arising, especially Agile Fixed-Price Contracts (Opelt, et al., 2013)

- The previous values are the bases to effectively **respond to change**, without compromising the work done before a possible change request. This value is probably the most misinterpreted: the planning is crucial for the Agile processes, but not to create detailed, elaborate plans, with a defined set of features and many dependencies between the tasks to proceed properly for the next piece of the puzzle. The Agile planning is developed around the already quoted concept of time-boxes: the planning is done periodically, to review the job done and to efficiently plan the next iteration, taking account of the potential changes that occur, transforming those into added value.

Around the values listed in the Agile Manifesto plenty of methods have been born, but all of them are inspired by those principles. Those methods then have been applied to many sectors of the business world, including of course Project Management, beginning to organize the activities in different ways, compliant with the innovation of the managed processes themselves. Between those methods the most used one is surely Scrum, followed by Kanban, Extreme Programming (XP), hybrids of different models and the pretty new concept of DevOps (VersionOne, 2018).

The common feature among those different methodologies is the incremental development of the target system, obtained by the release of consecutive sets of working and potentially shippable software, often organized in relatively short and very focused-on-scope timeboxes. In this way the value chain “specification gathering -> software development -> user feedback” is shortened as much as possible.

Since the pure Agile framework is not applicable to every kind of project to be developed (and also particularly hard to implement for high regulated environments), hybrid methodologies have been born to face the different needs of the various firms. As a matter of facts, the Manifesto does not describe a static model to follow in a narrow-mind way, but instead a set of suggestions and points of view collected by experienced people, with the aim to improve the environment and the processes of a project context.

The main features of the two faces of the coin of Agile paradigm are:

- Pros:
 - What has been developed is **easily checkable** by the interested stakeholders, that can give feedback on what has been produced in many more times than a traditional approach; those events are also much more distributed all along the development process and give many possibilities of enhancement considering the high number of releases. Then, the cost of changes is stable, constant and relatively low all along the duration of the project.
 - The **high communication** required means in most of the cases an important **boost to the morale** of the developing team. This reflects also in a **better quality** of the finished product, seen the enhanced effort posed in it.
 - Agile methodologies are highly **recommended when the features of the final product are not much clear**, also to the customer, in the first phases of contracting,

which is not a so uncommon situation. If the items become clearer once the project has been started, they will be inserted with more or less ease in one of the different iterations.

- Cons:
 - Especially for the strategic and top management, seen the high self-organization that usually Agile teams adopt, there can be **perception of non-control** and that can lead to contrasts, especially with clients.
 - Although its adaptability, the Agile methods bring **uncertainty** about what will be the final product in terms of features, but also of costs and time. The customer that invest his money on these projects usually wants to know what is going to get in the end and this can lead to litigation.
 - Despite its apparent ease to be understood, the Agile methods can be **difficult to be effectively apply**. For instance, to proper apply the framework it is highly recommended the physical presence of the subjects involved. This can be difficult for the team when the project is developed in more than one country or in case the representatives for the client's needs, important character in Agile development, is not available for any reason (lack of time or commitment). Also, it can be hard, especially during the first times of adoption of the methodologies, to find people that properly enforce them and that commit effectively to the strict and new style of work.

To have a concrete example of an Agile way of working, we will shortly describe the already quoted Scrum methodology, which is often confused with Agile itself (misunderstanding in this way the particular methodology with the entire framework). Scrum is a *“method of iterative and incremental product delivery that uses frequent feedback and collaborative decision making”* (Sliger, 2011).

As schematized in Figure 1.6, the framework starts from the **vision** of the product, conceiving its features and translating them into a **Product Backlog**. The items contained in backlog, maintained and updated by the **Product Owner**, are selected to be developed in the current timebox, called **Sprint**, that has restricted duration. During the sprint, the **Team**, composed by 7 plus or minus 2 highly skilled people works on the **Sprint Backlog** in a self-organizing way. Their “advocate” is the **Scrum Master**, who removes obstacles, facilitate team communication, mediates discussions within the team and negotiates with the external stakeholders. All along the Sprint, daily meetings are organized, called **Scrums**, to check and enforce the work done on the items contained in the Sprint Backlog, that cannot be changed during the sprint, oppositely to the product backlog that can be changed in preparation for the next sprint. The results of the Sprint are showed in the **Sprint Review**, proposing demos to the involved stakeholders. In the **Sprint Retrospective**, their feedback is analyzed and used to understand how to improve for the next Sprint.



Figure 1.7: The original Scrum framework (Sliger, 2011)

1.4. Problem: Agile practices adoption in Italy

In the frameworks that has been outlined in the previous section, one thing should have emerged: there is not a “correct” methodology of Project Management per-se. As it has come out in the paragraphs dedicated to the pros and cons of the two analyzed frameworks, there are different situations in which the utilization of one methodology instead of another is not only suggestable but desirable. This is because the main aim of a Project Manager (or someone else with a similar role) should be that one to minimize as much as possible the variability and the number of unknown factors that a project, according to its definition of uniqueness, always implies.

For these reasons in firms that are big, highly standard-oriented and where the changes are undertaken few times but in large scale and involving many aspects, the Waterfall approach should be preferred. Then, in smaller, more flexible and where small but continuous changes are tackled, the Agile framework can be the answer.

In fact, Project Managers should particularly take account of the environment surrounding the project they are dealing with, together with many other factors. Indeed, this is only an example to specify one of the elements that should lead to the optimal choice of the methodology for a project.

However, identifying all those factors leading to the appropriate approach, for which several articles and books have been written (Charvat, 2003), is not the aim of this work.

In the continuation of the thesis it will be in fact assumed, also being supported by factual data³¹, that the conversion and implementation of Agile methodologies is a must for the companies acting in the business world. Indeed, regardless of the type of project (“make” or “buy”), that framework can be a very powerful instrument. Indeed, it has been stressed that Agile methods put a lot of attention on the interactions. In a Buy project this will mean that the final output will probably be more compliant with the needs of the customer; in a Make project, Agile methodologies will be of auxilium to make the output feasible with the requests of the external environment.

Of course, this more or less drastic action (depending on the characteristics of the particular firm) doesn't have to be taken for all the aspects and project of the firms (it would contradict the statement of choosing the right framework for the right situation highlighted before), but it is undeniable that a change of attitude is requested, especially to manage the change of the environment. This has been actually stressed many times all along this introduction, together with all the opportunities and treats that this change is bringing. It is clear that Information Technologies and the Agile framework, correctly applied, can be the proper solution to thwart and also exploit this new wave.

Once stated this, a question that can arise, and that will lead the prosecution of the thesis, is: **What is the grade of adoption by Italian non-It producer firms of the Agile methodologies in IT projects?** With “grade of adoption” is intended both the pervasiveness of Agile methodologies and the attained benefits of their use, considering also the problems that have manifested once the framework has been adopted. This issue, despite all the literature produced in recent years (that will be analyzed in chapter 2), seems to be not addressed by any researcher or practitioner. This is comprehensible given the very narrow scope of the question.

To make a comparison Agile practices, and especially those involved in the usage of Scrum, have been adopted widely in the geographical centers of major impact in the business world, U.S.A first. Instead, it is hard to find out what is the situation of the Italian companies, that in their relatively short history has showed particular resistance to the change. To confirm this attitude, there is who state that Italy will be probably unprepared for the new wave of business changes, where for example is expected that one job out of five will disappear (Mercer, 2018)

1.5. Goal of the thesis

The object of this work is to find the answer to the above question, so to analyze, study and interpret effectively the behavior of Italian companies toward the Agile approaches for the projects concerning Information Technologies, which are actually much suited for those methods. As remarked above, in fact, there is a knowledge gap for what concerns the Italian condition: this can be a non-negligible lack, considering the importance and the appreciation that Italy have in the international world of business.

³¹ Those data, mostly regarding the study “The 12th Annual State of Agile Report”, VersionOne (2018) will be showed in the next chapter

So, with the help and the competencies of “Engineering-Ingegneria Informatica”, with his rich experience of consulting, system integration and outsourcing services, it will be analyzed the introduction of the methodologies both in quantitative and in qualitative terms. Quantitative, because it will be observed how much the Agile structure has spread in IT projects began by Italian companies; qualitative because it will be analyzed what are the actual and perceived benefits but also drawbacks in the utilization of the Agile methodologies and if those are aligned with the answers of the other companies all around the world. Finally, it will be measured the satisfaction of the companies in using the Agile methods and it will be figured their expected utilization in the future. It will be also performed a statistical analysis, to explore if there are particular correlations in the utilization of those practices and if systematic and logical reasons can be associated to the data obtained. Finally, after the necessaire study that will be conducted, the implications of the results achieved will follow in chapter 5.

The hope is that this work will, also minimally, contribute to set the base for Italian companies to steadily react to the new challenges that the uncertain future is bringing already now.

2. Literature Review

The Agile framework, putting apart the worldwide growing numbers in terms of utilization that it is achieving in the last years, has also become a fashionable topic. It seems that everyone in the world of business talks about it, there are dozens of courses available to specialize in one methodology rather than another, Scrum in first place, and plenty of lessons or seminars are dedicated exclusively on the examination of one or many aspects of Agile.

It is also on the road of the “institutionalization”, with many Project Management agencies that release certifications concerning Agile methodologies; Project Management Institute (PMI) is the first between them, which has released a new version of the PMBOK Guide (the 6th edition) containing a section dedicated to Agile approaches and has also drafted the new certification titled “PMI Agile Certified Practitioner” (PMI-ACP).

So, as can be imagined, a huge number of documentation has been produced for what concerns Agile in the last ten years. By the way, most of them regards the technical aspects of it, suggesting the best way, according to the author or the agency examined, to introduce effectively the concepts of Agile framework.

However, less attention, in terms of documentation produced, has been dedicated to the real outcomes that Agile implementation bring to the companies that consistently are trying to do this. In fact, as outlined in the last part of the first chapter, the Agile methodologies of working are not viable for every aspect of the companies, especially for Information Technology projects. Also, it should not be neglected the importance of “barriers to entry” that can be erected towards something so potentially disruptive for companies’ routines and ways of act. Many real-life cases talking about Agile practices used for projects which did not require them can be collected, also as witnessed by some recent experience, and as can be imagined those have reflected with more or less heavy consequences on those projects’ life.

The effort on analyzing the effective results of the Agile implementation has been even lower for what concerns the Italian perspective, with almost no material dedicated to this restricted but fundamental matter. This is easy to believe to, considering the somehow recent implementation of the Agile methodologies and the probable immaturity in using them; thus, the focus has been on the production of cases of study to support the implementation.

Having clear in mind that the object of the thesis is to try to minimally contribute in the fill of this knowledge gap, the role of this chapter will be that to collect the main sources of certified and stated information that will support the continuation and the real purpose of the work. Both academic and professional sources have been consulted and listed, to provide a complete overview of the actual state of the information concerning the maturity in the adoption of Agile methods, with particular attention for IT initiatives. Also, attention will be put on the worldwide situation in this matter, to be capable after the completion of the work to make comparisons with the more general situation.

2.1. *Academic literature*

The topic of the Agile methods has become, year by year, very popular also between researchers and in general people who produce material of academic relevance. But those kinds of works, in the general review that has been made in preparation of the composition of the thesis, are mostly concerned with the various aspects of the implementation of the Agile framework, especially focusing on four areas (Dyba & Dingsøy, 2008):

- Introduction and adoption
- Human and social factors
- Perception of Agile methods
- Comparative studies

Although, this is fairly comprehensible; academic perspective is generally focused in giving the most general theoretic model to apply on the particular case, whatever it is. Practitioners instead, are concentrated more on the results that that model gives in concrete terms to their professional life.

So, the attempts of the academic literature have been to formalize the various models of Agile implementation and the features that are required and that should emerge in their utilization. By the way, it has been found in many studies that a “one-size-fits-all” approach on the adoption of Agile methodology is unsuccessful, because every firm and often every project needs a different behavior (Sheffield & Lemétayer, 2013) and also it should be decided if that particular project is compatible with the Agile framework (Coram & Bohner, 2005).

Many and many articles are available, with different results and conclusions on the different topics, depending also on the scope of the various works and on the different methods of research used, sometimes arriving to conclusions much different one from the other. The material is so varied that some papers are only focused on systematic review and aggregation of results achieved over the years (Campanelli & Parrerias, 2015) (Dyba & Dingsøy, 2008). The presence of so much material is however crucial: having formal models to which refer is fundamental, especially because every project management practice have as principal goal to increase the probability of success of the projects involved (Chin & Spowage, 2010).

This section will very briefly summarize the most relevant results achieved in the various aspects of Agile methods implementation by the academic literature. This part, that is not strictly related with the explorative aim of this thesis, will nevertheless be helpful for all of those wants to deepen the research on the fields of application of Agile framework, considering however that this is not a proper literature review article.

2.1.1. Introduction and adoption

Many efforts were posed by the researchers to study and give a formalization of the various way of implementation of Agile practices (Wang, et al., 2012), also with someone giving a personal provision to the state of research like innovative frameworks of adoption (Qumer & Henderson-Sellers, 2008) but also someone that argue that Agile methods are not innovative at all and that there is no need for radical changes in the organizational life (M.-R. Hilikka, 2005). These trials are nevertheless very difficult to make considering the very adaptive nature of those methodologies and those are, as a matter of facts, sometimes contrasting with the results.

The results of the effective adoption can also be in contrast: in the trial of introduction of XP methods inside the companies there is for example who has found very difficult challenges, due especially to the organization complexity (Svensson & Host, 2005) and someone else who has discovered that its introduction has meant an improvement of the projects' indicators, like a 50% time-overrun, versus 60% for the traditional and at a significantly reduced cost overrun 25%, compared to 50% cost overrun for the traditional projects (Bahli & Zeid, 2005).

Nevertheless, the experience and the high level of skills of the people who compose the team of development has been proved to be crucial, pointing out the importance of the choice of the members (M.-R. Hilikka, 2005). Also, the effective knowledge of the methodology used is fundamental to avoid fatal errors that are hard to fix: in the estimation of the project time by using the "planning game", an agile practice, the level of knowledge on the effective use of this method has determined the underestimation of project duration (Tessem, 2003) or the contribution to the success of it, improving the insight on the development process (Svensson & Host, 2005).

2.1.2. Human and social factors

As frequently said, the Agile practices have as one of their core values the importance given to the individuals and interactions (Beck, et al., 2001). Of course, this kind of focus has been the subject of many studies, and for example it has been found that a high-caliber team, an Agile-friendly team environment and a strong customer involvement are critical success factors for the project (Chow & Cao, 2008).

Continuing to talk about teams, other studies have been made to determine the main characteristics of an Agile team member, for example to be self-aware of their own abilities, together with a strong sense of respect and responsibility, the willing to establish a trusty environment, and the intention to preserve the quality of working life (Robinson & Sharp, 2004). It is also available a study (Young, et al., 2005) determining a technique called "repertory grid analysis" to identify the beneficial personality traits for members belonging to Agile development teams. Summarizing, those can be viewed as "*analytical, with good interpersonal skills and a passion for extending his knowledge base (and passing this on to others)*".

Another study (Iivari & Iivari, 2011) has outlined that different types of organizational culture require different approaches for the adoption of Agile methodologies. In particular Agile seems to be in contrast with the hierarchical culture orientation, despite the high level of discipline that this adoption can bring (Kautz & Zumpe, 2008). This factor can also affect the organizations with more “developmental” culture (that is referred to creativity and adaptation to the external environment), that can make the Agile methods dysfunctional.

Finally, it seems that human and social factors are essentially the most important critical success factors for Agile development. Indeed, it has been studied (Misra, et al., 2009) that 6 out of 9 listed success factors, are strictly related with the relationships between the single stakeholders involved. In particular those 6 elements are customer satisfaction, customer collaboration, customer commitment, corporate culture, personal characteristics and societal culture (the other 3 are decision time, control, and training & learning).

2.1.3. Perception of Agile methodologies

Many studies have investigated how Agile methods are perceived by different groups of people interested in them. In fact, many categories of people are involved in the construction of a product under an Agile regime, seen that the product should be complete and that it should satisfy all the actors interested in it.

Of course, a very important stakeholder is the customer, or in general the final user(s) of the final outcome of the project. The significance of this actor for an Agile project has been remarked many times in this thesis. Indeed, their perceptions and judgements on the methodologies after their utilization has been collected in many studies. For example, it has been found that in some cases, with the utilization of Scrum (Mann & Maurer, 2005) but also of XP (Ilieva, et al., 2004), the increased necessity of involvement by the customers resulted in an increased perception to be up to date. Then, the shared confusion on what should be developed has been reduced, shifting from passive interaction to active commitment. However, it is remarked the importance of the training toward new methodologies for an enhanced result.

In fact, the more intensive involvement of the customers, if poorly managed, can result in consistent issues during the project: it has been reported (Martin, et al., 2004) that despite the successes achieved, the rhythms for the customers were unsustainable, a fact that has been enhanced also by the change of culture and behaviors implied in the change of the organizational environment.

