

# 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<sup>1</sup> and widely investigated, also by the authors [6] [7] [8] [1] [4]. 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

<sup>1</sup><http://techbeacon.com/survey-agile-new-norm>

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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 is it used for marketing purposes and/or to please top management?

The results of our study are 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*<sup>2</sup> and the most widely known Agile Methods, such as XP and Scrum.

The paper is organised as follows: Section 2 presents the structure of the investigation; Sections 3 and 4 summarise and discuss the results; finally, Section 5 draws the conclusions.

## 2 OUR INVESTIGATION

### 2.1 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)

<sup>2</sup><http://www.agilemanifesto.org/>

- \* 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

## 2.2 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 [10] [11] [12].

## 3 RESULTS

### 3.1 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%).

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.

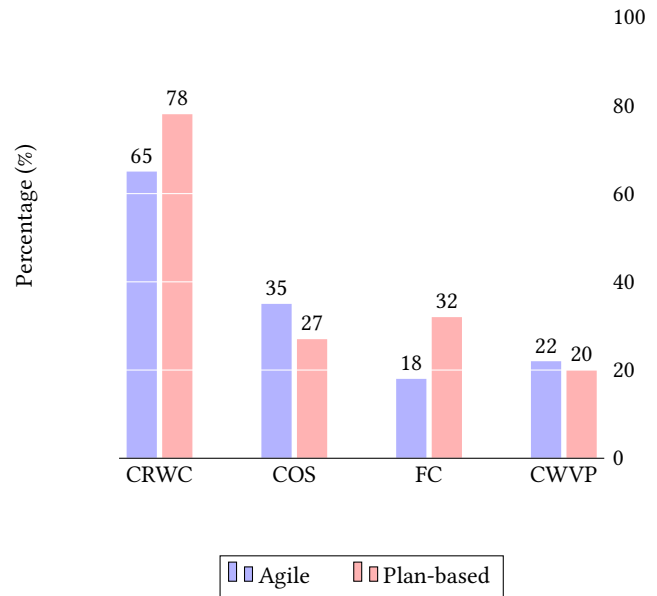
Agile and Plan-Based companies are quite satisfied with their relationship with the customer even if there is a small advantage of the Agile ones (95% compared to 90%).

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 1).

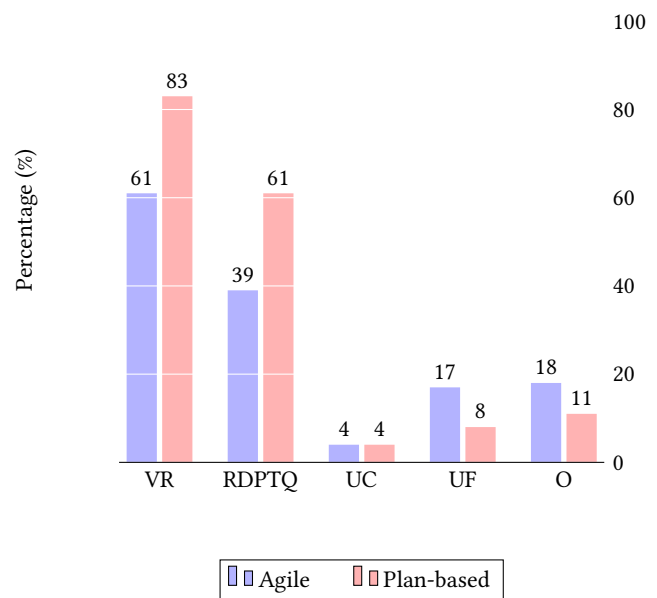
Agile (35%) and Plan-Based firms (27%) consider a good practice having the customer on site and the contractual relationship is the least frequently used. While the number of Agile and Plan-Based companies that use variable contracts is the same (about 20%), there is a difference in the usage of fixed contracts (32% Plan-Based, 18% Agile) (Figure 1).

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 2).

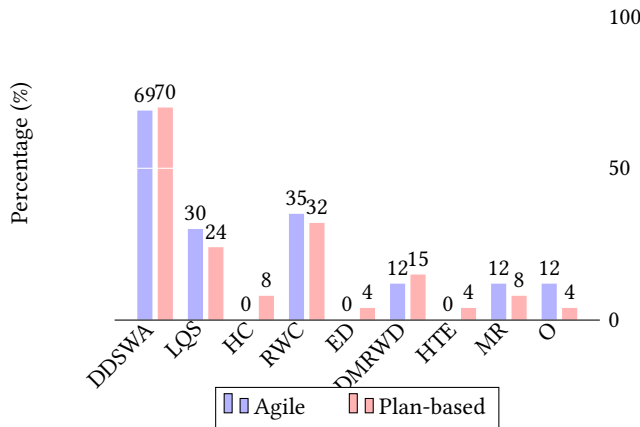
To control the requirements variability, Plan-Based firms try to anticipate/plan changes or to specify accurately all functionalities at the beginning of the project. Agile companies solve this problem



**Figure 1: 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 2: Main problems with the customer. VR = Variable Requirements, RDPTQ = Request to Deliver Products Too Quickly, UC = Unsatisfied Customers, UF = Useless Functionalities, O = Other**



**Figure 3: 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

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.

