The Relationship Between Objectives and Stages of Agile Implementation in Organizations

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Abstract The paper analyzes application of Agile in software development, revealing that Agile initially referred to software development, then in the context of agile began to be applied to the management of any processes in different fields and areas of knowledge. In this way, there was a shift. Therefore, "agile development methodology" and "agile management" may have different meanings. The survey results serve as the material for the study. These materials are interesting as they have the relevance of respondents to Agile. In addition, respondents answered the questions without additional incentives and could interrupt the survey at any time. 1,501 people have participated in the present survey. Purpose of the study: an exploration of the relationship between objectives and stages of agile implementation in organizations based on the opinions of developers. Within the present study, Pearson's rank correlation coefficient was used to calculate the interdependence between the variable "How many years has your company been applying Agile practices?" and the variable "Number of goals." To figure out the interdependence between respondents' answers to the question "what stage of Agile implementation is your company at?" and the variable "Number of goals" that the respondent associates with Agile, the Spearman rank correlation coefficient was used. The results showed that the number of Agile implementation goals depends on the level of Agile competencies in the organization: then higher the level of Agile competencies in the organization, then more goals the organization has. The results of the study enrich the knowledge of goal-setting in Agile. In addition, it can stimulate to consider the problem from a new point of view - the study of the evolution of goals from implementing Agile.

Keywords Agile · Product management · Project management · Digital transformation

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1 Introduction

Information technology (IT) has evolved astonishingly over the last 20–25 years. The improved IT environment has greatly enhanced an organization's ability to integrate various mediums and has expanded the choice of delivery vehicles for the organization. The rapid growth of information technology has made reasonably priced technology available with a tremendous potential to improve communication efficiency and effectiveness within and between organizations in support of agile business practices. Technology exists for any medium or combination of mediums (multimedia) suitable for conveying information in a rich, meaningful, and easily understood format [11].

The proliferation of IT has brought many changes to the organizational environment. Organizations can enlarge their operations into the global domain as they use technology.

Digital technology is transforming the services and business models of organizations and changing the structure of the economy and society. Organizations are becoming virtual, and there is a trend toward remote working. IT companies are gaining more weight in the GDP structure. The needs of society are becoming dependent on electronic devices: smart watches, smart homes, heart rate monitors, etc. These changes are taking place through the use of information technology. We can assume that digital transformation can be interpreted in different ways, as there are many approaches to the definition. First, it depends on the area of scientific interest in digital transformation studies. Secondly, it depends on the object of study. A sociologist, for example, will have a different view of digital transformation from a programmer. Digital transformation exists in Industry 4.0—the Internet of Things concept. This concept assumes that every physical object has integrated technology. The technology allows the physical object to interact with other entities. A key driver of the fourth industrial revolution is integrating cyber-physical systems into manufacturing processes.

Agile is an approach to digital transformation and optimization of internal software development processes. The essence of agile is the creation of product value, created in an unpredictable environment and rapid changes in the context of digital transformation. Thus, almost any company is now forced to become an IT company in one way or another. Simplifying processes, increasing velocity, and focusing on the customer will benefit any company, regardless of the industry. The limiting parameter for the transformation may be the company's size, the current level of culture in the organization, and its compliance with the basic principles of agile. The principles of agile are declared in the Agile Manifesto [2]. The Agile Manifesto is a document describing the values and principles of agile software development, proposed in February 2001 at a meeting of programmers.

The transition to agile approaches or NeoClassical Theory of Management is not due to continuous process optimization trend because of the general desire of managers to make these changes but to the variability of the environment and the

increasing complexity of the systems and software to be produced. Thus, the understanding concerning the future result between developers and customers is different from each other. The solution to this problem and bringing to a common ground is business analysis, which acts as a bridge between customers and developers. Business intelligence has resulted, in part, in terms of reference—a document that outlines the requirements for the final software product. A further increase in the complexity of understanding processes and the development of the customer-centricity category called for the developer community to change its approach to constructing plans and the execution of tasks. Each new task appears as a result of reflection on the results of the previous task.