On the other side there are the effective developers of the product, that are involved surely in the adoption of Agile. What is certified by many academic papers is that there is a common satisfaction by the productive teams with respect to the Agile development. In a survey work (Mannaro, et al., 2004) it has been reported that the overall satisfaction of teams using XP is much higher than the ones not using it (95% of people working with XP wanted to keep that methodology, only 40% of those not using says that the way of working used is fine). Then, the utilization of Scrum gives the perception for the team to be sure that the software they build is what the customer wants (Mann

& Maurer, 2005). However, for the developers there is the risk that they do not sustain the high level of concentration required by Agile methods for 40 hours a week, possibly incurring in a burnout (Ilieva, et al., 2004).

Finally, also students have showed interest in Agile: one study (Melnik & Maurer, 2005) has analyzed their perceptions in some universities and found that students felt that agile teams helped them to develop professional skills such as communication, commitment, cooperation, and adaptability. Moreover, 78% of the respondents stated that they believe that Agile methods improves the productivity of small teams.

2.1.4. Comparative studies

It is easy to understand that plenty of studies have focused on the comparison between Agile methods and the traditional ones, to study what are the true effects and differences that mostly occur during the adoption.

Thus, effects on project management has been extensively studied, considering that, as showed in the introduction, traditional management is strongly challenged by Agile methods in many aspects. Evaluating the various effects, some survey-based studies (Ceschi, et al., 2005) (Sillitti, et al., 2005), confronting project management of different subjects adopting Agile and plan-based management, has showed that managers using Agile are more satisfied of their way of planning than the latter and that also the relations with the customers are improved in the same way.

The possibility of interactions between different project management models has been studied too. In an analysis on the mixing of Agile model with a stage-gate one (Karlstrom & Runeson, 2005), it has been reported that the combination was successful: they found that the former methods give the to the latter powerful tools for microplanning, day-to-day work control, and reporting on progress. On the other side, the stage-gate model provided the agile methods with powerful means to coordinate with other development teams and to communicate better with marketing and senior management.

However, it has been reported also (Baskerville, et al., 2003) that concerning the human resource management, team members of agile teams are less interchangeable seen the high level of skills, and also are more difficult to describe and identify comparing to traditional methods.

Talking about the difference in productivity between traditional and agile framework, there are many studies that report differences in efficiency, some that highlight a consistent improvement of team productivity using Agile respect to standard methods (Ilieva, et al., 2004) (Layman, et al., 2004), others that outline a worse or a non-changing of productivity between them. The same contrasts in results can be find if we consider instead the product quality, seen that in studies comparing in this terms Agile and traditional practices, there are recorded positive (Layman, et al., 2004) (Ilieva, et al., 2004), as well as neutral (Macias, et al., 2003) or negative results (Dalcher, et al., 2005). Is clear that it is essentially a matter of how the methodology is used and if it implemented for suitable projects.

2.2. Professional literature

The major contribution to the research concerning the main topic of this thesis, the diffusion and the main issues in the adoption by companies of the Agile methodologies, has probably been given by the professional literature, intended as the informative documentation released by firms to expand both their knowledge and also the awareness of people external to the company toward topics worth of interest for the business world.

This is largely comprehensible if we think that this is a topic extremely interesting to the companies, considering that Agile practices, if correctly implemented, can give a considerable competitive advantage. However, considering how fashionable this topic for companies is, it seems also that everyone wants to almost forcedly implement these Agile techniques, with all the risks that this action can bring to the business.

So, professional literature has focused mainly on the width that the Agile phenomenon as assumed over the years, and on the problems and the benefits that have occurred in the progressive implementation of the methodologies, together with the impact that those has brought to the firms.

In the next sections we will overview some valuable content provided by professional literature, with the goal of having a first outline of the environment that this thesis will further deepen, although with his limited scope, and also to provide the concrete features that are perceived by the companies.

2.2.1. State of Agile report

One of the most quoted report by professional books, articles and studies, but also by many academic papers, is the “*State of Agile Report*”, that has been recently issued in its 12th version, drawn up by VersionOne, a company issuing software products which help in the implementation of Agile framework. Indeed, this is probably the source that most aligns with the final intentions of the thesis, although the focus, as expected, is global rather than the most narrowed scope that this work will have. Anyway, having a worldwide view comparable with the Italian situation can be very interesting. Thus, the report has given important inspiration for the survey that has been elaborated, so that comparisons will be possible after the collection of the data. Nevertheless, it should be said that the report takes only a descriptive view of the Agile environment worldwide, without analyzing in depth the data that have been gathered. Although, the value of this report, given mostly by the large number of people involved in the sample, is surely not neglectable. For this reason, the main results of this document will be here exposed and commented¹.

¹ The full report is available at: <https://explore.versionone.com/state-of-agile/versionone-12th-annual-state-of-agile-report>

Their survey has been conducted on a pretty wide sample, in terms of role of size of the companies and geographic location, nevertheless the most are taken from North America (55%) and Europe (27%), and the total size of the sample is of 1492 respondents. The most interesting results and the closest to the scope of this thesis are:

- 52% of the respondents have declared that more than half of their teams use agile practices (25% have said all their teams, 27% more than a half). This information is pretty significant because it states the importance and pervasiveness of Agile methods worldwide. Moreover, the percentage declared is much higher than the one of the previous years that was of 40%, highlighting the important growth of this tendency.
- The previous point should be also coupled with the fact that only 16% of respondents have declared to own a high or almost perfect grade of competency in Agile practices. All the others believe that they are a satisfying level, but they need to mature in using them (59%) or to be below that level of competence. This emphasize the important rule that the education towards Agile methodologies still has, to permit the extraction of better value from their utilization.
- The benefits of adopting Agile are many but are perceived in different ways, as showed in figure 2.1. In particular, the improvements that have been declared by more of the 50% of the answerer are those that mostly characterize the Agile thinking: reactivity to the change of priorities is the most found (71%), and this can be a consquence of the improvement in delivery speed (present for 62% of respondents); then, the focus posed on the relations between people have important consequences, so improving the team productivity, its moral and the allignment with the other functions of the company like Business (respectively 61%, 61% and 65%). Instead, the areas under the 50% threshold seems to be mostly concerning the technical features of an agile project and that should be the consequences of well implemented methodologies, like software quality (47%) or project cost reduction (22%) . Indeed, these less satisfactory results can be the consequence of the non-complete maturity in the adoption.

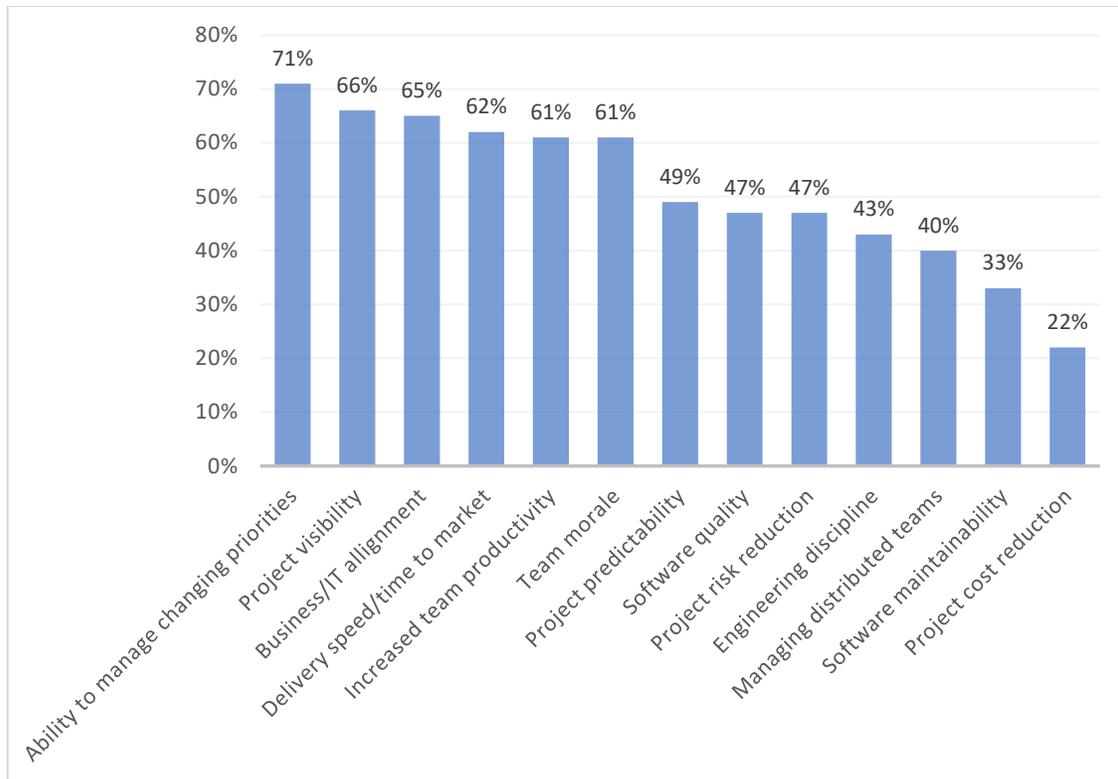


Figure 2.1: Benefits of adopting Agile (VersionOne, 2018)

- As outlined in the first chapter, the most used methodology worldwide is Scrum, with 56% of the answers confirming this fact. However, if these data are compared with the ones of the past year², it can be noticed that Scrum itself has lost 2 percentage points (from 58% to 56%). On the other side, the hybrid models (which means the adoption of two or more methods' concepts, mixing them together to better fit with the company behaviors) are slightly growing in numbers, gaining 6 percentage points compared to the last year (from 8% to 14%). Finally, it can also be noted the introduction, albeit with low numbers, of some new methods, like “Spotify model” or Lean startup. These pieces of information could mean that companies which like Agile thinking which is spreading all around the world, are trying to implement the framework in many different ways, including the hybridization, to fit optimally with the company environment and competences. Nevertheless, Agile is not a specific set of rules to be applied categorically but it is a framework, a way of thinking to adapt to the turbulent environment of the business world (Thomas, 2014).

² Report of the past year available at: <https://explore.versionone.com/state-of-agile/versionone-11th-annual-state-of-agile-report-2>

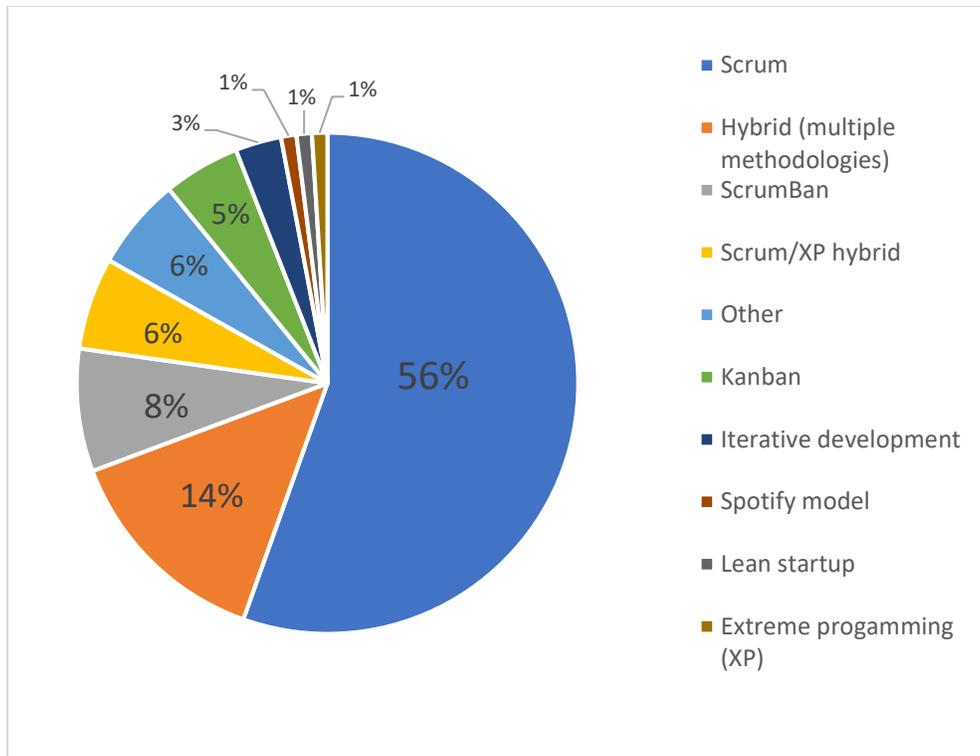


Figure 2.2: Agile Methods and Practices (VersionOne, 2018)

- As said, many can be the difficulties faced with the adoption of Agile methodologies, especially during its first implementations. The most serious ones, so those with a percentage of answers stating it higher than 40%, seems to comply with organizational diffidence in the use of Agile methods. Indeed, the most important issue is the organizational culture being in conflict with agile values (53%), followed by resistance to change and lack of proper management support (46% and 43%), that can be seen as strict consequences of firms' inertia. Lack of skills and experience is an important problem too (41%), and that is remarked by the other answers with a lower percentage, that are insufficient training and education (35%), inconsistent processes (34%) and the absence of a key figure like the product owner (31%). This is a further confirmation of the need of training that is required to consistently apply the Agile framework.

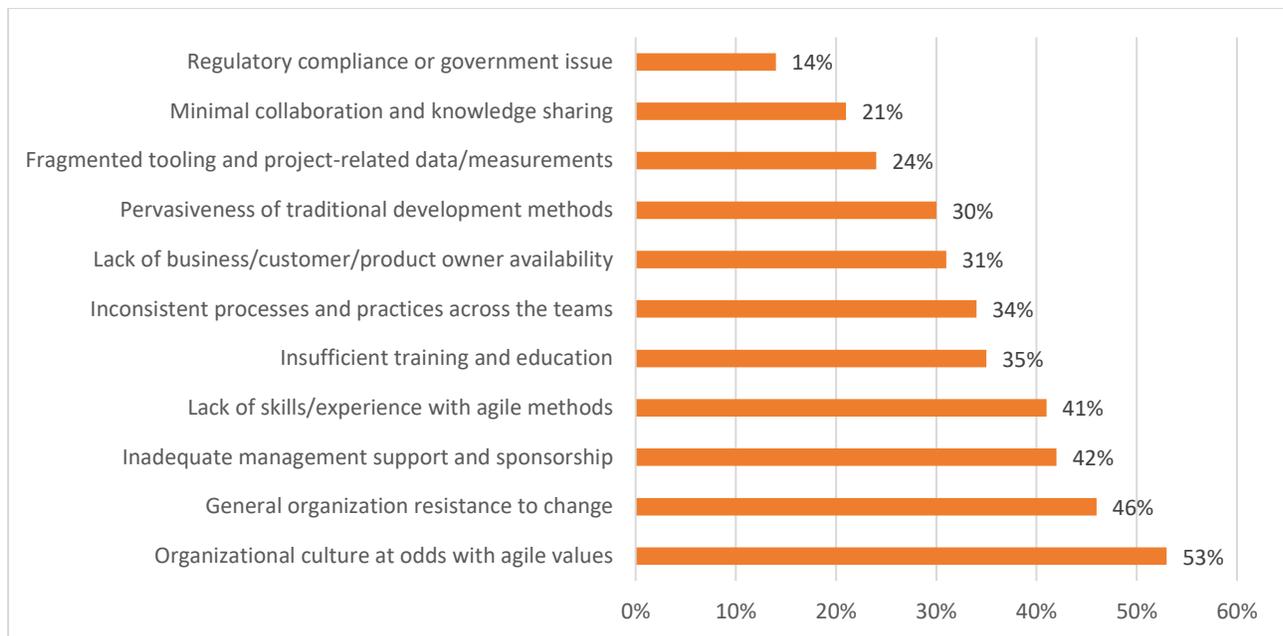


Figure 2.3: Challenges experienced adopting & scaling Agile (VersionOne, 2018)

The report gives a very interesting overview of the main positions toward Agile methodologies, and as showed some important observations can be extracted, here summarized:

- Agile framework is spreading all around the world very fast, but it is still needed a profound and intense learning process to form skilled people, capable of using the methodologies in the proper way.
- Agile practices seem to be very effective to answer the reactivity to change required in the fluid market outlining in the last years. Moreover, people that use agility are more productive and involved in the relative projects.
- Scrum is the most used method, but other in-house build ones, like hybrid methodologies, which have the purpose to fit better with the corporation context, are emerging.
- Organizational inertia is a big issue that prevents the correct utilization of the framework, especially in the first implementation of the practices.

2.2.2. Other professional literature

It has been said before that many contributions are being given by professional or in any case non-academic institutions and firms themselves. Indeed, plenty of literature has also been produced by those actors, sometimes with a certain grade of bias led by the nature or the philosophy of the writers. This is the case for example the case of the report “State of Scrum” (Scrum Alliance, 2018): this is a work similar to the discussed before “State of Agile” but focusing only on the Scrum methodology. Although, it is present a certain grade of bias in the report, because the questions of

the survey leading to the final paper have been submitted only to the members of the institution issuing the work, the Scrum Alliance. So, the results of this work or similar, stating a great expansion of the Scrum methodology, need to be taken carefully, despite the similar result that also the State of Agile report has achieved. Other reports trying to identify the situation and the diffusion of Agile have been redacted, sometimes commissioned by firms themselves; for instance, this has happened for the report “Accelerating velocity and customer value with Agile and DevOps” (CA Technologies; Coleman Parkes Research, 2017), where CA Technologies have committed the study on Agile results worldwide.

