# An Investigation of the Project Management Approaches of Agile and Plan-Based Companies

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## ABSTRACT

*Background* Agile Methods have been around for almost 20 years but still, there is an ongoing debate whether they are able to improve software development. In particular, project management is one of the most controversial aspect of Agile Methods.
*Objective* This paper investigates how Agile companies implement project management compared to the ones adopting plan-based approaches.
*Methodology* The research problem is defined using the Goal Question Metric approach. A questionnaire has been defined and submitted to senior members of the staff of 122 companies over a timeframe of four years (2016-2019).
*Results* The results of the research highlight that even if some important differences exist, all the companies approach project management in similar ways: many approaches that are considered Agile are used in Plan-Based companies as well.

## CCS CONCEPTS

• **Software and its engineering → Software development process management**;

## KEYWORDS

agile methods, project management, empirical study

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## 1 INTRODUCTION

Agile Methods (AMs) have been around for almost 20 years and their adoption has grown significantly becoming the preferred development approaches in many companies across a number of industries[1]. Talking to top managers of a wide range of companies in different countries and in different industries, we have found out that there are companies that like to be defined as *Agile*, as they think that it is a way to improve their development process and reduce costs. The term *Agile* is often defined in a fairly loose way and understanding what does the term really means is not always straightforward.

Our researched method is based on the Goal Question Metrics (GQM) approach [2]. On the basis of the GQM, we have designed a questionnaire for senior staff members of 122 companies to analyze their project management practices. 95 companies defined themselves as *Agile* (defined hereafter as *Agile*) and 27 did not (defined hereafter as *Plan-Based*). The results of the questionnaire have then been tested to identify statistically significant differences between Agile and Plan-Based companies. The research question we have focused on is the following:

does the term *Agile* reflect the real underlying process of the firms that define themselves Agile, or it is used for marketing purposes and/or to please top management?

The results of our study is quite surprising: there is a significant misalignment between the use of the term *Agile* and the actual adoption of *Agile project management practices*, as defined in the Agile Manifesto[2] and the most widely known Agile Methods, such as XP [3] and Scrum [4].

The paper is organised as follows: Section 2 describes the theoretical background of the research; Section 3 presents the structure of the investigation; Sections 4 and 5 summarise and discuss the results; Section 6 presents the limitations and the threats to validity of the study; finally, Section 7 draws the conclusions.

## 2 BACKGROUND

The success of software projects depends both on technical and on management factors. This paper focuses on how managers deal with the organisation, the process planning, and the main actors involved in the project (developers and customers). AMs are the adaptation to the software industry of the theories of Lean Management coming from the manufacturing industry [17]. As such, in the definition of AMs, the management of the software development has a paramount role. The management is the force that directs the resources on what produces value for the customer and eliminates waste [17].

In particular, AMs emphasise the human factor in the development process and the importance of direct, face-to-face communication among key stakeholders, the value of simplicity, perceived as an elimination of waste, and continuous process improvement, as the transposition to the Software Industry of Total Quality Management [17].

[1] http://techbeacon.com/survey-agile-new-norm

[2] http://www.agilemanifesto.org/


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Using the Beck's nomenclature [3], the Agile Manifesto defines AMs as a set of development methods sharing the following four values:

(1) Individuals and interactions over the process and tools
(2) Customer collaboration over contracts
(3) Working software over documentation
(4) Responding to change over planning

The former two values refer to management of human resources, while the two latter refer to process management. We now discuss such values to better understand their implications in Agile companies and how they are considered in the Plan-Based ones.

## 2.1 Human resources and relationships management

*2.1.1 Individuals and interactions over the process and tools.* AMs emphasize the collaboration among developers and the human role in the process and in the organization, as opposed to institutionalized processes and development tools. Accordingly, Agile teams consider the individual skills a critical factor for project success. They need *good people* to be effective [7].

Software development is a human-intensive activity, if the developers in a project are good enough, they can adopt almost any process or tool, but no processes or tools are able to compensate their inabilities [10] [11].

In Agile companies, personal skills are extremely important because of the set of basic practices and behaviors required, such as the flexibility of the development process, the reduced amount of upfront planning and analysis, and the distributed responsibility, etc. Furthermore, in an Agile team, there are no well-defined and fixed roles. Every member of the team plays different roles at different times during the project. This approach works only if all the team members are skilled enough to play all the roles effectively [6] [16].

Plan-Based methods focus more on well-defined and standardized processes to make the roles and activities predicable and repeatable rather than focus on individuals and their creative abilities. Usually, team members often have well-defined roles and responsibilities, follow detailed plans and predefined workflows.

*2.1.2 Customer collaboration over contracts.* AMs emphasize the cooperation between developers and customers rather than focusing on a careful and detailed definition of contracts. They claim that an enhanced informal communication between the team and the customer can replace most of the written documentation and even very detailed contracts. In other terms, AMs focus on tacit knowledge sharing rather than explicit knowledge sharing [6].