Agile development approaches in distributed teams have specific problems related to cultural differences, behavioral aspects, and different geographical distributions of employees. It generates another factor—different time zones so that all team members may have different activities simultaneously. Consequently, trust within teams, the basis for employee interaction, becomes very important.

Agile is a group of approaches. By approaches, we can mean both methodologies, models and methods. In this paper, we will not discuss what a methodology is and what a method is. It is only essential to understand that Agile is not classical management and not classical project management. If Agile is not classical management, it contains characteristics that are different from classical management. Agile contrasts itself with the predictive Waterfall model. The name "Waterfall" speaks to the essence of this model. Processes move from top to bottom, giving us the understanding that we cannot go back to previous tasks. Accordingly, we see rigidity in the Waterfall model. "Waterfall" refers to determinism. Determinism defines a causal relationship of events as a result of the completion of previous events. Agile refers to indeterminism. Indeterminism denies the objectivity of causality because subsequent events may involve more significant factors unknown at the event's time. The software development industry shifts from determinism to agile development approaches. A feature of agile approaches is the active participation of stakeholders throughout the development process [17]. Whereas deterministic approaches, based on classical theories to control, involve them in the initial stages, such as initiation or planning, as well as in the implementation of absolute control. Deterministic approaches predetermine the state of future objects based on resulting changes and initial plans, compliance with which is a principle of predictive models.

The Agile approach emerged because of a changing marketplace. Customers began to value rapid speed to market for products and began to be more flexible in formulating product requirements as the system's complexity increased. Flexibility started to manifest in an awareness among customers that software requirements may need to be completed or may be fragmented.

Purpose of the study: we will explore the relationship between objectives and stages of agile implementation in organizations based on the opinions of developers.

2 Literature Review

There are few comprehensive studies on Agile with a large field sample. There are only anecdotal case studies, and their number steadily increases yearly, which confirms the high interest in Agile among researchers. Moreover, there are studies in computer science: that implement Agile UX (User Experience) in the context of software startups [6], and the software team's evolution to self-organized collaboration practices, agile planning practices, and involved customer concentration depended on the customer's trust in the software team and flexible, collaborative routines [7]. Agile as social science: applying Agile principles to students' group work in project management [10]. There are papers in the business and management section: Researchers found that digital transformational leadership and organizational agility positively impact digital transformation, and digital transformational leadership impacts organizational agility [4], and researchers are exploring a lean and agile strategy for the supply chain in the construction industry based on an Agile approach [14]. Moreover, the focus of the examples mentioned above of articles is more related to the business and management section, as most of the papers need technical novelty.

Initially, agile methodologies were related to the information technology sector. Then in the context of agility, they began to be applied to the management of any processes in various fields and areas of knowledge. It is how it happened. Therefore, the articles "agile development methodology" and "agile management" refer to different objects and contents. Instead of technical novelty, a novelty in teamwork and productivity and velocity, relationships with customers, and others, is proposed. By the way, a lot of the work in the business and management section is related to something other than information technology, the domain of Agile, but to general organizational agility.

Goal setting in Agile can be seen in the context of critical roles in different Agile frameworks such as Scrum (the framework that allows developers to create value for the user through adaptive solutions to complex tasks), Kanban (development framework that implements the "just-in-time" principle), and others.

For example, consider the Scrum framework: the product owner prioritizes backlog. Prioritization balances arguments at the work planning stage and shows attention to changing conditions. Consequently, the value of the software is increased [16]. Scrum Master is responsible for the productivity and velocity of the team [12]. Self-organizing development teams in Agile instead of the structure in traditional management are collectively responsible for the sprint execution process, which includes task planning, performing, managing the tasks, following daily stand-ups, and communicating with the Scrum teams [8]. Therefore, team performance depends on maturity [9]. In addition, developer teams stimulate the technical perfection of the product to occur, at the expense of which quality is increased [3]. Product quality is a priority for both the customer and the developers; production speed is also crucial, so risk management should be consistent with these aspects [15]. The idea can be

further developed by adding artifacts: burndown chart, sprint backlog, and product backlog [5]. The purpose of the above artifacts contains the goals of agile.