For what concerns the diffusion of the knowledge about Agile framework, many actors worldwide are trying to spread as much as possible the culture about these Project Management discipline. Courses, articles and other material are available in a great number for who wants to deepen the culture in Agile methodologies. For instance, it exists a comprehensive guide to the correct implementation of Scrum “The Scrum guide - The Definitive Guide to Scrum: The Rules of the Game” (Schwaber & Sutherland, 2017) written by the inventors of the Scrum technique themselves.

Obviously, a great producer of material concerning Agile Project Management is the PMI, Project Management Institute, which, apart from the already quoted new sections in the PMBOK concerning Agile framework, has issued also many articles in the Project Management Journal helping to spread the Agile culture. For instance, in the article “Integrating agile in a waterfall world” (Flahiff, 2011) are explained the tools and the reasons why to begin the introduction of Agile in Project Management by mixing it with Waterfall methodology, stating the crucial importance of the Project Manager in the mixed framework for the activities of coordination, especially in large projects. Then, other articles and one in particular (Patra, 2017) state the efficiency for outsourced Agile projects, pointing out that it is anyway needed a close collaboration and a deep trust relationship between the involved parts to conclude the project in the best way for all. Of course, there is abundance of articles containing suggestions and measures to implement Agile effectively; for example, it is explained how to determine if one organization is ready for the introduction of Agile or not (Larson & Larson, 2011), there is a tutorial-like article explaining the steps to begin the transitions toward Agile (Tew, 2012), and also more specific articles describing in detail all the different methodologies, like Scrum (Sliger, 2011).

One comment to be done is that all the articles quoted, also in the section of academic literature, are mainly written and issued by non-European, especially non-Italian, authors and institutions. This once again remark the worldwide interest in Agile methods but the difficulty of properly analyzing and implementing them in the closest countries.

3. Research methods

The previous chapters have been essentially an extensive introduction on the actual context concerning Agile methodologies, including the perspective of the academic researchers and practitioners, but also the point of view of companies, which are probably the most interested in the correct implementation of this mindset. As it has been showed, there are many contributions by both the actors which have tried to define the boundaries, the context and the outputs of the utilization of Agile practices. Thus, this work tries to expand the scope of the research made towards these methods, introducing the study on the Italian companies that are not IT-intensive, but that however need these instruments to act efficiently in their context.

To achieve this goal, the study has been conducted basing on the results gathered by two techniques: the utilization of an online survey and of interviews made on a selected group of people. Both the instruments have been constructed in such a way to extract the most valuable information for the thesis purposes. The following paragraphs will explain in detail the structure of those instruments and the reasons of the choices made in their construction.

3.1. *Survey*

Many of the academic works and researches with the aim of exploring one or many aspects of Agile methodologies has been conducted with the support of a survey (Chow & Cao, 2008) (Fontana, et al., 2014) (Misra, et al., 2009) (Serrador & Pinto, 2015) (Ceschi, et al., 2005) (Sillitti, et al., 2005); this is comprehensible, since the Agile framework is essentially only used by firms, and an analysis of their behaviors towards is necessaire to make most of studies or assumptions. In this thesis too, the approach of the survey utilization has been considered the main instrument to find interesting results, satisfying the purpose of the work.

The survey has been the result of the studies made on many documents, papers, reports (VersionOne, 2018) (Chow & Cao, 2008) (Dyba & Dingsøyr, 2008) (Sheffield & Lemétayer, 2013) (CA Technologies, 2017), which have highlighted the most important aspects of the adoption of Agile methods, both positive and negative and their importance across the companies all around the world. Indeed, it could be interesting compare the condition outlined by other authors and the situation that the survey will present concerning Italy.

The effective form has been wrote considering those entries, introducing and selecting the elements of more interest. Before making available the final version of the survey, it has passed through various revisions made by the author, different people inside “Engineering-Ingegneria Informatica”, which main representant has been the company referent Fulvio Masuero, and the supervisor for the thesis from “Politecnico di Torino”, prof. Alberto de Marco.

The survey has been issued through the online service “Google Forms”, that has been a valuable instrument, giving a good enough degree of freedom in the composition of the questions. The link to the fillable form has been sent mainly through e-mail to firms that could fit the target of research of the thesis. Indeed, most of the answerer have been provided by Engineering customer base, that does not have in IT the main core of their business, which instead cover an important role of support: indeed, these characteristics perfectly fit with the target of this study. Some of them have been also personally contacted to enhance the number of answers. Also, to improve the number of answers, the survey has been constructed with the intention to be not difficult and long to answer, being anyway full of study-worth insights and fillable by people with a certain expertise in the IT projects.

The survey was available both in English and Italian, with the choice available in the very first question. It has been thought that inclusion of the Italian language could be appropriate, seen that the study has been conducted on companies of such nationality. Moreover, there was a disclaimer in both language at the start of the survey to state the research purposes of the questionnaire and the declaration that the information would be exposed aggregated and anonymous in this final work, to avoid privacy issues.

In the next sections will be covered essentially the main parts of the survey, explaining the motivations of the placement of the various questions. The complete text of the questionnaire is available in appendix A.

3.1.1. Introductory questions

The first 8 questions, namely those present in the sections “Information about you and your company” and “Importance of IT projects” (so excluding the question of the choice of the language for the survey) have been essentially elements that could permit to characterize the firm respondent. Indeed, this group of questions were important for two main reasons:

- The data made available in this way could be extremely useful to make comparisons between different sectors of firms or relative importance assumed by IT projects, by crossing the answers referred to the “concrete” part of the survey, in this case the utilization of Agile practices.
- Starting with “easy” questions, so “breaking the ice” is important to make the answerer more relaxed in the next parts of the questionnaire and obtain more sincere and relevant answers. Indeed, the first group of question of this survey is very easy for those who live the company reality, especially practitioners of IT projects, every day.

In particular, the purposes of the questions were:

- With the group of questions related to firm’s information, the intention was, apart from checking the effective business dimension and the actual expertise on the topic of the answerer with questions 4 and 6, to collect precious information about the field in which that company operates. Indeed, there could be a correlation with the attitude toward Agile

methods and the core business of the respondents. It has been also useful to filter the given answers and eliminate some that has been given by subjects outside the target of the thesis; indeed, those who answered that the core business of the company was to deliver software for third parties has been eliminated from the sample.

- The cluster of questions about importance of IT projects could be useful to find eventual connections between the role assumed by them in the firms' life and the will to adopt Agile framework. In particular the question about the average dimension of the projects could be important to verify the linkage between small projects and better utilization of Agile.

3.1.2. Project management methodologies

The third group of questions is where the effective study begins, asking what the current condition of the answerer firms is in terms of project management methodologies that are mostly used in their context. Indeed, the intention of this group of questions was to assess quantitatively the use of the various frameworks and to collect relevant data for a comparison between the different methodologies, trying to understand where the Italian context of project management is most shifted to.

In particular:

- Question n.10 had the goal to assess what the companies feel to be the most pervasive method of project management for IT projects. The possible answers provided are those which have a definition according to the most respected Project Management institutions and what have resulted to be the most commonly used (VersionOne, 2018), giving of course the possibility to digit a personal answer through the field "Other".

The question, although his pretty generic layout, has the indirect intention also to determine which is the methodology that the respondents feel more confident and more expert too, seen that in the answering they could choose only one option. Moreover, bias in the answer of the next question could be detected.

Finally, it was a way to determine the subjects capable of answering question n.13, that was available only if the respondent had answered "Agile" to question 10. In this way it could be assessed what is the particular Agile methodology preferred by that companies with a certain degree of expertise of the framework. Again, the available answers to the question were officially recognized Agile methodologies, and with a public that effectively use them.

- Question n.11 is an important complement to the previous question, providing the possibility of giving an assessment on every single item listed according to a Likert scale from 1 to 5. With this question it can so be assessed an evaluation on the usage of all the various methodologies, avoiding the limited scope that the previous question has. So, this question can give a more generic overview on how much is present on the national territory one methodology comparing to another.

Also, the answers could give hints on what should be the methodologies to include in an eventual mixed methodology, seen that it has been said along the thesis that the Agile

framework gives the important possibility to hybridize its practices with more traditional ones, extremely helpful for those at their first Agile experience.

Finally, Likert scale give of course the significant possibility to perform correlation studies, especially with statistical methods.

Question n.12 was only present to eventually give an assessment to the answer “Other” if that was selected in question n.10.

3.1.3. Agile features

Questions from 14 to 17 were developed in order to explore the attitudes of the respondents toward the other main points of this thesis, that is the perceived benefits resultant from the adoption of the Agile methodologies, but also the issues that those have involved once the implementation of them has started. Similarly with the construction of previous questions, a careful work of study has been done on the sources (VersionOne, 2018) (Chow & Cao, 2008) (Dyba & Dingsøyr, 2008) and confrontation with the various referents has been held to determine the range of available answers, which needed to be the most “correct” according to the literature and the purposes of the thesis.

Going in depth into the questions’ content:

- Question n.14 asked to assess an evaluation for every listed “positive” feature that has been generally recognized to the implementation of Agile practices. Again, those has been written in such a way to be more comprehensible and intuitive for the practitioners, adapting to the firms’ language and needs.
The evaluation, that have assumed the form of a Likert scale from 1 to 5 was required for every characteristic, considering the importance of this question. Indeed, this has been an exceptional instrument to find what are effectively, for Italian firms, the ensemble of the most valuable Agile features. Knowing this, it could be easier to determine for companies a model so that the effort is posed only to extract most of the value from the best Agile characteristics. It is also interesting to compare those data with the more global ones, understanding if the level of adoption and perception of the framework is aligned with the global ones.
Of course this kind of data gathering gives the important possibility to make crossing of information and statistical studies to verify phenomena of correlation depending the characterization of the answering firms.
Question n.15 gives the freedom to insert other features evaluated as important for the company and to evaluate them, preventing in this way the loss of information.
- Question n.16 try to assess quantitative evaluation the features of the other side of the coin of Agile adoption, that are those factors that are holding back companies to a complete and more successful adoption of the framework. This question has a crucial importance, because it can efficiently determine what the most preventing factors for a correct use of Agile framework and the inhibiting strength of those elements are.

The study of the answers will be possible another time with the utilization of the Likert scale as instrument to answer the question. The analysis of the outcomes of the question will be critical, again with the possibility to verify particular correlations

Indeed, after having understood what the eventual difficulties and their intensity are, effective counter-measures to react to and minimize the effects of those elements could be found. Indeed, this will be a crucial point in the construction of the conclusions, where there will be suggested the actions to take to strengthen Agile utilization in the Italian business environment.

Question n.17 enrich the possibility of answer by the respondents, enabling the typing of a personal answer to complete the overview.

3.1.4. Agile methodologies satisfaction

The last group of questions has been studied to permit the final evaluations on the Agile methodologies in their entirety. This camp has the general purpose to verify if truly there is place for the adoption of agility in IT developing projects. In detail:

- Question n.18 permits the evaluation with a score from 1 to 5 of the satisfaction of the utilization of already used Agile practices in developed projects. Essentially, the question is the resume of the previous question, assessing numerically the overall benefits achieved. The data will clearly show the overall judgment that is given today over the utilization of Agile framework and if there is a consistent margin of improvement. Where to act to enable this enhancement will be clear after the analysis of the previous questions.
- Question n.19 ask to make a numerical evaluation, with a Likert scale from 1 to 5, of the possibility to concretely use in the next future Agile practices for IT development. The question was proposed to rate the possible spreading of the methodology and the perception that the same companies has with respect to the direction that the business world is taking. Also, making a comparison with previous questions, it can be verified if the willing to use Agile methods is in line with the effective preparation that there is towards it.

3.1.5. Final questions

The last questions have the purpose, besides thanking the respondent for the effort put in the answering, to give the possibility to the answerer to leave more comments or evaluations on the use of Agile methodologies, giving the freedom to type everything he/she wanted. Inserting this question improves the possibility to collect other important opinions from who live on their skin the effective results of any kind of methodology. Anyway, more detailed comments and contributes will be given by the use of interviews, which outline will be showed in the next section.

Finally, there are important questions concerning privacy and the asking of the permissions for eventual quotations inside this work, inserted mainly in the acknowledgements.

3.2. Interviews

The second instrument to collect information on how it is judged and utilized the Agile framework in Italian companies has been direct interviews to few people. Those persons have been chosen on the respondents' base of the survey and between those who have left their e-mail address in the dedicated area at the end of the form. Then, between them have been chosen the ones who had, in the survey, the most extremist evaluations on Agile methodologies; this means that have been selected, considering mainly the scores given in the last questions of the survey (Overall evaluation of Agile and future perspective on its usage), the persons who are very enthusiastic of the framework (high scores in the questions) and the ones who have some doubt about it (low scores in the questions).

Part of the questions of the interview were previously prepared by the writer and people from Engineering and preemptively sent to the interviewed persons, to get them prepared for the contents of the meeting. Those questions, partially different for the “positive” and “negative” subjects, were (the differences between them will be outlined with italic for the “negative” questions):

- Can you summarize shortly the initial objectives and benefits expected by the business of a project developed with agile methodologies that particularly satisfied/*dissatisfied* you?
- Was the project Buy or Make? What has been its duration?
- Why did you choose Agile methodology for this project?
- What were the results that have especially satisfied/*dissatisfied* you at the end of the project? Why? (Project time, budget, satisfaction of the requirements, quality of the product etc.)
- According to your experience, what can be done to improve Agile methodologies per se and their implementation in the projects?
- What suggestions would you give to a colleague that should start a project with Agile methodologies?

As can be seen, one of the intentions of the interview was to collect stories from real-life cases of projects carried on with Agile Project Management. This was very important to give some kind of context to the results achieved with the study, that has a more theoretical nature. On the other hand, the main theme of the thesis concerns about a method that is strongly related with experience and human contact. Then, other questions arising from the proceeding of the interview were also done, mostly to explore the meaning of one answer or to deepen some point that has come out from the interview itself.

Two persons, one for each viewpoint, were finally interviewed: the interview to Carla Olmi of FCA (Fiat Chrysler Automobiles) has been conducted face to face in FCA plant in Turin, while the interview with Valerio Manzo of Piaggio has been made through Skype. The main results are presented in the last section of chapter 4.

4. Results of the study

The hearth of the thesis has been finally reached in this chapter, that is the display of all the results that has been collected to evaluate the state of the Italian industries towards Agile methodologies. The methods of study have been two: a survey conducted on a sample of companies and a more detailed and personal interview submitted to people representatives of the most discordant opinions about the Agile framework. Those two studies have been explained in detail in Chapter 3.

In this chapter, as said before, the outcomes of the research will be showed in detail through the use of different methods of analysis: thus, for the results of the survey statistical methods will be used and their outcomes will be widely commented. The interviews, seen their less scientific nature but also their important utility, will be carefully examined to extract important additional information that only with a more “emphatic” method should be outlined.

4.1. *Survey results*

In this section will be described and analyzed the answers given to the survey. For this reason, there will be plenty of graphs, to better visualize the main outcomes. However, due to the graph’s nature, there could be confusion on the exact conformation of the answers. So, for clarity reason, the tables with the collection of precise answers for some of the graphs can be found in Appendix B.

4.1.1. Survey sample

The survey, after the location and the elimination of the answers by respondents not in line with the thesis purposes, received 30 answers in total. Those has come mainly from the people directly contacted by Engineering and from someone involved by the spreading of the survey by some of those contacts. Then, the publishing of the survey on social networks, in groups concerning Project Management on LinkedIn mainly, did not contribute substantially to the results, providing few answers. This maybe can be explained by the “regional” nature of the study, given the choice to focus only on the Italian territory for the reasons widely expressed before, and by the poor interest that firms in Italy are actually posing on new methods of Project Management.

As said at the end of the first chapter, this study is quite original, considering the substantial absence of studies focusing only on the Italian diffusion of Agile Project Management; for this reason, and the consequent shrinking of the field of study, the quite small sample achieved has been considered functional for the purpose of this study.