Therefore, it is important to promote and encourage mutual trust between the development team and the customer. Mutual trust is effective in defining expectations, driving behaviors, and ensuring fair play from all the key stakeholders involved in the development process. To build such trust, AMs promote continuous customer interactions [16] and frequent delivery to the customer through short and rapid iterations. In this way, the customer feels in control of the project [5].

Plan-Based companies use contracts as a form of knowledge externalization and sharing. Furthermore, detailed contracts identify and document constraints and responsibilities [6]. According to this approach, Plan-Based companies do not emphasize mutual trust and customer involvement or collaboration.

## 2.2 Process management

*2.2.1 Working software over documentation.* One of the main sources of waste in software development is documentation. Paperwork consumes resources, slows down response time, hides quality problems, gets lost, degrades, and becomes obsolete. When paperwork is required, it is necessary to keep it short, high level, and do it off-line. There should be a constant search for the most effective way to share information [17].

AMs focus on the understanding of the product through collaboration with the customer and delivery of working software, thus reducing the amount of documents required [9].

Plan-Based companies collect and share knowledge through documents [6]. This approach reduces the risk of loss of knowledge due to the turnover of personnel. It supports the information sharing among members of the development team and between the team and the customer. In addition, it keeps everyone informed about the project status and the decisions taken.

Documentation and artifacts are also used as coordination mechanisms or standardized interfaces [14].

*2.2.2 Responding to change over planning. "Agility is the ability to both create and respond to change in order to profit in a turbulent business environment"* [9].

According to this definition, AMs view changes as opportunities to help customers to address the turbulence of the marketplace rather than problems for the development. In an Agile company, the development team and the managers should not rely on predefined plans and embrace the conformance to business value [9]. This does not mean that AMs advocate the lack of plans, but they consider plans as guidelines rather than control mechanisms.

Some of the principles for the implementation of the Agile planning are the following [9]:

(1) Align/realign the process to your goal and react promptly to unforeseen circumstances, also changing the initial plans.
(2) Focus first on what is most important and urgent. In this way, it is possible to start addressing what has the highest return, creating the highest possible value for the customer.

Plan-Based approaches were created to order a chaotic and complex activity: software development. To achieve this goal, at the beginning of the project, the development team decides what to do through the definition of a plan. Then, the team follows such plan strictly [5].

Such plans have two main goals:

(1) To coordinate different activities to achieve a common goal.
(2) To cope with the foreseen and unforeseen variability in such activities.

Plan-Based methods assume that it is possible to anticipate most of the future needs. Even companies adopting more flexible approaches, like incremental or spiral models, are plan-based. In fact, they plan their flexibility at the beginning of the process using additional design and resources to develop the product [13].

Plan-Based companies usually use planning tools, such as Gantt charts, Pert charts, and function points. The effectiveness of all these tools depends on the ability of the company to forecast the size of the final system, the time, and the effort required.

For these reasons, project management plays a key role in the overall organization of the work.

# 3 OUR INVESTIGATION

## 3.1 Goals, Questions and Metrics of the research

The research focuses on the management of people (developers and customers) and the process (planning and organization). The overall structure of the research is based on the GQM approach[2], as follows:

- **Goal:** Evaluate the actual implementation of the Agile project management practices.
- **Perspectives**
  - Management of human resources
  - Process management
- **Context:** 122 local and international companies: 95 Agile and 27 Plan-Based
- **Question:** Is there any misalignment between the theoretical basis and the actual perceptions of how project management is performed in companies using AMs?
- **Metrics**
  - Metrics about the management of human resources (developers and customers)
    - Main problems with the customers
    - Relationship with the customers and the level of satisfaction
    - Main qualities of developers
  - Metrics about process management (planning and organization)
    - Organization of the software process
    - Planning tools used
    - Company's level of satisfaction with the planning process
    - Main problems in the software development and in the solutions adopted

## 3.2 Research design

The design of the research is based on the approach of Silverman [19]. In this approach, the design of a structured and formalized research involves two initial and partially correlated decisions:

(1) **The method:** whether performing a quantitative or a qualitative investigation.
(2) **The methodology:** the specific technique for gathering data (e.g., interview, questionnaire, case study, survey, etc.).

Such decisions are based on an accurate evaluation of the goal of the research and the kind of information required.

Our study focuses on gathering opinions on the development process in use. This kind of information requires a qualitative investigation. In fact, qualitative research involves analysis of data such as words and sentences instead of numbers [19]. Using qualitative methods it is possible to understand a phenomenon from the point of view of the participants, discovering interesting information about their opinions, attitudes, and perceptions [15].