Further, we will consider the approach to goals in the example of a paper [13], which considers the move to Agile because of the desire to eliminate the hierarchical management structure. Leveling out the hierarchy cannot be the primary goal, so another more economic goal is to improve team results and enable working remotely. So here we see that the researcher can claim one goal, but it will hide another goal.

If we summarize the literature review on goal-setting in Agile, there can be many goals in different fields. Goals can be focused on the artifacts of Agile approaches. Objectives can be oriented toward Agile principles as well as Agile values. Therefore, the research topic is broad, and we are grateful for the opportunity to participate in this research.

3 Materials and Methods

The research materials are the data provided by ScrumTrek LLC—the results of the 2019 survey. This data is interesting because of the relevance of the respondents to Agile. In addition, the respondents answered the questions without additional incentives and could interrupt the survey at any time. This data has no shelf life, as it hides various patterns, the discovery of which will enrich Agile theory.

A total of 1,501 people from different cities (primarily Russian) took part in the survey. Respondents answered questions about the organization where they work. Thus, the results of the survey allow us to analyze the characteristics of the use of Agile in the following groups of organizations: IT (605 people, 40%), finance (341, 23%), telecommunications (64, 4%), and non-IT spheres (491, 33%). The survey report is available online at the link in the literature [1].

Participants in the survey came from various roles within their organizations, from senior managers and business owners to developers.

The distribution of employees by primary activity (role) varies across companies in different industries. The highest representation of middle managers is in telecoms, while top managers and company owners are in non-IT. Thus, the highest percentage of Scrum masters and Agile coaches is recorded in the financial sector organizations (26%), the maximum representation of project managers—in telecommunications and IT.

To calculate the interdependence between the variable "How many years has your company been applying Agile practices?" and the variable "Number of goals," the Pearson rank correlation coefficient was used, a parametric method used to examine the relationship between phenomena statistically. This method was used because, in this pair, both variables are quantitative and have a normal distribution (the normality of the distribution of the respective attributes is indicated by the asymptotic significance value, which for both variables takes a value less than 0.05. See Table 1).

Table 1 Kolmogorov–Smirnov one-sample test (testing variables for normality of distribution)

		Number of goals	How many years has your company been implementing Agile practices?
N		1501	1303
Normal parameters [a,b]	Mean	2.64	3.19
	standard deviation	2.412	2.590
Difference between Two Extremes	Module	0.214	0.177
	Positive	0.214	0.177
	Negative	-0.137	−0.113
Kolmogorov–Smirnov Z statistics		3.736	7.736
Asympt. value (two-sided)		0.000	0.000

a. Comparison with a normal distribution

b. Estimated from the data

Note The correlation tables use the following indications of the significance of correlations:
**—Correlation is significant at the 0.01 level (bilateral)
*—Correlation is significant at the 0.05 level (bilateral)

The Spearman rank correlation coefficient was used to calculate the interdependence between the respondents' answers to the question "What stage of Agile is your company at?" and the variable "Number of goals" that the respondent associates with Agile—this is a non-parametric method suitable for studying the relationship. This method was used based on the fact that, in this pair, one of the variables under study (the variable "At what stage of Agile implementation is your company in?") is ranked (not quantitative). Spearman's correlation calculation is used to assess the strength of the relationship between such variables.

When the correlation coefficient is used, the closeness of the relationship between the variables is conventionally estimated, considering values of the coefficient equal to. 0.3And less—The Indicators of the Weak Closeness of the Connection

Values more than 0.4 but less than 0.7—indicators of the moderate closeness of connection, and values of 0.7 and more—indicators of the high closeness of connection.