As explained in the previous chapter, to identify efficiently the sample in analysis is essential. For this reason, graphs useful to describe the respondent to the survey will now follow, with several

comments about them (the display of the first results the will begin from the next sub-section). The percentages outlined in the graph are of course defined with respect to the total sample studied

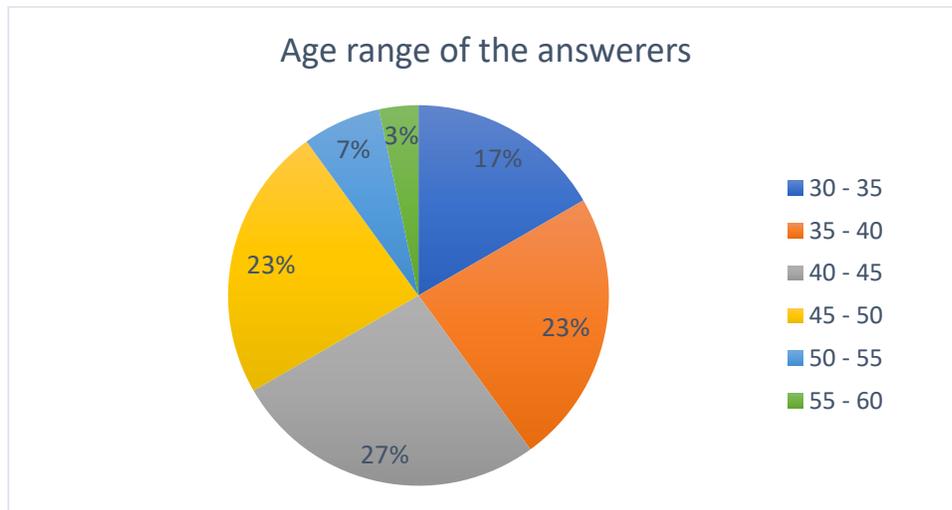


Figure 4.1: Pie chart representing the age range of the respondents of the survey

As it can be seen from the graph, the variety of the respondents in terms of age has been quite good apart for the elder's age-ranges.

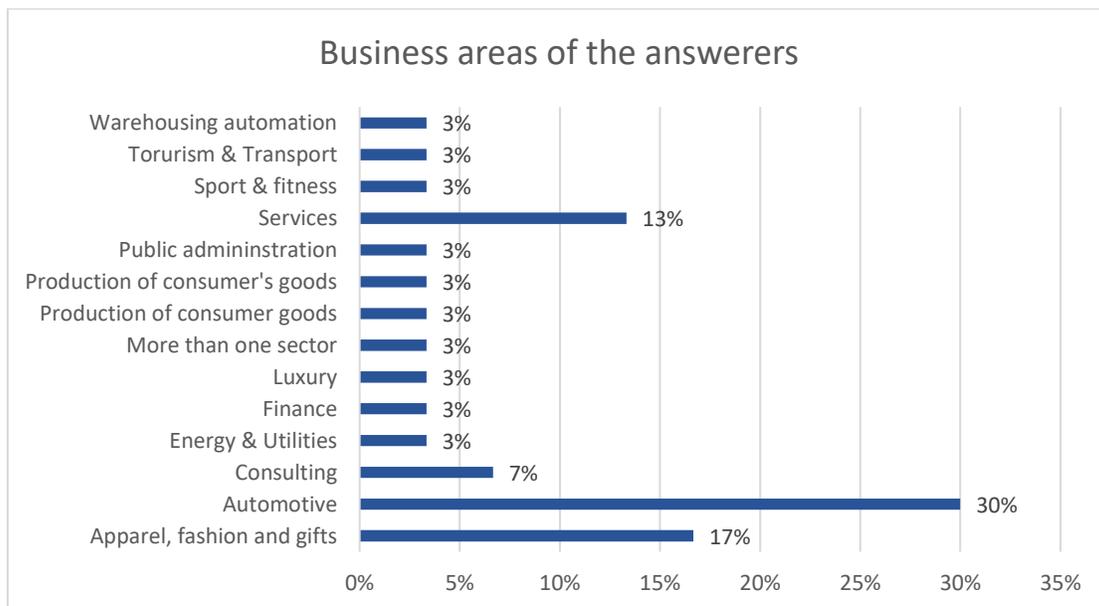


Figure 4.2: Bar chart representing the business areas of the respondents to the survey

The graph above represents the different fields of business in which the respondents operate in. It is evident that many of the answerers come from the automotive, the apparel and the services business area. Thus, a good portion of Engineering customers, to whom the survey has mostly been submitted to, belongs to those areas. Anyway, a so shaped sample is probably representative of the Italian distribution of firms, that more or less follows the trend of the analyzed sample. Moreover, it should be considered that the fields that more need a solid IT infrastructure are probably those mostly represented.

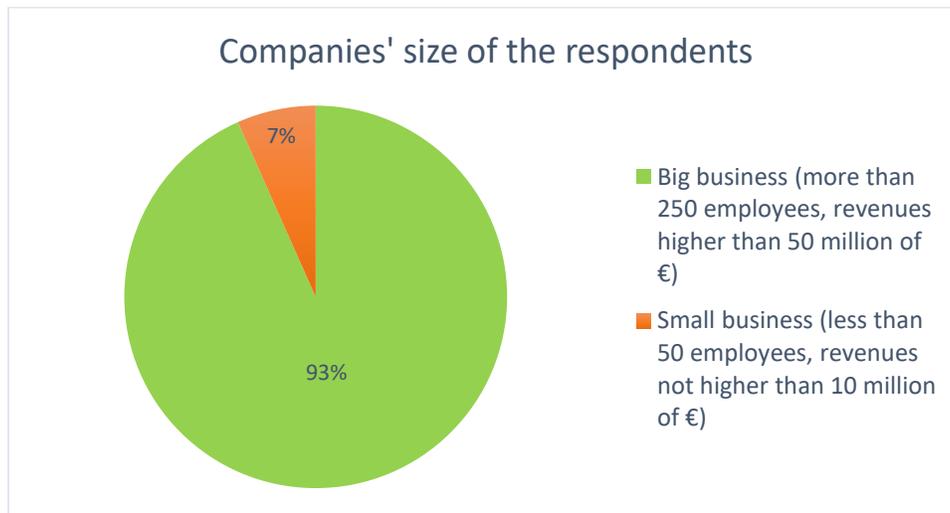


Figure 4.3: Pie chart representing the size of respondent's companies

The above chart portrays the distribution of the answerers of the survey with respect to their company size in terms of business. As can be easily seen, the answers come mostly by the big business world, with a small percentage of small business and no answers from the “middle companies”. Having a so unidirectional sample is probably one of the biggest limits of this study, because it should have been interesting to analyze the behaviors of other actors in the Italian business world. However, it should be also considered that probably the big companies are the most interested in the new methodologies of Project Management, because they are the ones more focused on the optimization of processes, having reached the maturity of the products they issue.

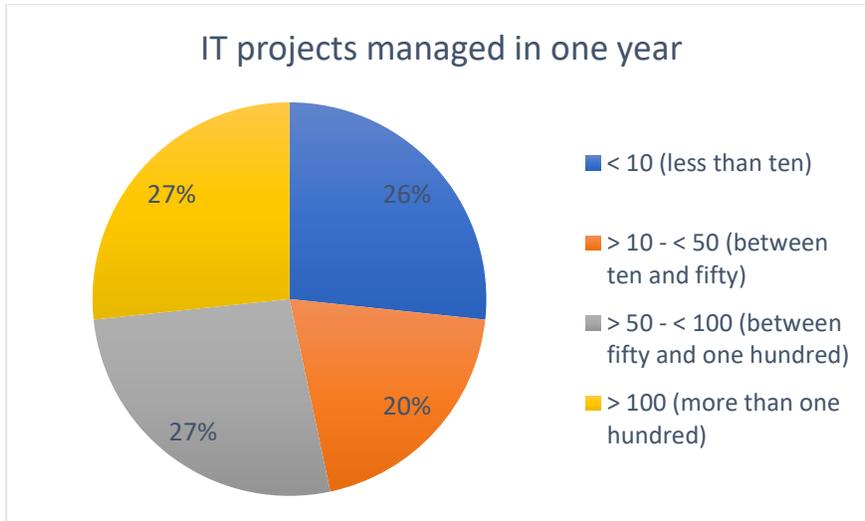


Figure 4.4: Pie chart representing the distribution of respondents with respect to the number of It projects managed in one year

This graph depicts the situation for what concerns the number of IT projects managed in a single year. As can be seen, the distribution is pretty uniform in this case.

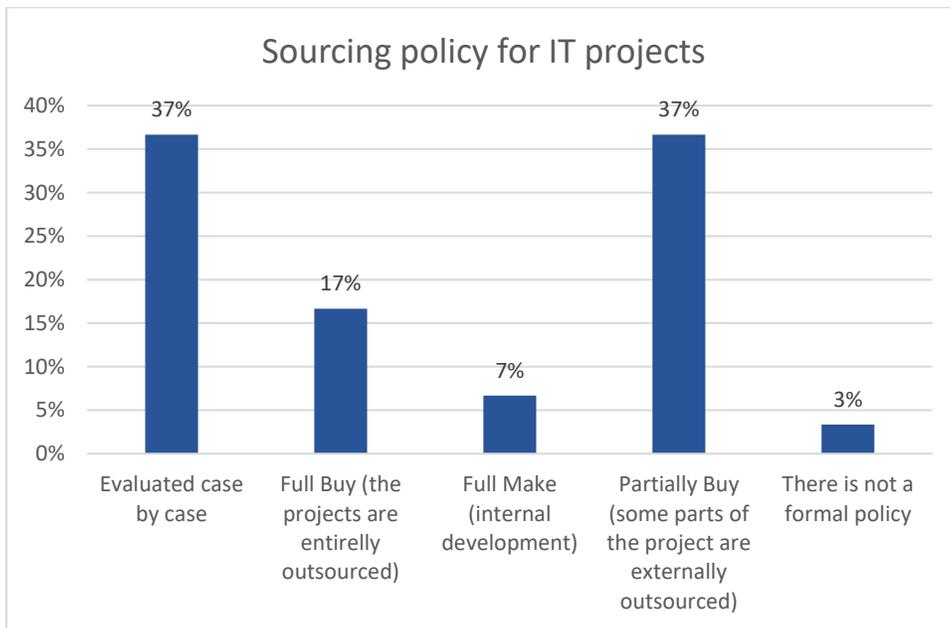


Figure 4.5: Distribution of answers on the general sourcing policy for IT projects of the respondents' companies

The final graph of this section represents the conformation of the respondents and their firms is about the methods of sourcing to develop an IT projects. Remembering that the sample is entirely made of persons working for non-IT-producer companies, is quite clear that that kind of firms prefer to outsource projects of information technologies, which pretend a certain grade of skills in that field. In light of this, it turns once more that the potential of application of Agile methods, which means to promote involvement of the customer, is quite large.

4.1.2. Descriptive statistics

Now we can go further to the results concerning what are the methods used by the firms to make up an IT project and their perception of the benefits and the defects of Agile methodologies. As before, graphs about those questions will follow, coupled with analysis and reflections about the data that will eventually be properly quoted for the sake of study.

The first question complaining with the aim of this work, was that on what the method mostly used is to issue an IT project (see question 10 in appendix A). Figure 4.6 shows graphically the outcomes of this question.

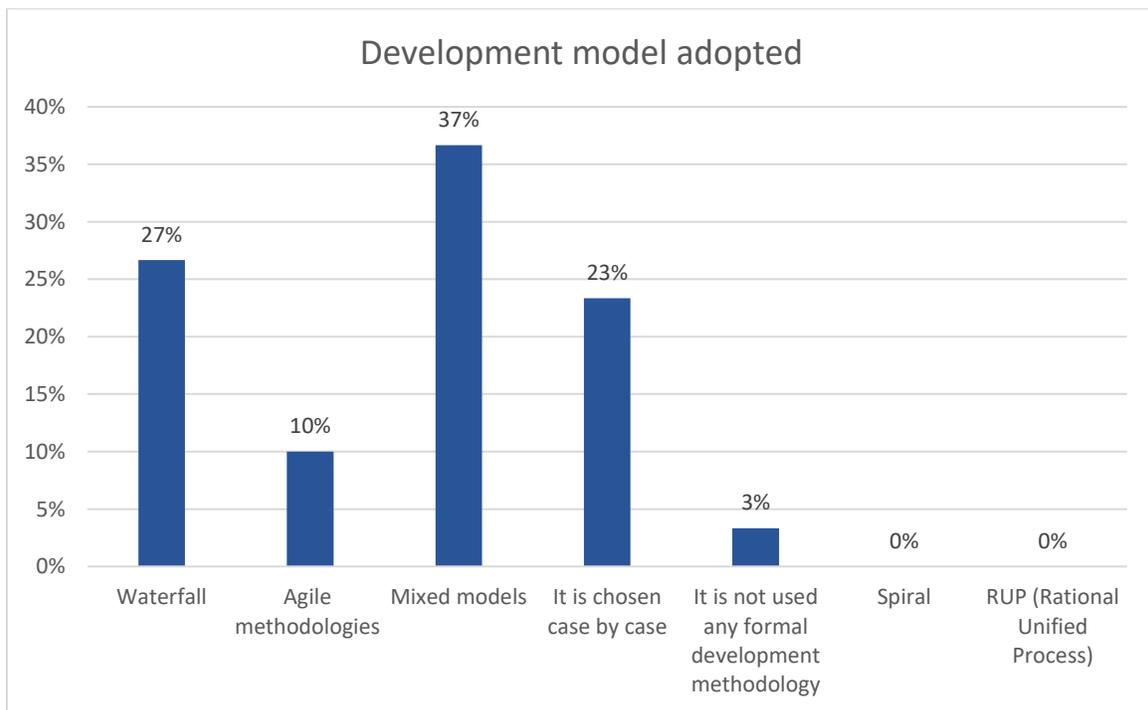


Figure 4.6: Percentage of answers for the question: "In undertaken IT projects, what is the development method usually adopted?"

The results gathered are interesting. For what concerns pure Agile methodologies, the results are pretty poor, because only the 10% of the population use mostly Agile methods for their IT projects (who has answered Agile in this question has later stated that the specific method utilized is “Scrum” or “Extreme Programming XP”). Moreover, it is overwhelming the supremacy of Waterfall methods in a direct confrontation. However, an interesting fact is that many of the respondents, exactly the 37%, say that the most used methodology is to mix different models. It is reasonable to think that this is done to optimize the prevision of results.

In light of a future greater use of Agile, this data is to be taken into account. It has been said many times in the previous chapters that Agile techniques are particularly suited for the utilization in a mixed context, to extract the major benefits from this implementation. This result shows that Italian companies would be capable of an eventual introduction of Agile mixed with other more familiar methodologies, seen that they are used to this practice. Moreover, seen the important result of the answer “It is chosen case by case” (23%), if companies recognize the value of an Agile utilization, they would likely apply Agile methods when it is suggested for a specific project.

The results of the previous question are analyzed more in depth in the next one (question 11 in Appendix A), asking the respondents to give a numerical evaluation of the utilization of different methods in analysis. The graph below shows the distribution of the score given to every method in the question.

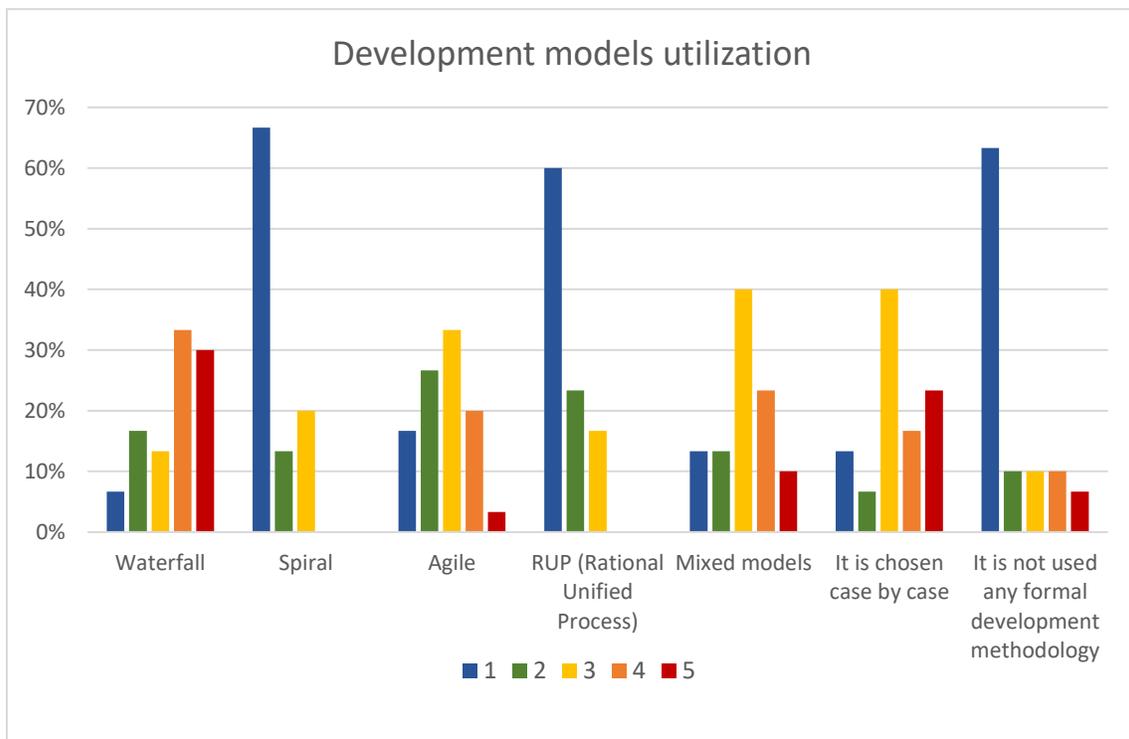


Figure 4.7: Distribution of the scores concerning the utilization for the developing models of Project Management in question n.11

Things to be observed are for instance the low scores given to the “alternative” Project Management methods like RUP or spiral model (also, only two persons have given a score higher than 3 to “Other”). Also, it is observable, again, the low utilization attributed to Agile methods, with few answers giving a score higher than 3, that on the contrary are many for Waterfall approach. The results of Mixed models and “It is chosen case by case” are again quite important. Finally, it is observable that low scores are given to “It is not used any formal methodology”, which is a sign that Italian companies, especially big businesses, prefer not to act with a structured approach.