The choice of the research method influences and guides the data collection methodology. We have selected a semi-structured questionnaire as research methodology. The questionnaire has been filled in during face-to-face or Skype interviews. In face-to-face interviews, two options were available: either the interviewer asks the questions and records the answers, or the interviewer explains the research and gives the interviewee the form to fill in [1]. In our case, we have chosen the first approach for performing both face-to-face interviews and Skype interviews.

Given the nominal nature of most of the variables in the questionnaire, the suitable statistics are mode, frequency count, and relative frequency distribution [21].

Data measured by nominal scales must be analyzed by non-parametric methods. Nevertheless, the suitable non-parametric statistical tests (e.g., binomial test and chi-square test) cannot be used due to the structure of the questionnaire. In particular, the characteristics of the questions and the low number of data gathered do not satisfy the hypothesis required for performing such tests [18].

## 3.3 Structure of the questionnaire and data gathering process

The final form of the questionnaire was achieved through several drafts. First, the authors checked the soundness of each question and the whole questionnaire. Then, a group of students reviewed the first draft of the questionnaire and the comments were incorporated in a second draft. Finally, a set of ten managers evaluated the second draft. The questionnaire follows the psychological criteria of Converse and Presser [8]:

- The questions have been ordered from general topics to more specific.
- Data about the interviewee (age, gender, etc.) have been asked in the last section to avoid encroaching upon privacy.
- Oriented questions, that could cause distorted and obvious answers, have been avoided.

The data gathering process has been the following:

(1) The respondents have been contacted to determine their general interest in the study.
(2) The questionnaire has been sent to the respondents to verify the actual availability.
(3) Data has been collected by face-to-face or Skype interviews.
(4) The results of the interviews have then been recorded, and the interviewee has been asked for a final check.
(5) Only upon a positive feedback from the interviewee, the questionnaire has been considered accepted and the data has been processed.

The questionnaires have been filled in through interviews. We interviewed senior members of staff for about 30 minutes. Participants were guaranteed anonymity and the information reported has been reviewed so that no individual person or company can be identified.

The questionnaire consists of three main parts:

(1) It analyzes how firms organize/plan their process, their satisfaction related to these aspects, and the main problems in software development
(2) It evaluates the relationship with the customer and the characteristics of good developers.
(3) It analyzes the firm and the interviewee?s status. This part also includes specific questions for Agile firms, to investigate the advantages/problems related to the use of these methods.

## 3.4 Structure of the sample

To perform a global research, we have involved firms (a) located in different countries including Russian Federation, Italy, UK, Austria, Germany, Canada, Switzerland, and U.S.; and (b) operating in different business areas such as consulting, services, software development, etc.

The sample includes both Agile and Plan-Based firms. Since the AMs are very popular, the number of companies adopting them is quite large. This factor affects the structure of the sample: 27 companies use Plan-Based approaches and the 95 Agile ones. To overcome this problem, suitable statistical tools have been used [18] [19] [20].

To evaluate the homogeneity of the two groups we have compared individual attributes (e.g., age, gender, role, education, and experience) and company attributes (e.g., number of employees, years in the market, and business areas). The sample considered in this study is small; however, we have interviewed companies of different sizes and in different areas.

Most Agile and Plan-Based companies work on several small and medium size projects. The sample did not include companies developing big projects since the agile approach is suitable for smaller and medium size projects. Interviewing Plan-based companies developing projects of similar size to the agile companies has assured a more homogenous and comparable sample.

This study focuses on the approaches to project management at company as a whole, not on the specific approaches on the individual project. Consequently, each interviewee was asked to answer to the questionnaire referring only to her/his opinion and experience about all the projects s/he was involved, not just on the current or on the last one. Therefore, interviewee's answers reflected the projects he/she was involved in. Since only one person was interviewed from each company, the claim that the company is Plan-based or Agile was based on the personal opinion of the interviewees.

## 3.5 Basic interviewee data

The interviewees in both groups are senior members of the staff, their average age is about forty, and nearly all of them are males. Most of them have a postgraduate degree (more than 65% in both cases). 81% of Agile workers and 76% of the Plan-Based ones worked in their present firm for less than ten years.

According to Figure 1, both groups have showed a tendency toward small or large size. The Kolmogorov-Smirnov test for distributions does not evidence any significant difference in the distributions of the two samples.