4 Results

The top 5 goals for which organizations implement Agile are as follows:

1. Improving the way they manage changing priorities (49% of employees of companies using Agile consider this goal to be relevant to their organization);
2. Improving product quality (46%);
3. Speeding up product delivery and time to market (45%);

Table 2 Goal alignment with Agile Manifesto principles

Goal	Agile Manifesto principle
Better ways of managing changing priorities (49%)	*Principle 1*
Improving the quality of products (46%)	*Principles: 2, 7, 9, 11*
Faster delivery and speed to market of products (45%)	*Principles: 1, 3, 8*
Improved project management transparency (43%)	*Principles: 4, 6*
Better alignment between business and IT and increased productivity (41%)	*Principles: 3, 4, 6, 7, 12*

4. Improved transparency of project management (43%);
5. Ensuring coordinated work of business and IT and increasing productivity (41% each).

Thus, more than a half of respondents associate the need for Agile with the need for companies to manage the company coherently and openly in a transformational environment while improving product quality and accelerating processes. The overall ranking of Agile goals as perceived by organizations' employees is shown in Table 3.

Next, let us determine the alignment of the goals with the Manifesto principles, see Table 2.

As we can see, the goals align with the Manifesto principles, which are logical and expected. "Ensure alignment of business and IT, and increase productivity" is the goal most consistent with the Manifesto and is in line with 5 of the 12 Agile Manifesto principles.

Logically, the set of Agile implementation goals depends on the level of Agile competence in an organization: the higher the level of Agile competence in an organization, the higher the proportion of its employees naming each Agile goal as relevant. See Fig. 1.

A weak trend is revealed: the more extended and more in-depth experience of Agile application an organization has, the more goals its employees associated with Agile. It is evidenced by the results of the correlation analysis between the respondents' answers to the "How many years has your company been applying Agile practices?" question and the number of organizational goals associated with Agile. This number is calculated based on respondents' answers to the multiple choice question, "What are your company's goals for implementing Agile?" (correlation coefficient $r = 0.106$ is weak and significant at the 0.01 level). Also, between the respondents' answers to the "What stage of Agile implementation is your company at?" question and the number of organizational goals that the respondent associates with Agile (correlation coefficient $r = 0.549$ is medium and significant at the 0.01 level), see Table 4.

This result should be interpreted as follows: the greater the value of the first variable, the greater the value of the second. However, based on this relationship alone, we cannot argue that the benefits of Agile implementation depend on the implementation stage. We can only argue that the indicators' dynamics are consistent over time. As Agile implementation deepens in organizations, the volume of benefits increases with a significant degree of probability.

Table 3 "What are the goals of implementing Agile in your company?"

No	Goal	%
1	Better manage to change priorities	49
2	Improve product quality	46
3	Speed up product delivery/market entry	45
4	Improve transparency of project management	43
5	Ensure alignment between business and IT	41
6	Increase productivity	41
7	Increase motivation of teams	35
8	Improve the predictability of delivery	25
9	Better manage distributed teams	23
10	Reduce project risks	21
11	Improve engineering culture	20
12	Facilitate product support	18
13	Reduce project costs	17
14	Other objectives	4
15	I don't know	2

The results of the correlation analysis suggest that the stage of Agile implementation has the most significant impact on the number of benefits such as

– management of changing priorities;
– acceleration of product delivery/market penetration;
– facilitation of product support;
– management of distributed teams;
– Ensuring alignment between business and IT.

5 Conclusion

Overall, it can be said that the goals of the Agile transition are in line with the Agile Manifesto [2], which was anticipated in advance because it makes no sense to expect goals from Agile that other companies have not tested.

Regarding an inevitable weak trend: the more experience Agile practices have, the more goals are pursued. This fact is likely due to the amount of experimentation during the experience of Agile approaches. The more practice, the higher the chance of benefiting from that practice. The number of goals achieves the increase in chance. If one of several goals is achieved, this one good result offsets the other unachieved goals.