The outlined conclusions are confirmed in the graph below, which illustrate the averages for all the answers, with only Waterfall, mixed models and “case by case” approaches that go beyond 3. For these answers their variance will not be showed because the pretty clear outcomes.

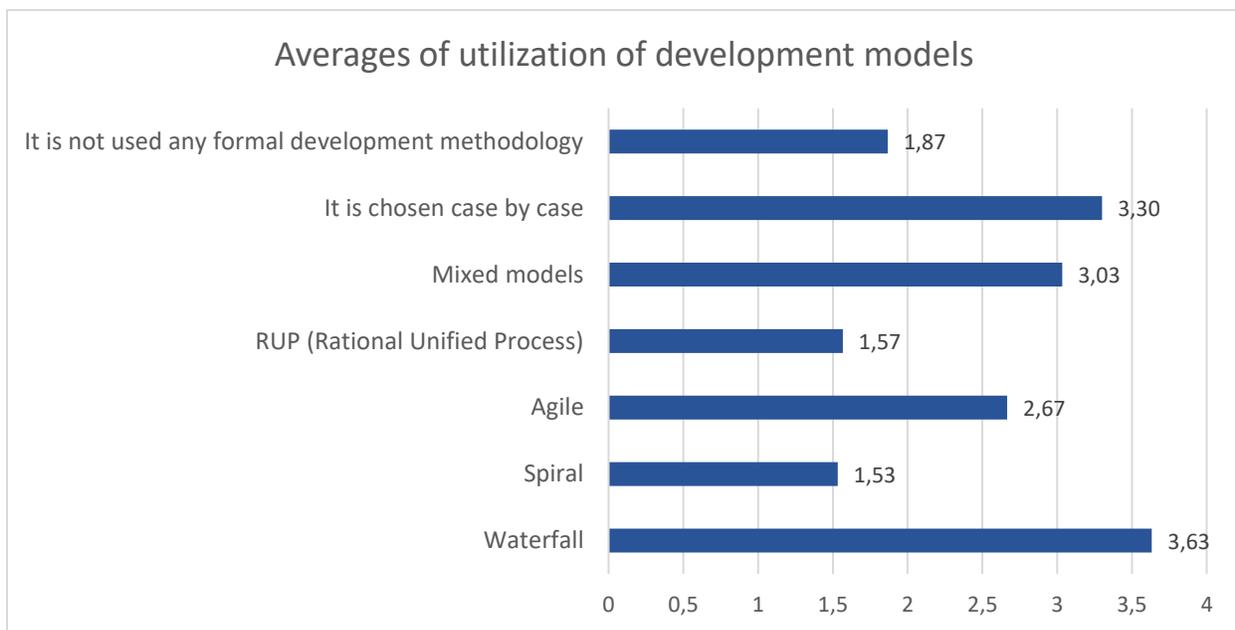


Figure 4.8: Averages for the answers about the utilization of development models in question n.11

Question n.14 and n.16 asked for a deeper opinion about Agile practices, asking to evaluate respectively their positive and negative characteristics. Talking first about the advantages, just by observing the distribution of answers reported below in Figure 4.9, it turns out that firms evaluate the certified benefits of Agile methodologies with high scores. Actually, the results in the graph show that many of the qualities in the question have scores “shifted to the right”, with a lot of respondents giving rates 4 or 5.

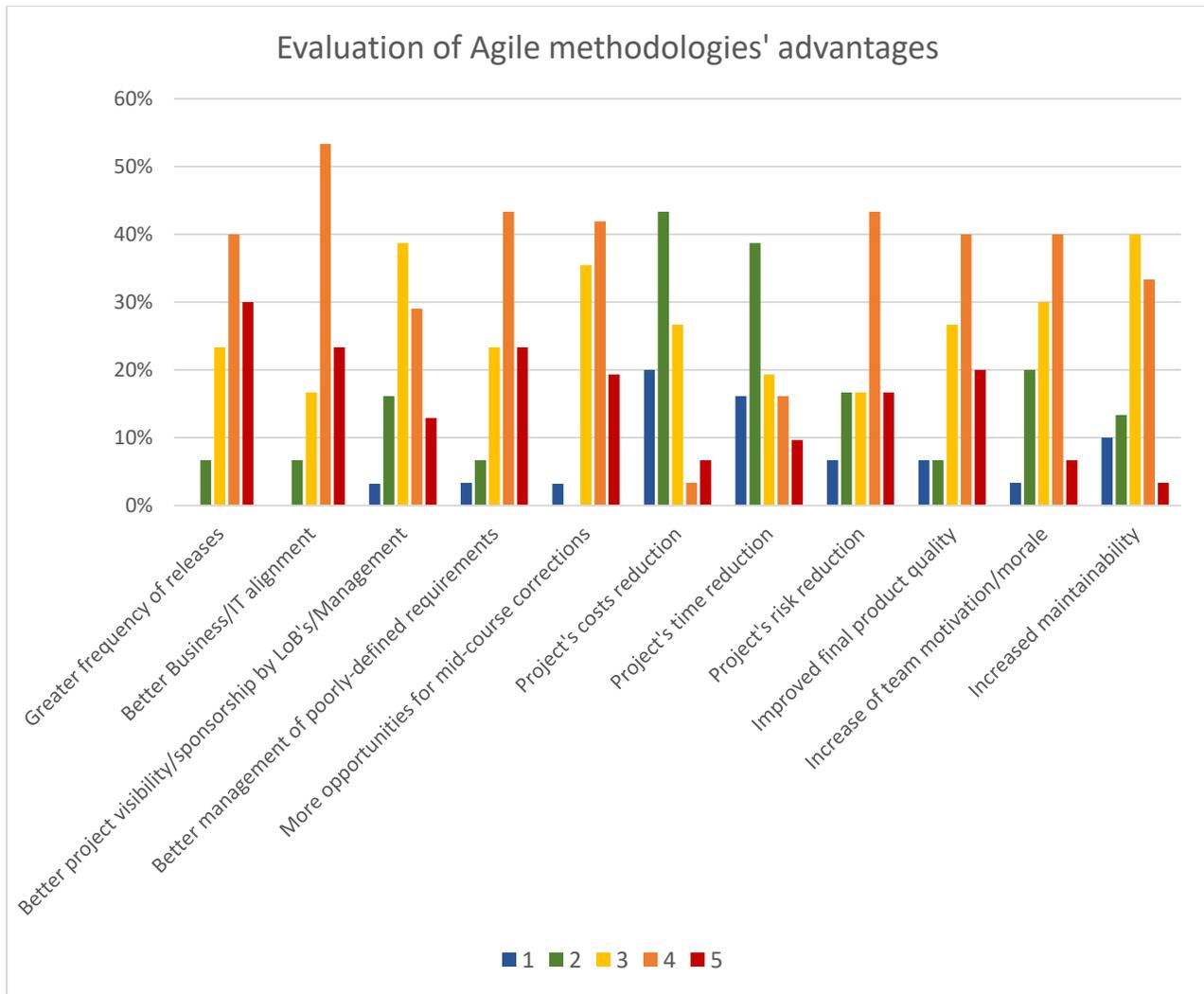


Figure 4.9: Distribution of the answers giving scores to Agile advantages in question n.14

A good description of the results to this question is given by the calculation of the averages for the different qualities. In this way, the most important features for Italian companies when developing an IT project with Agile Project Management can be evaluated. It turns out that almost all the averages of attributes described in the question surpass the threshold of 3. The ones behind this level are the qualities “Project cost reduction” and “Project time reduction”. Although these are advantages that can be brought in a correct utilization of Agile, the perceptions of the respondent do not feel the same.

This can be explained by the fact that those two aspects are probably the most negatively affected during the first times where the methodologies are adopted, because the actors involved need to understand the new conception and this can reflect in more consumption of money and time. So, seen the low adoption of Agile that has been stated in the previous question, those low scores can probably be a consequence.

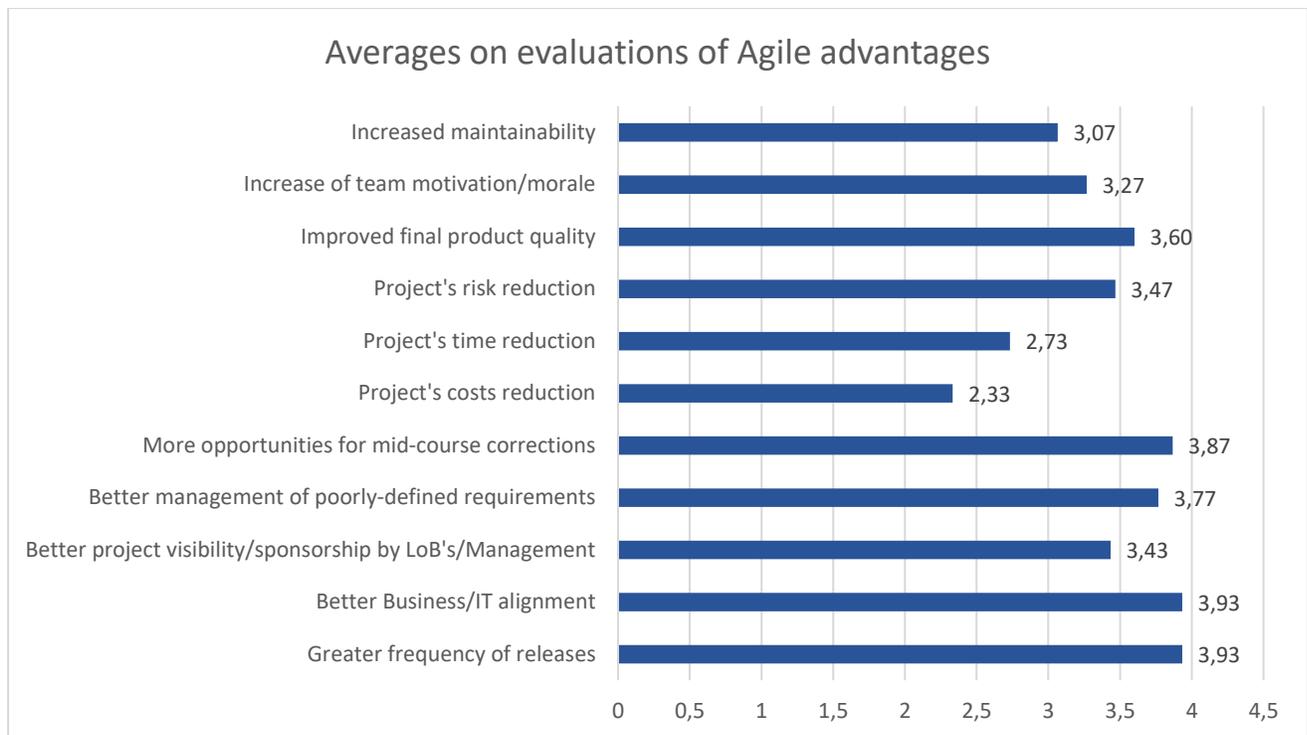


Figure 4.10: Averages of the scores given to Agile advantages in question n.14

Then, we can consider the characteristics which average has exceeded 3.5 as the most important and searched in a project conducted under Agile methodologies. Those are:

- Greater frequency of releases;
- Better business/IT alignment;
- More opportunities for mid-course corrections;
- Better management of poorly-defined requirements
- Improved final product quality

We can combine the results given by the computation of the averages with that of the variances calculated on the sample, graphically showed in Figure 4.1; this combined analysis shows that the top three qualities (greater frequency of releases, better business/IT alignment and more opportunities for mid-course corrections) have also low variances associated. This states that the majority of respondents strongly believe that those features are the most important ones.

Though, the other two, better management of poorly-defined requirements and improved final product quality have a slightly higher variance: this discrepancy among answers of respondents can be given by different experiences or believes. Indeed, those aspects are again strongly affected by the correct or not utilization of Agile methods. This is particularly true for the final product quality, that in fact as quite high variance showed for the answer “improved final product quality”.

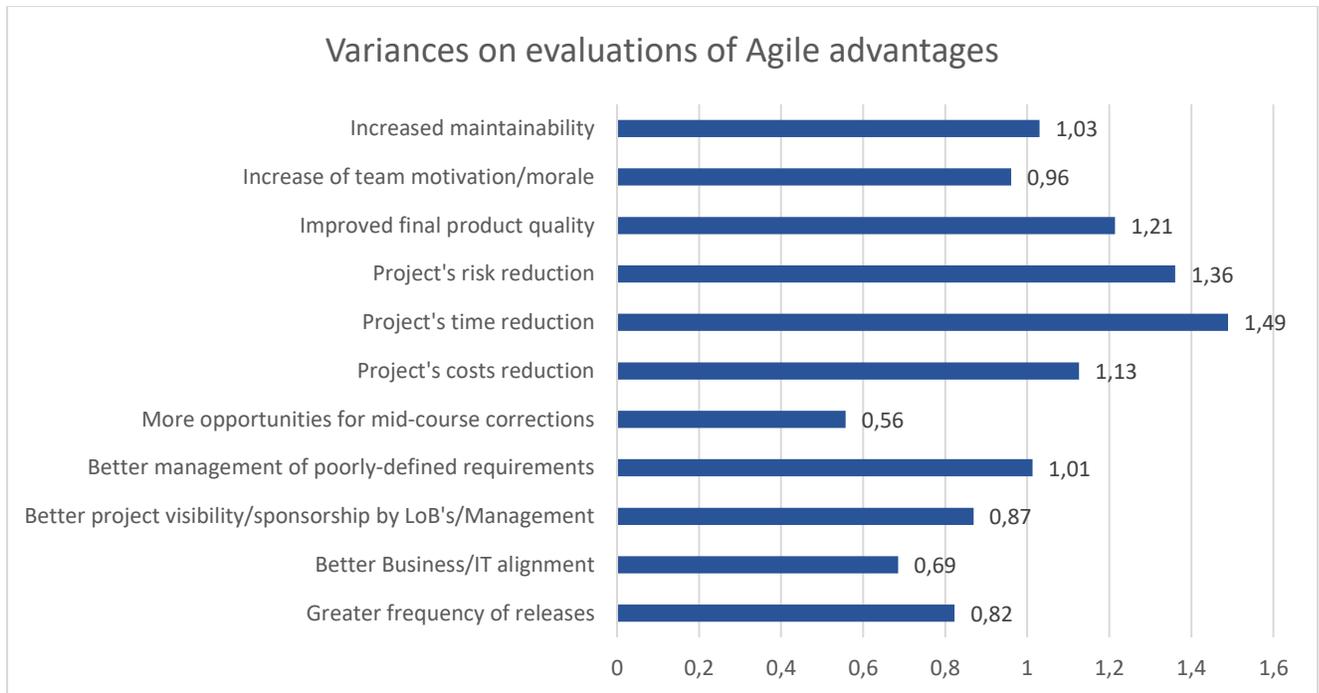


Figure 4.11: Variances of the scores given to the Agile advantages in question n.14

The next question, n.16, was about the negative aspects of Agile methodology and all the obstacles that could compromise the successful adoption of the framework. Reminding the nature of the question, it was asked to give a score proportionally to how much a negative feature of Agile Project Management prevents the utilization of that methodology. As usual, the outcome of the answers is represented by the following graph, Figure 4.12.

The first thing that can be seen with a look to the graph is that the answers for the respective Agile problems are quite polarized: it means that there are issues which really are seen as major obstacles for the implementation and some others that are not seen as a considerable trouble. This is reflected in the distribution of answers, considering that there are features which have peaks of low scores, especially of 2s represented by the green bar, and others that have a considerable amount of answers giving high scores, mainly 4s.

This evaluation is confirmed by the observation of the averages computed on the scores given to question n.16 (the graph is in page 57, Figure 4.13). It is clear that there is a category of issues, the ones which amply cross the threshold of 3, which are the most problematic and the others which do not go beyond that barrier that are less significative.