The only significant difference between the two groups is that the majority of Agile companies have been founded in the '90s,

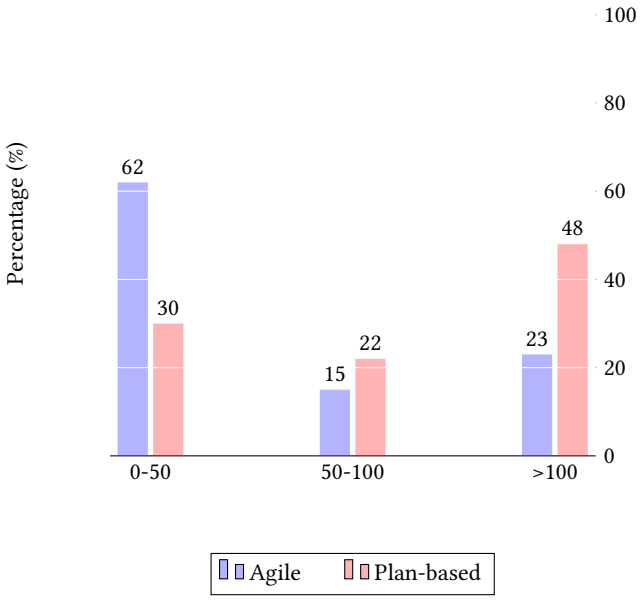


**Figure 1: Number of employees and co-worker**

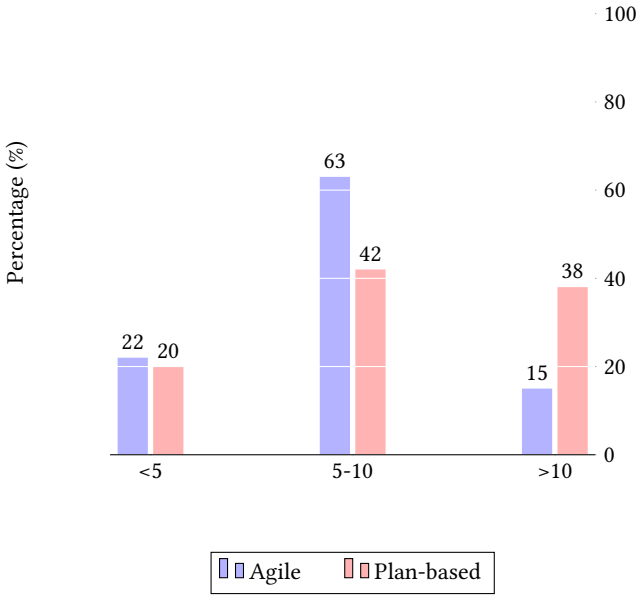


**Figure 2: Age of the company**

while most of Plan-Based ones before (Figure 2). Such difference could be originated by the fairly novelty of the AMs, in fact their diffusion has started only in the late nineties. An increased number of new firms in the middle nineties may depend on the dot com boom that happened in the same period. New firms were more likely to adopt newer software development approaches than the older firms.

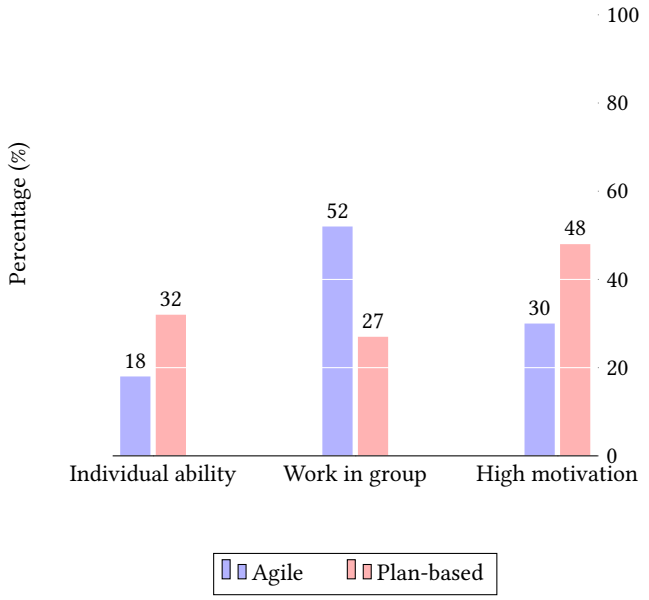


**Figure 3: Most important quality for a developer**

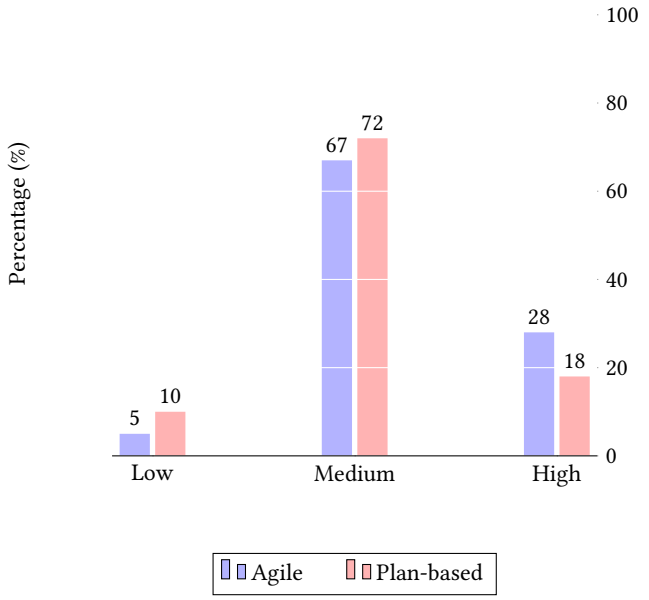


**Figure 4: Level of satisfaction with the customer's relationship**

However, all companies have changed the development process over the years. The most important reasons are the same for Agile and Plan-Based firms: change in customer's requirements and in the adopted technologies.