The results of the study enrich the knowledge of goal-setting in Agile. In addition, it can stimulate to consider the problem from a new point of view—the study of the evolution of goals from implementing Agile. In addition, the following studies can
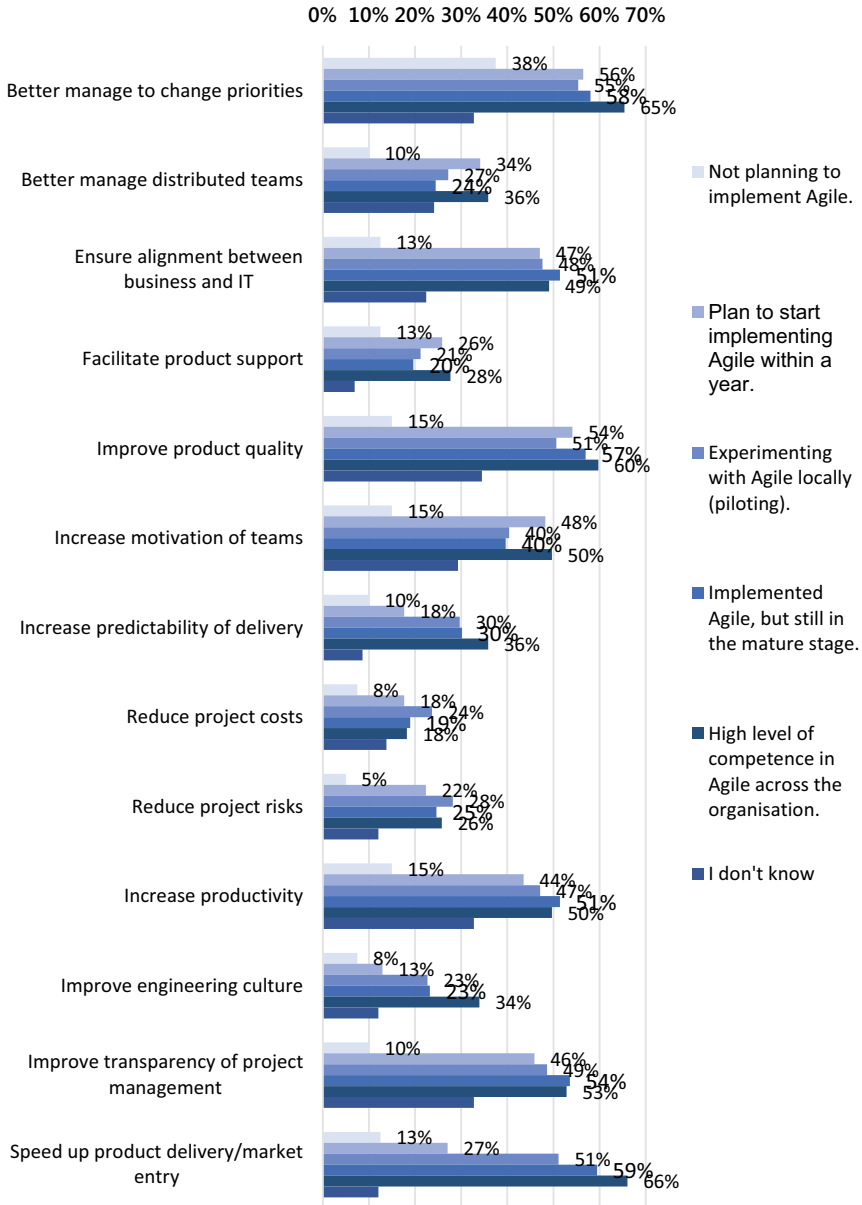
Fig. 1 "What are the objectives for implementing Agile in your company?", depending on the level of Agile competencies in the organization

Table 4 Results of the correlation analysis

		Number of goals
How many years has your company been implementing Agile practices?	Correlation coefficient	0.106[**]
	two-sided p-value	0.000
	N	1303
What stage of Agile implementation is your company at?	Correlation coefficient	0.549[**]
	two-sided p-value	0.000
	N	1443

determine the impact of goal-setting trends in organizations. Perhaps the content of goals is independent of Agile maturity but on trends.

In practice, the acquired knowledge can be applied to compose courses and training, focusing on the respondents' demand according to the Agile implementation goals.

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