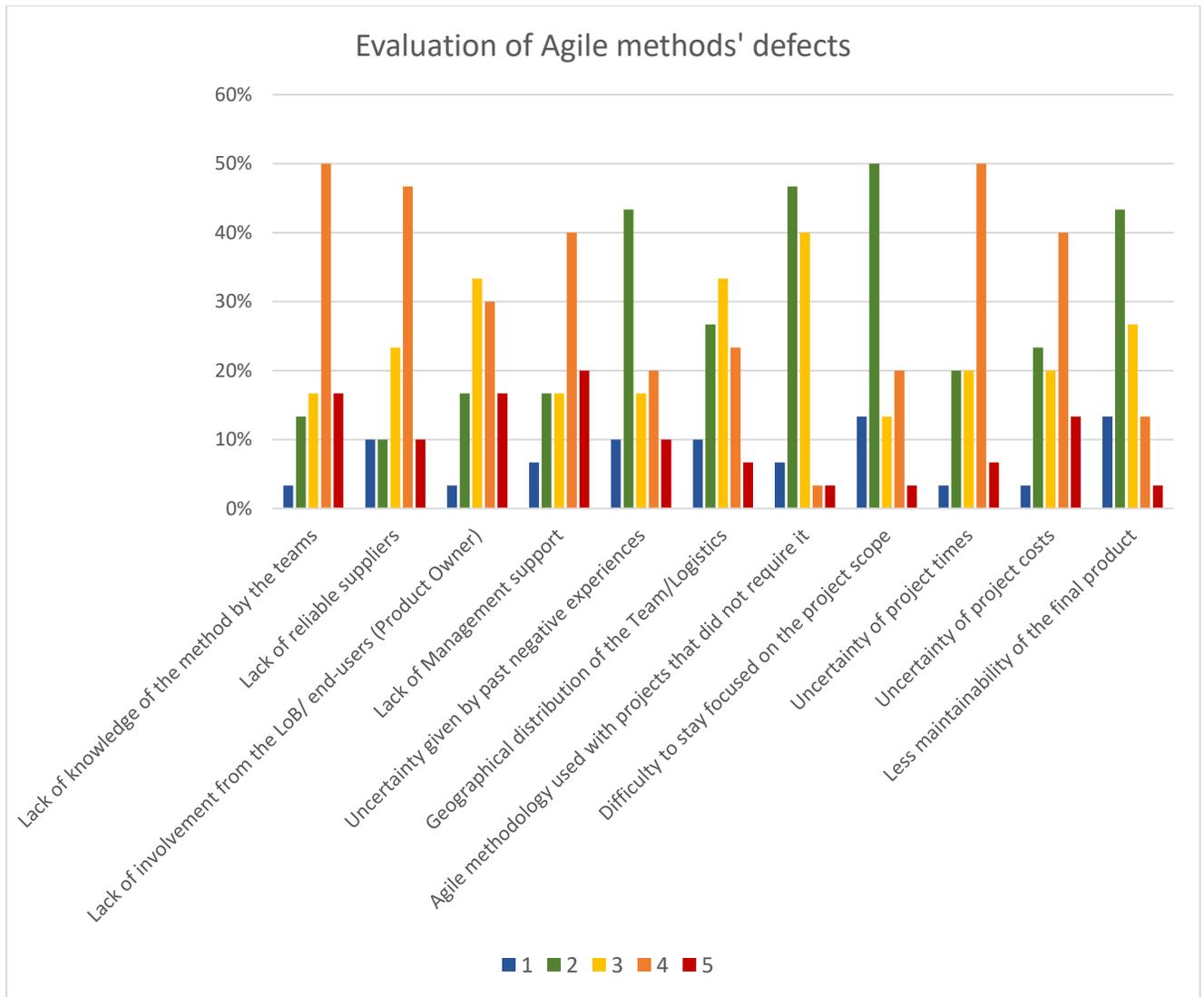


Figure 4.12: Distribution of the answers giving scores to Agile defects in question n.16

Focusing on the most important issues, they are, in order of importance (given the value of the average):

- Lack of knowledge of the method by the teams
- Lack of management support
- Lack of involvement from the LoB/ end-users (Product Owner)
- Lack of reliable suppliers
- Uncertainty of project times
- Uncertainty of project costs

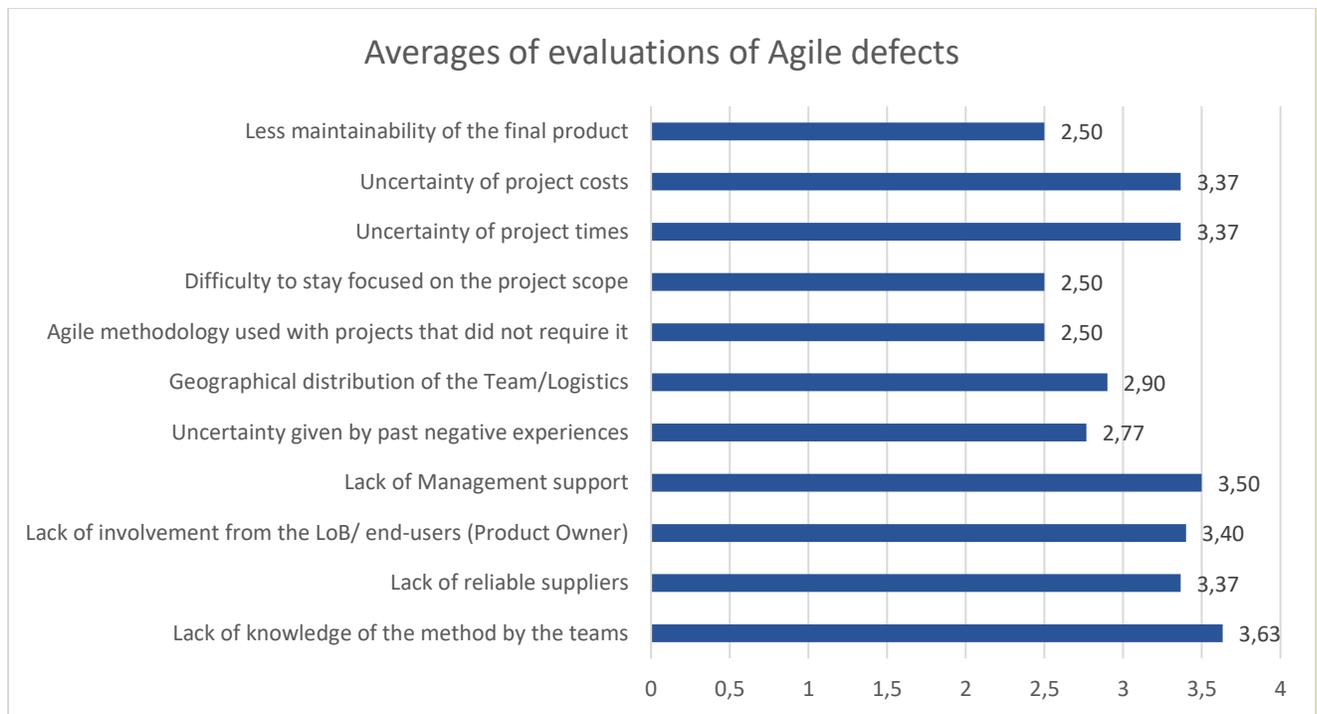


Figure 4.13: Averages of the scores given to Agile defects in question n.16

It is evident that the first detected issue, lack of knowledge of the methods by the teams, and also the other three in the top 4 causes of difficult implementation are related to the relative youth of the Agile methods, especially in Italy, and to the little knowledge that there is around them. So, what seems to miss are experiences of Agile projects and a deep understanding of their mechanics and roles. Indeed, if we think to the Agile framework Scrum and we observe the first three impediments to the implementation, it is clear that the three main figures (Scrum Master, Product Owner and the team) are missing or are not well trained. Then, the last two main problems can be a consequence of the previous causes too: a poor knowledge of the method leads to a miscalculation or in an enhancement in project's time and cost, fundamental parameters in Project Management. This evaluation of the answers is enhanced by two comments made in the additional space provided in the survey, which literally say:

- “Sometimes the organization doesn’t support very well the Agile initiative and the program lose power during the implementation and execution phase”;
- Availability of business is necessary but not always is available

However, observing also the variances for the given answer in figure 4.14 it is notable that almost all the answers have a pretty high variance, including the issues determined before with a peak for lack of management support. This is probably a sign that companies are uncertain about the real causes of a misinterpretation of Agile practices or that probably firms are good in one component of the methodology but lack in some others, going against the request of Agile framework of a fine interlacement of all the project actors.

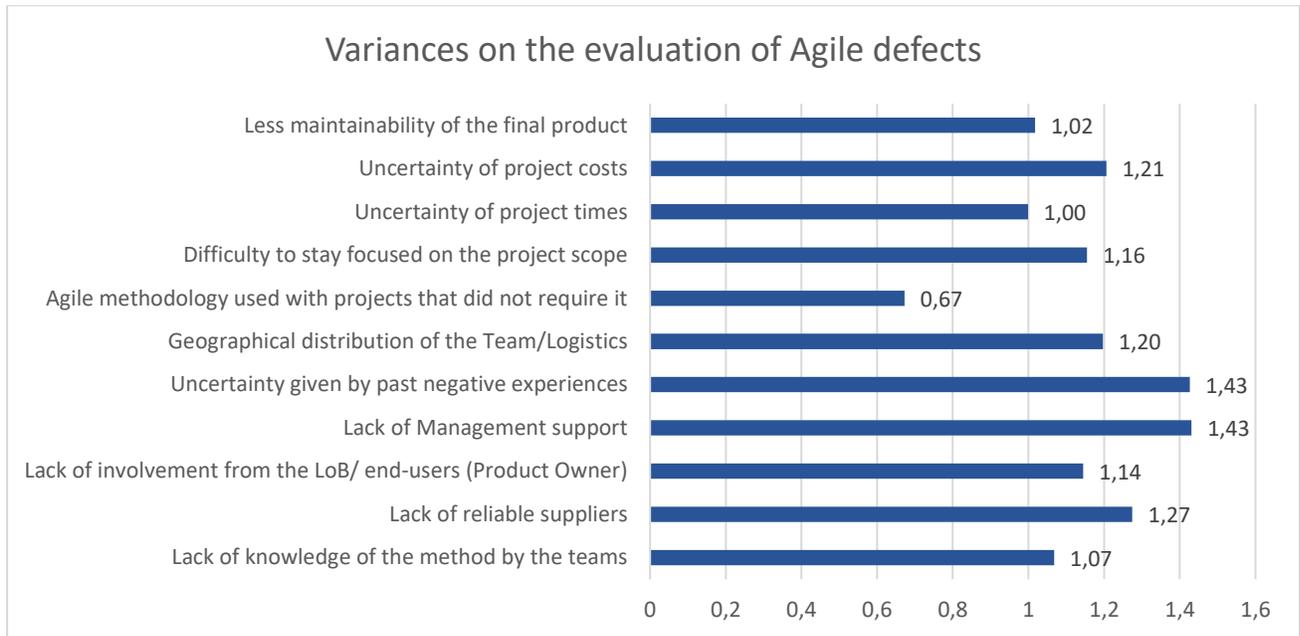


Figure 4.14: Variances of the scores given to the Agile defects in question n.16

Finally, it has been asked in question n.18 to give a numerical evaluation on the overall satisfaction that the utilization of Agile methods has brought. Although, in question n.19 it has been asked to give again an evaluation on how much the respondent think that Agile methodologies will be used in the future.

The results, which are represented as usual in the graphs in the next page, are quite clear. For what concern the first question the results are less enthusiastic than the second but are significant too. Indeed, it is obvious that the graph of answers concerning the satisfaction of Agile is shifted to the right side, with a very high number of 4 scores. However, only one 5 score has been given. So, the first conclusion can be that who has used Agile framework is generally positive satisfied of the results but not fully, probably for the problems that have been outlined in the previous section.

Though, the answers for question n.19 are interpretable almost univocally. Indeed, there is a solid concentration of answers of 4 and 5 scores, with the higher number of answers given to the maximum grade. There are few interpretations that can be given to this: Italia firms are convinced that in the future Agile methodologies will be vastly used in the near future.

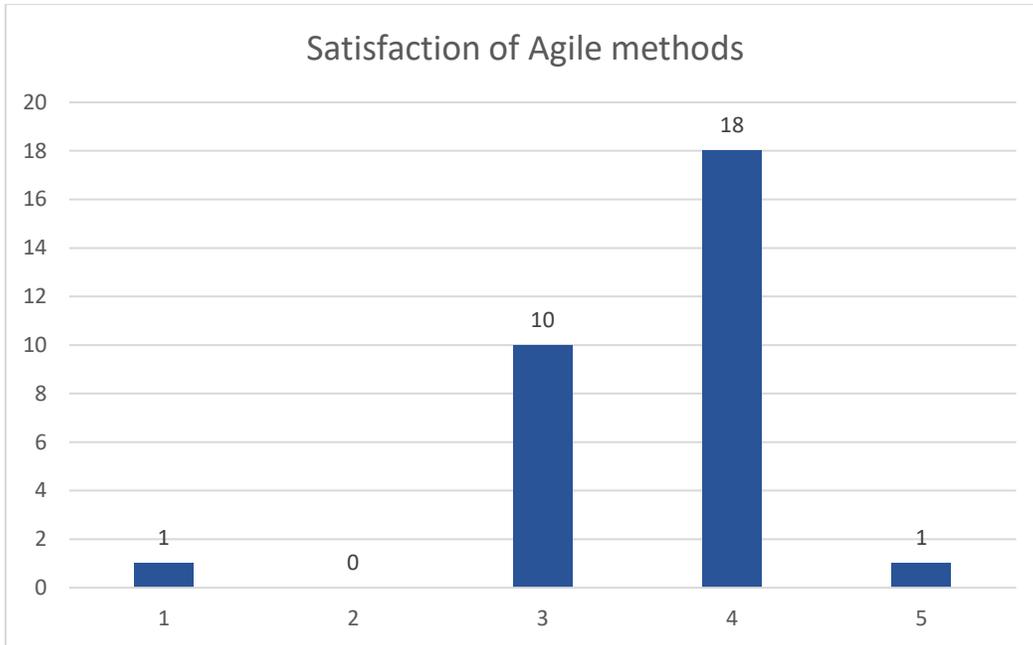


Figure 4.15: Distribution of the scores defining Agile satisfaction in question n.18

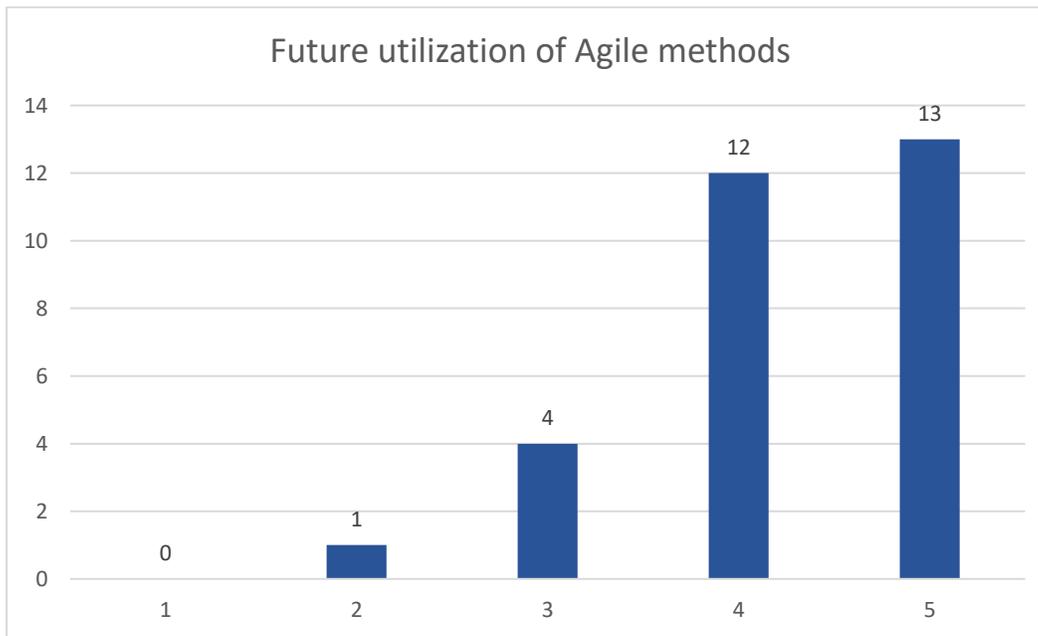


Figure 4.16: Distribution of the scores defining future Agile utilization in question n.19

4.1.3. Statistical analysis

With the aim to improve the results obtained by the survey, it has been conducted a more statistical analysis, to look for particular outcomes that can only be obtained by such analysis. The study has been pursued with the IBM statistical software “SPSS Statistics” and applied of course to the data obtained by the survey. The quality of this study can be affected by lack of deep knowledge in the field by the writer, that has conducted this kind of analysis according to what have been learned in the academic experience.

The number of answers unfortunately has not been sufficient to carry out a study on the correlations between the type of respondents, identified through the first questions in the form, and the given answers: indeed, the various category of respondents were not sufficiently represented to determine a significant correlation. However, it was made another kind of study, a Factor Analysis, which have been done on the answers about the positive and negative characteristics of Agile. This analysis was aimed to identify the trend of the answers, studying the correlation between the scores given to the single features and detect a set of characteristics that were determined by a similar behavior of answering. In summary, the purpose was to shape the “package” of features that for the respondents are crucial to stay together in the proposal for an implementation of Agile methodology for the question concerning the positive features. Then, for the negative characteristics, it has been identified the set of obstacles that collectively need to be removed to go on with a successful Agile realization.