The target business areas are wide for both Plan-Based and Agile companies including telecommunication, healthcare and pharmaceutical, banking and insurance, IT, etc. The comparability between the Agile and the Plan-Based groups has been guaranteed including in both samples companies belonging to similar domains.

## 4 RESULTS

### 4.1 Management of Human Resources

For Agile firms, the most important quality for a developer is the ability to work in group (52% of the interviewees), while for the Plan-Based ones is the motivation (48%) (Figure 3).

For both groups the individual ability can be improved mainly through training. Plan-Based companies improve in the same way the ability to work in group: while the Agile ones prefer to organize social and team building activities, Plan-Based companies enhance the motivation of their developers through involvement and responsibility/goal sharing.

Agile and Plan-Based companies are quite satisfied with their relationship with the customer even if there is a small advantage of the Agile ones (Figure 4).

Both prefer a collaborative relationship. The research revealed that the interviewed Plan-Based firms (78%) are even more focused on customer collaboration than the Agile ones (65%) (Figure 5).

Agile (35%) and Plan-Based firms (27%) consider a good practice having the customer on site and the contractual relationship is the least frequently used. While the number of Agile and Plan-Based companies that use variable contracts is the same (about 20%), there

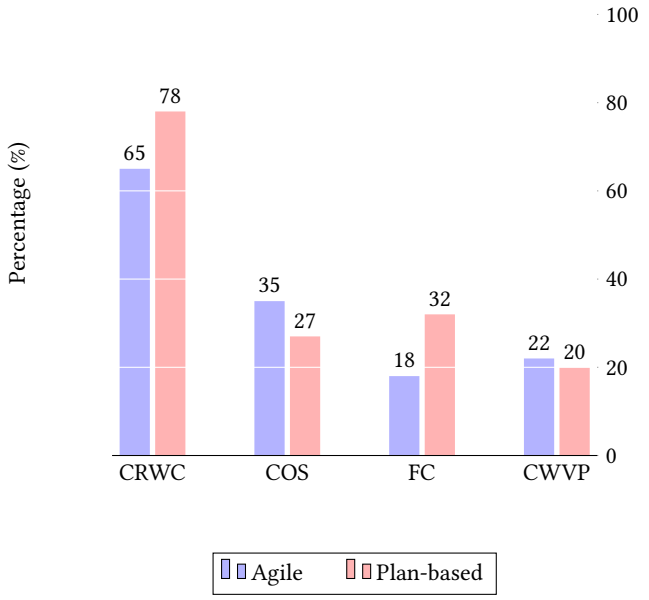


**Figure 5: Kind of relationship with the customer. CRCW = Collaborative Relationship With the Client, COS = Client On Site, FC = Fixed Contracts and CWVP = Contracts With Variable Price**

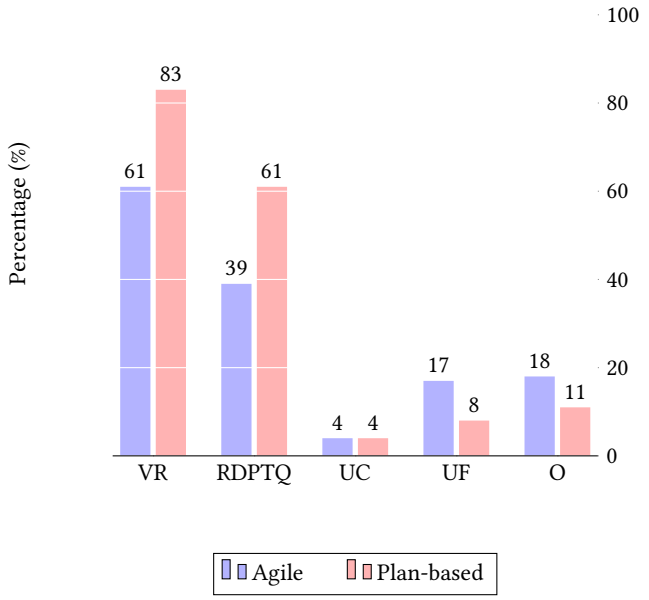


**Figure 6: Main problems with the customer. VR = Variable Requirements, RDPTQ = Request to Deliver Products Too Quickly, UC = Unsatisfied Customers, UF = Useless Functionalities, O = Other**