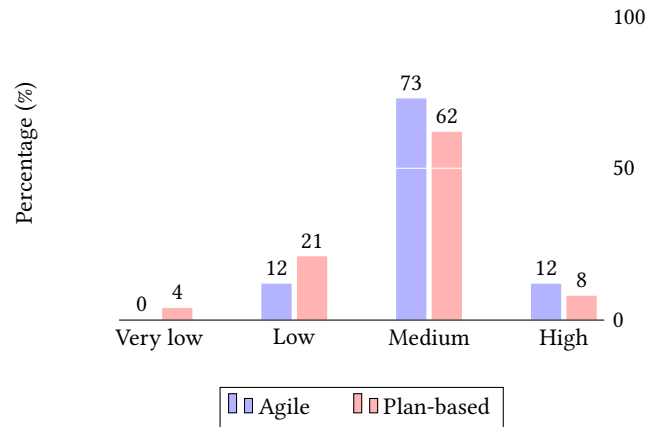
Concerning the main problem in software development, most firms (about 70%) pointed out the difficulty to deliver software with all functionalities on time, followed by the relationship with the customer (about 35%), and the lack of qualified staff. Concerning this problem, there is a slight difference in the percentages of the two groups: 30% for the Agile and 24% for the Plan-Based companies (Figure 3).

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.

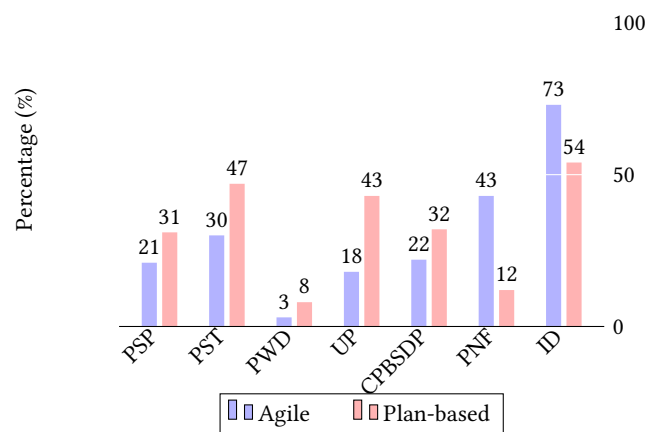
### 3.2 Process management

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 4).

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 5).



**Figure 4: Satisfaction with the planning of the process**



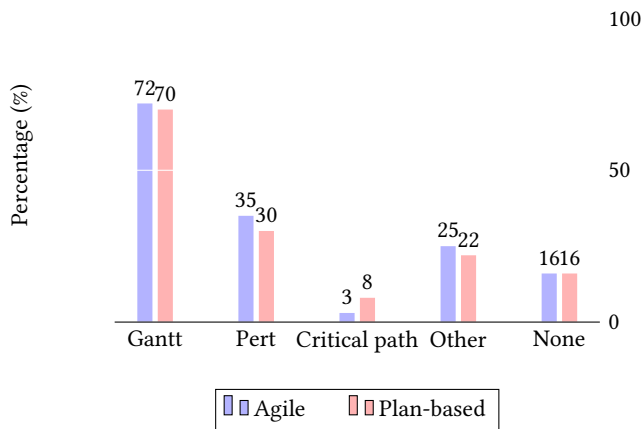
**Figure 5: How companies organize and plan their development process.** PSP = Precise Subdivision in Phases, PST = Precise Subdivision in Tasks, PWD = Precise and Wide Documentation at the end of every phase, UP = Use of Prototypes, CPBSDP = Careful Planning Before Starting the Development Process, PNF = Planning of only Necessary Functionalities and ID = Incremental Development of code after the customer evaluation

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 5).

Both Agile and Plan-Based firms mainly use the following planning tools: Gantt charts, Pert charts and Critical Path models (Figure 6).

## 4 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



**Figure 6: Planning tools used**

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 [5] [9]. However, the collected data show that the most important ability for developers in Agile companies is the ability to work in teams. In fact, the lack of qualified staff is not perceived as the main problem in software development (Figure 2).

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 1). 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 1).

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.

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 3).

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 2). 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 5). 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 5). In both cases, they are satisfied with their planning process (Figure 4) and use the same set of planning tools (Figure 6).

## 5 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.

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