The method has consisted of detecting some indicators concerning the answers to the survey and according to those some characteristics have been recursively excluded to reach a significant value for the indicators. These indicators are mainly:

- Value of the self-anti-image correlation, which are the values in the diagonal in the tables like the one in Figure 4.17 (those indicated with an “a” as index): in the final solution those value need to pass the threshold of 0.60;
- Value of the KMO test: it is pointed in the tables similar to Figure 4.18, where only the number in the first row is considered: this value should be higher than 0,7;
- The total variance explained, showed in graph 4.19 for the positive features: the cumulated value of variance explained by the components chosen, which are sets of characteristics taken in consideration, need to be higher than 60%.

To gather the sets of features (i.e. the components) that the analysis should have given, it has been proceeded canceling out iteratively the characteristics that has showed to be not relevant enough to include them in the final result. The criterion for the exclusion has been mainly the anti-image correlation, seeing for what characteristics this value was too low (< 0.5).

Below there are some of the tables representing the situation concerning the positive features (the answers given to question n.14) in the first iteration of software running.

Anti-image Correlation	Greater frequency of releases	,601 ^a	0,000	0,098	0,033	-0,514	0,196	0,105	-0,239	0,081	-0,371	0,146
	Better Business/IT alignment	0,000	,597 ^a	-0,406	-0,378	-0,110	-0,271	-0,100	0,368	0,247	-0,028	0,171
	Better project visibility/ sponsorship by LoB's/ Management	0,098	-0,406	,482 ^a	0,443	-0,259	0,200	0,026	-0,399	-0,430	0,030	-0,196
	Better management of poorly-defined requirements	0,033	-0,378	0,443	,609 ^a	-0,382	0,315	0,158	-0,360	-0,097	-0,293	-0,310
	More opportunities for mid-course corrections	-0,514	-0,110	-0,259	-0,382	,681 ^a	-0,180	-0,132	0,253	-0,097	0,347	-0,231
	Project's costs reduction	0,196	-0,271	0,200	0,315	-0,180	,449 ^a	-0,406	-0,857	0,307	-0,187	-0,294
	Increased maintainability	0,105	-0,100	0,026	0,158	-0,132	-0,406	,657 ^a	0,329	-0,409	-0,391	0,159
	Project's time reduction	-0,239	0,368	-0,399	-0,360	0,253	-0,857	0,329	,334 ^a	-0,215	0,102	0,313
	Increase of team motivation/ morale	0,081	0,247	-0,430	-0,097	-0,097	0,307	-0,409	-0,215	,636 ^a	-0,079	-0,132
	Improved final product quality	-0,371	-0,028	0,030	-0,293	0,347	-0,187	-0,391	0,102	-0,079	,723 ^a	-0,408
	Project's risk reduction	0,146	0,171	-0,196	-0,310	-0,231	-0,294	0,159	0,313	-0,132	-0,408	,745 ^a

Figure 4.17: Matrix of anti-image correlation given by the first SPSS run on the answers to question n.14

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,595
Bartlett's Test of Sphericity	Approx. Chi-Square	152,784
	df	55
	Sig.	0,000

Figure 4.18: KMO Test given by the first SPSS run on the answers to question n.14

The test made on the sample of answers given to question n.14 was pretty easy to continue, because after the first run it has been decided to keep away from the prosecution of the test the characteristics: “Project’s cost reduction”, “Project’s time reduction” and “Better Project visibility/sponsorship by LoB/Management”. After this first selection the software has been run again and immediately has given satisfactory result. Indeed, all the indicators explained before shows satisfactory results (see Figure 4.19, 4.20 and 4.21 and 4.22).

Anti-image Correlation	Greater frequency of releases	,619 ^a	0,103	-0,062	-0,490	0,204	0,042	-0,370	0,240
	Better Business/IT alignment	0,103	,773 ^a	-0,200	-0,298	-0,213	0,236	-0,050	0,040
	Better management of poorly-defined requirements	-0,062	-0,200	,801 ^a	-0,287	0,310	0,001	-0,309	-0,200
	More opportunities for mid-course corrections	-0,490	-0,298	-0,287	,677 ^a	-0,211	-0,185	0,364	-0,359
	Increased maintainability	0,204	-0,213	0,310	-0,211	,630 ^a	-0,316	-0,535	0,064
	Increase of team motivation/morale	0,042	0,236	0,001	-0,185	-0,316	,766 ^a	0,000	-0,137
	Improved final product quality	-0,370	-0,050	-0,309	0,364	-0,535	0,000	,653 ^a	-0,486
	Project's risk reduction	0,240	0,040	-0,200	-0,359	0,064	-0,137	-0,486	,778 ^a

Figure 4.19: Matrix of anti-image correlation given by the last SPSS run on the answers to question n.14

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,707
Bartlett's Test of Sphericity	Approx. Chi-Square	91,250
	df	28
	Sig.	0,000

Figure 4.20: KMO Test given by the last SPSS run on the answers to question n.14

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3,799	47,494	47,494	3,799	47,494	47,494	3,252
2	1,237	15,459	62,953	1,237	15,459	62,953	2,688
3	0,851	10,638	73,591				
4	0,678	8,477	82,068				
5	0,621	7,764	89,831				
6	0,365	4,565	94,396				
7	0,294	3,672	98,069				
8	0,154	1,931	100,000				

Figure 4.21: Matrix of variance explained by components in the last SPSS run on the answers to question n.14

With the “surviving” elements, their disposition according to the 2 components space (those components explain, as seen in Figure 4.22, 62.953% of the variance) can be analyzed: the corresponding graph follows (the coordinates representing the points in the graph are in a table in appendix B).

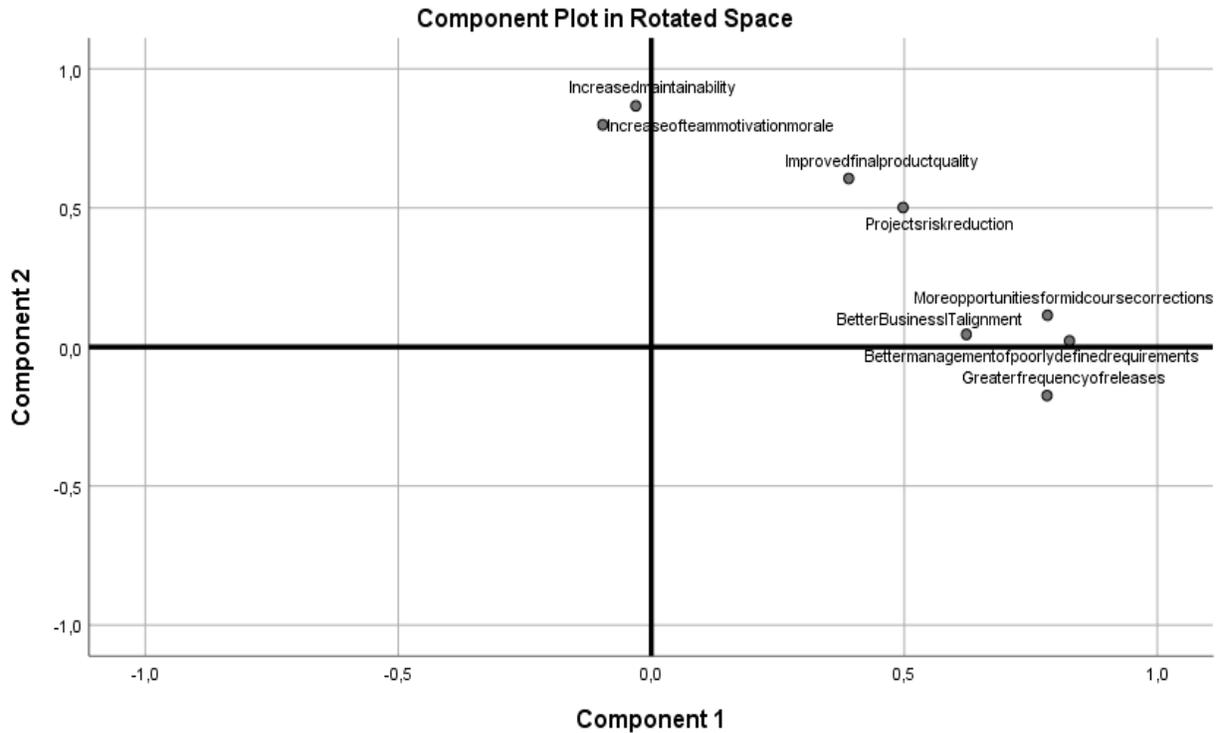


Figure 4.22: Component plot given by the last SPSS run on the answers to question n.14

The figure above should be interpreted in this way: the elements that gather around one axis can be viewed as part of a cluster (i.e. the component) of features that should be all present in the proposition and implementation of, in our case, the Agile methodology. So, as said in the introduction of this section, the characteristics belonging to one component are considered to be strictly necessary for a successful Agile implementation.

So, it is observable that practically the features “More opportunities for mid-course corrections”, “Better Business-IT alignment”, “Better management of poorly defined requirements” and “Greater frequency of releases” all belong to Component 1. This essentially confirms what has been found in the descriptive statistic part, where all these elements were part of the most attractive characteristics for an Agile project.

An additional element is that “Increased maintainability” and “Increase of team motivation/morale” can be assembled in component 2: this means that those “soft” features that the Agile framework can bring are also positively evaluated and that together add value for a Project that follows the methodology.

Finally, we can see that also “Improved final product quality” and “Project risks reduction” are important for the respondents but can be considered as stand-alone properties for a good Agile project.

For what concerns the answers for question n.16, concerning the challenges faced in the adoption of Agile framework, the procedure to find a satisfactory solution was more difficult. Indeed, after the first software run (which data are not inserted to avoid useless redundancy) it was necessary to adjust the variables and run the program many times because the results obtained cutting out one by one the less interesting elements were not satisfactory enough. After many trials, the result is described by the Figures 4.23, 4.24, 4.25 and 4.26.

Anti-image Correlation	Lack of reliable suppliers	,707 ^a	-0,057	-0,099	-0,273	-0,375
	Lack of involvement from the LoB/ end-users (Product	-0,057	,699 ^a	-0,314	-0,137	-0,020
	Uncertainty of project costs	-0,099	-0,314	,717 ^a	-0,070	-0,073
	Less maintainability of the final product	-0,273	-0,137	-0,070	,767 ^a	-0,213
	Difficulty to stay focused on the project scope	-0,375	-0,020	-0,073	-0,213	,717 ^a

Figure 4.23: Matrix of anti-image correlation given by the last SPSS run on the answers to question n.16

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,722
Bartlett's Test of Sphericity	Approx. Chi-Square	22,060
	df	10
	Sig.	0,015

Figure 4.24: KMO Test given by the last SPSS run on the answers to question n.16

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	Total	% of Variance	Cumulative %
	Total	% of Variance	Cumulative %				
1	2,241	44,829	44,829	2,241	44,829	44,829	
2	1,026	20,510	65,339	1,026	20,510	65,339	
3	0,652	13,039	78,378				
4	0,585	11,690	90,068				
5	0,497	9,932	100,000				

Figure 4.25: Matrix of variance explained by components in the last SPSS run on the answers to question n.14

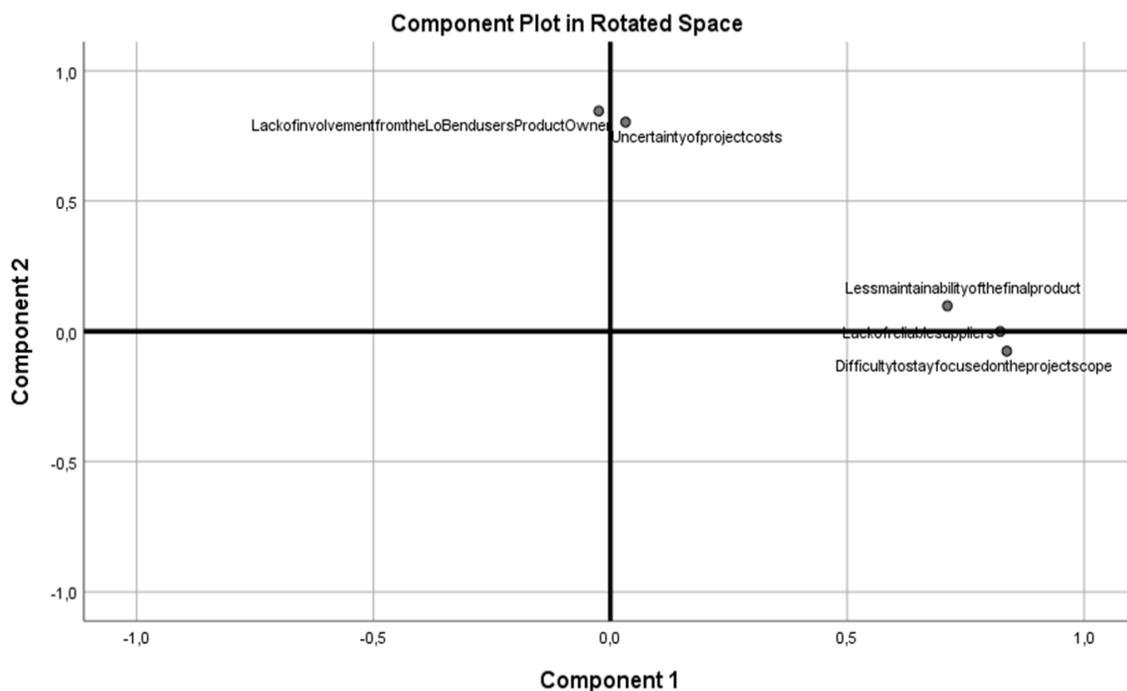


Figure 4.26: Component plot given by the last SPSS run on the answers to question n.16

As can be seen the “surviving” elements are much less than before. Also, 2 of the less scored defects, “Less maintainability of the final product” and “Difficulty to stay focused on the project scope” are part of component 1 together with “Lack of reliable suppliers”, which again means that the respondents see some kind of correlation between those 3 elements. The correlation between these elements can be that when an Agile project is outsourced to a supplier that is not particularly

skilled in Agile methodologies (reliable), it can be difficult for all the stakeholders to stay focused on the project and achieve the success of the project (see interview to Carla Olmi in the next section), also in terms of maintainability of the final product.

The interpretation of component 2 is much easier: it is composed by 2 two elements, “Lack of involvement from the LoB/end-users” and “Uncertainty of project cost”, both of them are part of the most voted difficulties; the correlation is easy to see, considering that in Agile methodologies the lack of collaboration granting the interests of the final users of the product or of other sectors involved in the project (in Scrum methodology the figure who have to do this is the Product Owner) led inevitably to a failure, so to the uncertainty on project costs and on other elements.

4.2. Interviews

To complete the portrait that this study wanted to represent, it has been chosen to make interviews to selected people from the respondent base of the survey: the way of selection has been explained in chapter 3. The intention was to contextualize the results emerging from the analysis done, both with a better explanation of the answers given in the survey and with the important introduction of stories about real projects that has been conducted with Agile methodologies. In the end, the interviews were two: one to Valerio Manzo of Piaggio, representing the positive opinion about agile, and to Carla Olmi of FCA.

4.2.1. Interview to Valerio Manzo (Piaggio)

Valerio Manzo, as said before, is part of the people (pretty numerous, as showed) which had a positive experience in the adoption of a project following Agile methodology and that is almost sure that in the near future Agile will be vastly used also in Italy.

Before entering fully in the interview, it has been explained the structure of the IT department in Piaggio: considering that of course the core activity of the company is not to ship IT products, the department was quite small. Their function is essentially to gather the requisites for potential new software that can support the activities inside the firm and produce it, also with the aid of external people so partially outsourcing the project.

The project which we have talked about has followed the Agile framework, Scrum in particular, and it was mostly outsourced externally. It has been carried out following Agile methodology because it was thought at the beginning that in the end would be brought more value to the final user of the software in development. It should be said that the project was not a particularly big one; for this reason, it has proven itself as a perfect proving ground for other Agile projects in the future.

The major problem that has incurred in this project, for what Valerio Manzo has told, has been to interact effectively with the supplier of the final software: indeed, this was used to act according to

the Waterfall methodology. So, they were pretty confused by the request to talk almost every day to update each other on the state of the work, to adjust this or that feature according to the needs emerging, to issue in various times a working but not fully complete software, and in general by all the features that an Agile project can bring. It is so outlined and confirmed that one of the main problems preventing a large diffusion of Agile in Italy is mainly cultural and what miss is essentially experience in that.

By the way, insisting in the pursuing of the Agile methodology, step by step both parts converged to a compromise, like the release of two releases in 9 months of work or the introduction of the “rituals” typical of Agile methods, including the partition of the project in 10 “sprints”. This has finally resulted in the final success of the project. It must be said that is high probable that this satisfactory result was caused by the determination of the IT department of Piaggio and by the knowledge of the method by Mr. Manzo.

The first successful factor was that instead of building a huge technical report before the start of project, they have proceeded with a continuous path of little but important improvements and modifications, starting from the general idea of the final product and refining it through little changes and additions day by day. This has granted the safety to have in all the stages of the project a product that satisfy and that is determined by all the parts involved. This have resulted in a final product that have satisfied fully the final users and the business side of Piaggio. It has been also settled the will to make other projects observing Agile framework.