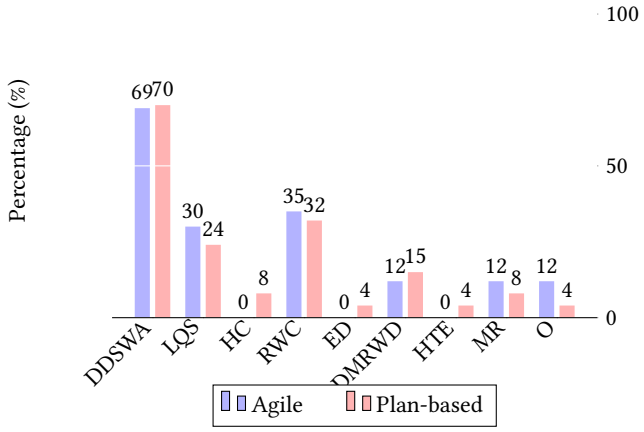


**Figure 7: Main problems in software development. DDSWA = Difficulty to Deliver Software With All functionalities on time, LQS = Lack of Qualified Staff, HC = High Competition, RWC = Relationship With the Customers, ED = Excessive Documentation of code, DMRWD = Difficulty in Managing Relationships Within the Development team, HTE = High Turnover of Employees, MR = Managing Requirements, O = Other**

is a difference in the usage of fixed contracts (32% Plan-Based, 18% Agile) (Figure 5).

The main problem with the customer is the requirements variability (61% Agile, 83% Plan-Based). The second one is the request to deliver software too quickly (61% Plan-based, 39% Agile) (Figure 6).

To control the requirements variability, Plan-Based firms try to anticipate/plan changes or to specify accurately all functionalities at the beginning of the project. Agile companies solve this problem using Agile practices such as frequent and short releases, customer on site, refactoring, etc.

To address the second problem, Plan-Based firms adopt partial releases and prototyping while Agile companies focus on customer involvement and communication.

Concerning the main problem in software development, most firms (about 70%) pointed out the difficulty to deliver software with all functionalities on time, followed by the relationship with the customer (about 35%), and the lack of qualified staff. Concerning this problem, there is a slight difference in the percentages of the two groups: 30% for the Agile and 24% for the Plan-Based companies (Figure 7).

To solve the first problem, Plan-Based companies use process/problem splitting and modularization, while the Agile ones exploit some of their typical practices like small and frequent releases and requirements prioritization involving the customer. Both groups improve the relationship with their customers mainly through a greater involvement of them. There are no significant solutions to overcome the lack of qualified staff.

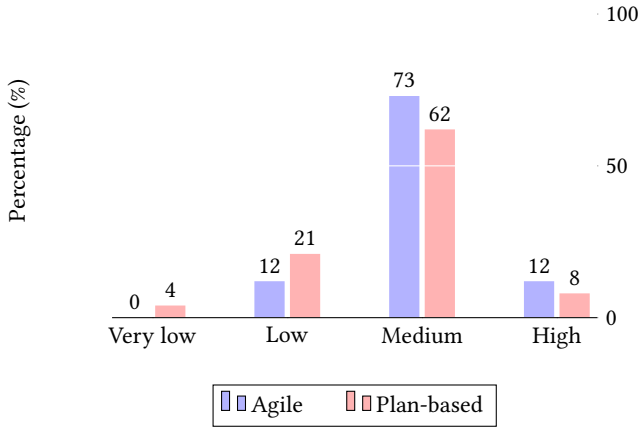


**Figure 8: Satisfaction with the planning of the process**

## 4.2 Process management

Most of the Agile and Plan-Based companies, respectively 73% and 62%, are sufficiently satisfied with the planning of their processes even if almost all of them would like to improve it (Figure 8).

The largest part of Agile (73%) and Plan-based (54%) firms organize their process mainly by increments driven by the customer?s evaluation. Several Plan-Based firms decompose the process into tasks (47%) or use prototypes (43%). Only a few of them write detailed documentation at the end of every phase (8%) (Figure 9).

Regarding the planning process, 43% of Agile firms plan only the necessary functionalities, while 32% of the Plan-based ones plan carefully before starting the development process (Figure 9).

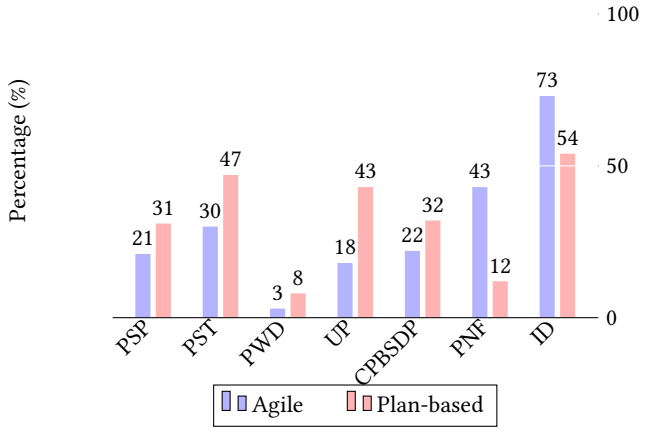


**Figure 9: How companies organize and plan their development process. PSP = Precise Subdivision in Phases, PST = Precise Subdivision in Tasks, PWD = Precise and Wide Documentation at the end of every phase, UP = Use of Prototypes, CPBSDP = Careful Planning Before Starting the Development Process, PNF = Planning of only Necessary Functionalities and ID = Incremental Development of code after the customer evaluation**

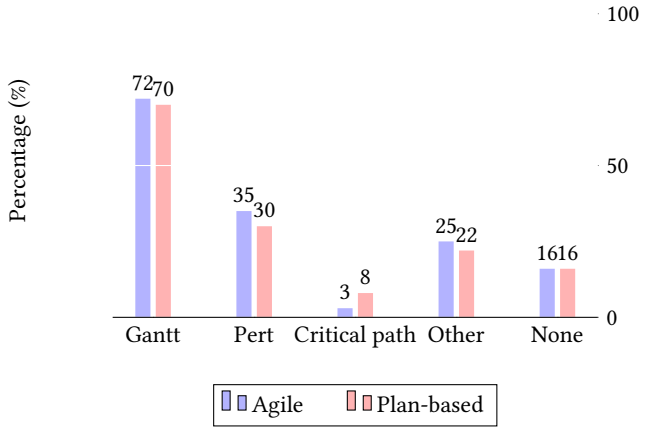


**Figure 10: Planning tools used**

Both Agile and Plan-Based firms mainly use the following planning tools: Gantt charts, Pert charts and Critical Path models (Figure 10).

## 5 DISCUSSION

Customer satisfaction is of paramount importance to both Agile and Plan-Based companies. The research results confirm the central role of the customer and the interaction between the developer and the customer. Other aspects of software development are oriented toward the satisfaction of the requirements defined by the customer.

Agile teams consider the individual skills as a critical factor for project success [7] [12]. However, the collected data show that the most important ability for developers in Agile companies is the ability to work in teams (Figure 3). In fact, the lack of qualified staff is not perceived as the main problem in software development (Figure 6).

Agile companies focus more on cooperation between developers and customers rather than on a careful and detailed definition of contracts improving the relationship with the customer [3]. According to the data, the focus on customer cooperation in Agile companies is stronger than in Plan-Based ones (Figure 5). Furthermore, both kinds of companies use the customer on site practice. The difference in the customer involvement in Agile and Plan-Based companies is not as relevant as expected (Figure 5).

The data shows that both Agile and Plan-Based companies are sufficiently satisfied with the relationship with their customers. A higher level of satisfaction was expected for Agile companies, but data show a very limited difference (Figure 4).

Even if both kinds of companies have the same level of collaboration with the customer and are both satisfied with this relationship, this is one of the main problems in software development for both (Figure 7).

Investigating the specific problems with the customer, requirements variability is the most important problem for both Agile and Plan-Based companies. As expected, this problem is more relevant for Plan-Based than for Agile companies (Figure 6). This result could be related to the usage of the Agile practices. The frequent delivery of working software allows the development team to communicate with the customer replacing part of the documentation. According to the data, both kinds of companies organize the development process using an incremental approach driven by the customer evaluation. The level of a complete documentation is very low in both cases (Figure 9). As expected, the use of an incremental approach is higher in Agile companies.

The data shows that the two kinds of companies adopt a different planning process. Most Plan-Based companies plan carefully before starting the development process, while the largest part of the Agile ones plan at each iteration only the necessary functionalities (Figure 9). In both cases, they are satisfied with their planning process (Figure 8) and use the same set of planning tools (Figure 10).

## 6 THREATS TO VALIDITY

The research approach adopted has some drawbacks:

(1) Qualitative methods focus closely on individual results and fail to make generalizations.
(2) The information gathered from the semi-structured interviews is subjective.
(3) In qualitative research, the researcher is not an objective observer; usually, he participates and influences what is under investigation.

To address the first issue and mitigate the effects, we have selected companies located in different countries and operating in different business areas. In this way, the Agile and Plan-Based companies sample should match better the characteristics of the population. However, we cannot say that the population is closely represented. However, a set of more thorough investigations could

provide additional information about the generalization of the results. A larger sample would provide additional confidence even if it is hard to gather a large number of companies willing to participate in a similar research.

We are aware of the subjective nature of the data gathered, but we are interested in the opinion/personal perception of the managers about their project management approach.