Another interesting point is that it has been recognized that probably, despite the higher initial budget requested to act following Agile, the final amount of money that would be spent if the project had been done with Waterfall method would be higher (like 30% more), caused by the eventual restart of the project to a previous point caused by problems during the progress. However, it has been also admitted that the effort and the time spent on the project by the team was higher in comparison with a Waterfall framework.

Indeed, seen that Agile requires essentially a change in the way of acting and thinking for a project, the suggestion by Valerio Manzo for companies that have to introduce the framework is to train in the utilization of Agile itself, going beyond the “simple” supply of courses because they don’t give the experience that is strictly required for a successful implementation.

4.2.2. Interview to Carla Olmi (FCA)

For the negative experience on a project using Agile, Carla Olmi of FCA was interviewed. Later in the interview has added one colleague that had a more determinant role in the Agile project that was not a success. The project in issue was also outsourced to Engineering.

It can be said that the project, at least under the Agile implementation perspective, was a failure. Indeed, after the mutual efforts to work for the success of the project, at a certain point it was decided that it would continue with the traditional Waterfall approach due to many failures and wastes of time and money the bad use of the framework has brought. There were mistakes and

miscomprehension continuously, due to a misinterpretation of the roles or the lack of a connecting figure between stakeholders (like a Product Owner) and the absence of the behaviors to be respected if really one wants to follow Agile methodology; finally, it has to be reported the substantial absence of the business sector during the project.

It must be said that this was one of the first trial to introduce Agile, and it has been discussed a lot in the thesis of how much is required experience and efforts to a successful implementation. Also, in the interview has showed up that in FCA is difficult to apply a standard methodology due to the many stakeholders usually involved.

By the way, considering the big adoption of Agile that worldwide is being reached and also the result of this study, the trial to introduce those methodologies is considered necessaire to not lose eventual competitive advantage. The problem is that in a company so big like FCA, worldwide located and with a great number of employees, the implementation cannot be simple at all. Indeed, for what has been explained all along this thesis, Agile is based on mutual collaboration and this imply that at least the parts that are involved in the project need to agree on the methodology values, rituals and ways of acting. It is hard to imagine the effort that in such a company need to be posed to reach a uniformity in that sense.

What Carla Olmi has proposed to try overcoming this major challenge is that the high management in big companies, so FCA too, need to be involved in first line to propose and enforce an eventual switch of methodology. In this way there could be the motivation for all the people in the lower level to begin a change in the behaviors and in the way of thinking of the companies.

5. Conclusions

5.1. *Outcomes of the study*

The analyzable results arising from the work done are many and are worthy of some final comments now that we have all the elements of the picture.

Starting from the first part of the problem that has led to the compilation of the thesis, so the diffusion of Agile Project Management for IT in Italy, the obtained representation is pretty clear: in Italy the most utilized method still remains the Waterfall approach. There is no evil in this of course, but if the reported competitive advantages that a successful Agile project can bring will start to be present in Italy too, those companies will probably need to switch abruptly to the new methodology, losing a lot of value along the road.

However, it has been seen also that there is a consistent part of the sample that chose case by case the method to apply or that counts on mixed models. It is probable that these subjects will be the first to utilize a more Agile framework, because they are more used to analyze the situation of the project and are ready to adapt their behaviors with respect to the final goal to achieve. Those companies, in the opinion of the writer, need to start using Agile methodology for small and experimental project, to be eventually ready when the harder challenges will come, considering that essentially all the respondents are sure that Agile will be widely used in the near future.

For what concerns the believes on the positive aspects of Agile methodologies, it can be observed that the results obtained in this work, especially the ones regard the top ranked elements, are similar to the more global analysis that has been made by VersionOne and that have been analyzed in chapter 2. This shows the fact that the IT managers, to whom the survey was addressed, in Italy are quite prepared on the topic and aligned in the thoughts with the rest of the world. To remember the results obtained, the most desirable features are:

- Greater frequency of releases;
- Better business/IT alignment;
- More opportunities for mid-course corrections;
- Better management of poorly-defined requirements
- Improved final product quality

Not only those are the most wanted elements, but the statistical analysis has showed also that the first 4 features are considered as a mixture of essential characteristics that must be present in a successful Agile project.

It is clear that in Italy the Agile feature that likes more is the possibility to have a product that can evolve with the prosecution of the project according to the emerging needs and that will end in a final output that fully satisfy all the stakeholders involved (especially the business), as in the case told by Mr. Manzo. This is something that the Waterfall approach cannot grant, seeing that many

of the stakeholders that have interests in the project will see the outcome only in the very end, with a high possibility that the end-users will not be satisfied by it, requesting for expensive changes in terms of time and costs.

However, it is obvious that those features are not a straight gift given by Agile utilization, but a consequence of a correct application, as the experience of FCA told by Carla Olmi has taught. This led us to the final analysis of the perceived difficulties in the utilization of Agile Methodology, which the most challenging have resulted to be:

- Lack of knowledge of the method by the teams
- Lack of management support
- Lack of involvement from the LoB/ end-users (Product Owner)
- Lack of reliable suppliers
- Uncertainty of project times
- Uncertainty of project costs

As discussed in chapter 4, those obstacles are mostly concerned with the absence of key figures typical of Agile framework: indeed, it seems that the first three negative points can be linked to the absence of a prepared Team, Scrum Master and Product Owner, which are key figures in Scrum methodology. This difficulty can be reconnected to an organizational culture at odds with what should be present in an Agile environment, as also the interviews have demonstrated. This results too are similar to what has been outlined in the international Agile report showed in chapter 3. However, it seems that, considering the still low experience on the use of the methods, in Italy the problem is much more remarkable.

Also, in cases of outsourced project, seen that also the IT suppliers are not ready to help the transition to Agile, there can be problems in the issuing a complete product, especially in terms of compliance with the requirements and final maintainability, as the statistical analysis has showed.

A final observation needs to be done on the answers given to the final questions of the survey related to the satisfaction achieved with a project carried on with Agile methodology and to the future Agile utilization. Briefly, the actual judgement is quite positive but there is room for improvements. Though, there is almost certainty that in the next years there will be an increase of the utilization of Agile, probably forced by the external environment.

To sum up everything we have achieved until now into few statements, we can say that companies are fully aware of what can be the benefits of a correct Agile implementation but due to the quite radical change of mind that it requires, the actual ground for the effective execution is pretty poor. The suggestion that the writer have for Italian companies, of course considering the experiences that have been made and analyzed in this work, is that **is necessary a strategy for introduce in the organizational culture the Agile thinking**, in order to be ready to face this challenge and not lose important competitive advantages, considering the almost total certainty, shared also by Italian companies, of the future proliferation of Agile methodologies. The suggested first step in order to get used to the framework is to practice effectively with it, applying the methodologies first on little projects, aiming to deviate from the diffused organizational inertia. It should also be taken in consideration that there is the possibility to hybridize the Agile thinking with a more traditional

one, and that many researches, some of them quoted in chapter 2, have showed that this approach can be successful.

5.2. *Future research*

This work, with all the limits that has been outlined during its prosecution, is pretty unique in his field: the goal was to outline the current situation about Agile Project Management for Italy and for non-IT companies only. For sure, it has been important to draw a first picture of a country that historically has always followed the trends in the industrial world with a little delay, which has showed in this thesis too.

However, my means of research were limited, not being yet a full-fledged member of the world that has been analyzed, the Project Management one, so lacking some of the knowledge and contacts that would have make this work better. It must be considered also that the work lacked also of financial instrument, being produced essentially at zero cost.

For these and for a lot of other reasons huge enhancements of what this thesis has begun to explore. For instance, the dimension of the sample can be expanded a lot with a little investment in the “marketing” of a better version of the survey, for example invest in advertising in social networks like LinkedIn or in a better instrument of survey editing. It can be expanded also the type of firms’ respondents, seen that the survey leading to this work has been not take into consideration for small/medium industries. This can possibly lead to a better statistical analysis of the data and to a more descriptive study.

For what concerns also the practical aspect, so the introduction of the Agile methodology, it could be interesting to activate thesis, projects or researches useful to test effectively if the Italian firms can enhance their Agile culture and if there is room for an effective implementation. Also, a great work would be to analyze specifically the needs of companies when approaching to a project and use these data to suggest specific and precise actions to ease the application of Agile. Indeed, as this work has shown, Italian companies and especially large ones find difficult to change their attitude toward their way of working. This is probably due also to a high average age of workers in companies, who inevitably (and they are not culprits of this) are less used to changes.

Considering all the material that has been studied for the construction of this thesis, it has been understood that the Agile topic is now at the peak of his attractiveness and research. For this reason, on many themes concerning this very fluid and evolving methodology can be found and are ready to be deepened.

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Appendix A

Survey Questions^{1 2}

1. In what language do you prefer to fill the questionnaire? *
 - Italiano
 - English

Information about you and your company

2. What is your gender? *
 - Female
 - Male
 - Prefer not to say

3. What is your age range? *
 - 20 - 25
 - 25 - 30
 - 30 - 35
 - 35 - 40
 - 40 - 45
 - 45 - 50
 - 50 - 55
 - 55 - 60
 - 60 - 65
 - 65 +

¹ Only the English version of the survey will be showed.

²The questions marked with the * are those who were mandatory.

4. How can you define the size of the company in which you work? *
- Micro - business (less than 10 employees, revenues not higher than 2 million of €)
 - Small business (less than 50 employees, revenues not higher than 10 million of €)
 - Medium business (less than 250 employees, revenues not higher than 50 million of €)
 - Big business (more than 250 employees, revenues higher than 50 million of €)
 - Other

5. In which field does your company work? *

- Automotive
- Consulting
- Mechanics
- Food & Beverage
- Apparel, fashion and gifts
- Tourism & Transport
- Finance
- Medicine & Chemistry
- Culture & Publishing
- Sport & Fitness
- Public administration
- Services
- Production of consumer's goods
- Energy & Utilities
- Other

6. Can you please insert, specifically, your job inside the company?

Importance of IT projects

7. How many IT projects do you usually manage in your company during a single fiscal year? *
- < 10 (less than ten)
 - <10 - < 50 (between ten and fifty)
 - <50 - < 100 (between fifty and one hundred)
 - >100 (more than one hundred)

8. What is the average dimension of the developed IT projects by your company (in man-months FTE)? *
- < 3 (less than three)
 - < 3 - < 6 (between three and six)
 - < 6 - < 12 (between six and twelve)
 - < 12 - < 24 (between twelve and twenty-four)
 - < 24 - < 48 (between twenty-four and forty-eight)
 - < 48 (more than forty-eight)
9. What is your ordinary sourcing policy for IT projects? *
- Core business of company is consulting and/or selling of IT products to third parties
 - Full Make (internal development)
 - Full Buy (the projects are entirely outsourced)
 - Partially Buy (some parts of the project are externally outsourced)
 - Evaluated case by case
 - There is not a formal policy
 - Other

Project Management methodologies

10. In the undertaken IT projects, what is the development model usually adopted? *
- Waterfall
 - Spiral model
 - Agile methodologies (Scrum, DevOps, Extreme Programming XP, Kanban, etc...)
 - RUP (Rational Unified Process)
 - Mixed models
 - It is chosen case by case
 - It is not used any formal development methodology
 - Other

11. For those methodologies, can you please assign a value from 1 to 5 according to your use of that methodology for IT projects (1: not used - 5: widely used) **³

	1	2	3	4	5
Waterfall					
Spiral model					
Agile methodologies (Scrum, etc.)					
DevOps, Extreme Programming					
XP, Kanban, etc...)					
RUP (Rational Unified Process)					
Mixed models					
It is chosen case by case					
It is not used any formal development methodology					

12. If you have selected "Other" in the previous question, please specify its utilization.

13. What is, in detail, the Agile methodology mostly adopted? *⁴

- Scrum
- Kanban
- DevOps
- Extreme Programming XP
- Other

³ The questions marked with the ** are those who were mandatory to give an answer for every row.

⁴ This question was available only if the answer to question 10 was "Agile methodologies"

Agile features

14. How much do you value from 1 to 5 the possible advantages (1: absent or negligible - 5: crucial) given by Agile methodologies development for IT projects according to your experience/knowledge? **

	1	2	3	4	5
Greater frequency of releases					
Better Business/IT alignment					
Better project visibility/sponsorship by LoB's/Management					
Better management of poorly defined requirements					
More opportunities for mid-course corrections					
Project's costs reduction					
Project's time reduction					
Project's risk reduction					
Improved final product quality					
Increase of team motivation/morale					
Increased maintainability					

15. There are other benefits that are not listed above? If it is the case, please write it (them) in the field below with the evaluation following the rule above.

16. How much do you value from 1 to 5 the possible issues and disadvantages (1: absent or negligible - 5: crucial) emerging from Agile methodologies development for IT projects according to your experience/knowledge? *

	1	2	3	4	5
Lack of knowledge of the method by the Project Manager, Team or other elements associated to the project					
Lack of reliable suppliers					
Lack of involvement from the LoB/ end-users (Product Owner)					
Lack of Management support					
Uncertainty given by past negative experiences					
Geographical distribution of the Team/Logistics					
Agile methodology used with projects that did not require it					
Difficulty to stay focused on the project scope					
Uncertainty of project times					
Uncertainty of project costs					
Less maintainability of the final product					

17. There are other issues that are not listed above? If it is the case, please write it (them) in the field below with the evaluation following the rule above.

Agile methodologies satisfaction

18. How much do you feel satisfied of the IT projects developed with Agile methodologies?

*

- 1 (Fully unsatisfied)
- 2
- 3
- 4
- 5 (Fully satisfied)

19. How probable is that you will utilize Agile methodologies in your future IT projects? (in the next 3 years) *

- 1 (Highly improbable)
- 2
- 3
- 4
- 5 (Highly probable)

Final comments

20. There are other factors concerning Agile methodologies, difficulties of adopting them, methods to simplify or improve their utilization, or also other comments that you want to do?

Thanks

21. Thank you for your availability in answering. I ask if I'm allowed to quote in the thanks inside the final thesis the name of the company and/or name, surname and role inside the organization of the answerer.
- I authorize to quote the name of the company.
 - I authorize to quote name, surname and role.
 - I authorize both.
 - I do not authorize to quote any information.
22. I ask also, if you are interested in receiving the thesis once concluded, to insert a reference e-mail address.

Appendix B

This appendix contains the tables containing the numbers that have drafted the graph they are referred to.

	Waterfall	Spiral	Agile	RUP (Rational Unified Process)	Mixed models	It is chosen case by case	It is not used any formal development methodology
1	7%	67%	17%	60%	13%	13%	63%
2	17%	13%	27%	23%	13%	7%	10%
3	13%	20%	33%	17%	40%	40%	10%
4	33%	0%	20%	0%	23%	17%	10%
5	30%	0%	3%	0%	10%	23%	7%

Figure 4.7

	Greater frequency of releases	Better Business/IT alignment	Better project visibility/sponsorship by LoB's/Management	Better management of poorly-defined requirements	More opportunities for mid-course corrections	Project's cost reduction	Project's time reduction	Project's risk reduction	Improved final product quality	Increase of team motivation/morale	Increased maintainability
1	0%	0%	3%	3%	3%	20%	16%	7%	7%	3%	10%
2	7%	7%	16%	7%	0%	43%	39%	17%	7%	20%	13%
3	23%	17%	39%	23%	35%	27%	19%	17%	27%	30%	40%
4	40%	53%	29%	43%	42%	3%	16%	43%	40%	40%	33%
5	30%	23%	13%	23%	19%	7%	10%	17%	20%	7%	3%

Figure 4.9

	Lack of knowledge of the method by the teams	Lack of reliable suppliers	Lack of involvement from the LoB/end-users (Product Owner)	Lack of Management support	Uncertainty given by past negative experiences	Geographical distribution of the Team/Logistics	Agile methodology used with projects that did not require it	Difficulty to stay focused on the project scope	Uncertainty of project times	Uncertainty of project costs	Less maintainability of the final product
1	3%	10%	3%	7%	10%	10%	7%	13%	3%	3%	13%
2	13%	10%	17%	17%	43%	27%	47%	50%	20%	23%	43%
3	17%	23%	33%	17%	17%	33%	40%	13%	20%	20%	27%
4	50%	47%	30%	40%	20%	23%	3%	20%	50%	40%	13%
5	17%	10%	17%	20%	10%	7%	3%	3%	7%	13%	3%

Figure 4.12

	1	2
Greater frequency of releases	0,782	-0,175
Better Business/IT alignment	0,623	0,045
Better management of poorly-defined requirements	0,826	0,022
More opportunities for mid-course corrections	0,783	0,114
Increased maintainability	-0,031	0,867
Increase of team motivation/morale	-0,096	0,799
Improved final product quality	0,390	0,606
Project's risk reduction	0,498	0,501

Figure 4.22

	1	2
Lack of reliable suppliers	0,754	-0,329
Lack of involvement from the LoB/ end-users (Product Owner)	0,556	0,626
Uncertainty of project costs	0,579	0,573
Less maintainability of the final product	0,719	-0,213
Difficulty to stay focused on the project scope	0,715	-0,390

Figure 4.26