The last issue has been challenging. Sending the questionnaires by email would have reduced the bias of the researcher, but it would have been more difficult obtaining filled in questionnaires because of the well-known low response rate of the mail researches [20]. Therefore, we attempted to minimize this problem writing clear instructions for every question and making the interviewer's explanations as objective as possible.

The research approach used has several advantages as well [20]:

- The interaction between the interviewer and the interviewee allowed the collection of interesting information not directly required by the questions.
- The interviewer can ensure that respondents answer all questions.
- The face-to-face or Skype interviews usually decrease the number of "don't know" responses.

## 7 CONCLUSIONS

In the sample under investigation, it appears that the label "Agile" is used by companies in a fairly flexible and not rigorous way. This happens also because the boundary between the Agile and the Plan-Based approaches are not well defined.

Often, the comparison between Agile and Plan-Based approaches is based on the identification of the Plan-Based approach with the waterfall model. Actually, during the years, many Plan-Based companies have adapted their development process to the needs of the customers introducing practices that can be considered "Agile". Therefore, in most of the cases, this identification is false.

Even if the theoretical project management approaches of Agile and Plan-Based companies are fairly different, the actual implementation makes the differences between the two kinds of firms not as relevant as expected.

The four values of AMs are often implemented in a wide variety of ways by the self-defined Agile companies. Moreover, some or all of such values are often adopted by Plan-Based companies as well.

In the implementation, it appears that the boundary between Agile and Plan-Based approaches is more undefined than expected. Only a few companies are completely Agile or Plan-Based, most of them are in between.

An open question is the motivation of these results. From the discussion we had, it could be twofold: (a) companies use the label "Agile" as a marketing driver; (b) companies are trying to implement Agile practices, but a complete change of paradigm requires time.

## REFERENCES


[1] E. Babbie. 1997. *The Practice of Social Research.* International Thomson Publishing Services.
[2] V.R. Basili. 1992. Software modeling and measurement: The Goal/Question/Metric paradigm.
[3] K. Beck. 2000. *Extreme Programming Explained.* Addison Wesley.
[4] M. Beedle, M. Devos, Y. Sharon, K. Schwaber, and J. Sutherland. 2000. SCRUM: An Extension Pattern Language for Hyperproductive Software Development. In *Pattern Languages of Program Design 4, N. Harrison, B. Foote, and H. Rohnert, eds.*
[5] D.M. Berry. 2002. The inevitable pain of software development: Why there is no silver bullet. In *Radical Innovations of Software and System Engineering in the Future.*
[6] T. Chau, F. Maurer, and G. Melnik. 2003. Knowledge Sharing: Agile Methods vs. Tayloristic Methods. In *IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises.*
[7] M. Cohn and D. Ford. 2003. Introducing an agile process to an organization. *IEEE Computer* 36, 6 (2003).
[8] J.M. Converse and S. Presser. 1986. *Handcrafting the Standardized Questionnaire.* Sage Publications.
[9] J. Highsmith. 2002. *Agile software development ecosystem.* Addison Wesley.
[10] J. Highsmith and A. Cockburn. 2001. Agile Software Development: The Business of Innovation. *IEEE Computer* 34, 9 (2001).
[11] J. Highsmith and A. Cockburn. 2001. Agile Software Development: The People Factor. *IEEE Computer* 34, 11 (2001).
[12] M. Lindvall, V. Basili, B. Bohem, P. Costa, K. Dangle, F. Shull, R. Tesoriero, L. Williams, and M. Zelkowitz. 2002. Empirical Findings in Agile Methods. In *Proceedings of XP/Agile Universe.*
[13] A. MacCormack, R. Verganti, and M. Iansiti. 2001. Developing Products on Internet Time: The Anatomy of a Flexible Development Process. *Management Science* 47, 1 (2001).
[14] T.W. Malone and K. Crowston. 1994. The interdisciplinary study of coordination. *Comput. Surveys* 26, 1 (1994).
[15] C. Marshall and G.B. Rossman. 1989. *Designing qualitative research.* Sage Publications.
[16] M. Paulk. 2002. Agile Methodologies and Process Discipline. *CrossTalk* 15, 10 (2002).
[17] M. Poppendieck and T. Poppendieck. 2003. *Lean Software Development: An Agile Toolkit.* Addison Wesley.
[18] S. Siegel and N.J. Castellan. 1988. *Nonparametric statistics.* McGraw-Hill.
[19] D. Silverman. 2000. *Doing qualitative research.* Sage Publications.
[20] R.A. Singleton, B. Straits, and M.M. Straits. 1993. *Approaches to Social Research.* Oxford University Press.
[21] C. Wohlin, P. Runeson, M. Host, M.C. Ohlsson, B. Regnell, and A. Wesslen. 2000. *Experimentation in Software Engineering, An Introduction.* Kluwer Academic Publishers.