



# The Impact of Agile Project Management Model on the Performance of Technology Teams

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**Abstract.** In the academic and business world, the number of leaders who are not familiar with the concept of an agile team has recently declined. Compared to traditional project management approaches, small but entrepreneurial teams, which are established close to the customers for the purpose of shortening the efficiency and time to market, are preferred in order to keep up with the rapidly changing conditions and competition. The study prepared by taking into account the relationship between OECD countries and seven emerging countries, trying to show the difference between the share of research and development (R&D) expenditures from national income (GDP) and the number of patent applications and export in the Information and Communication Technologies (ICT) sector, and introduction-based literature review to provide information about the productivity and scalable evaluability of teams in engineering approaches, and the definition of the model, where the measures are, and the result stage.

**Keywords:** Agile team management · Agile project management · Team performance measurement

## 1 Introduction

Technological progress in classical economics was not directly calculated, and in modern growth theory it is clear that a well-educated workforce is an indispensable resource for the creation of technology. Because researchers are the driving force of technology, they need to be managed very differently from the usual workforce. An approach based on delivering needs iteratively and gradually called “Agile” is a preferred way of managing teams to end R&D with technology and innovation. Otherwise management would result in technology failure and the competition with technology creators would be shifted down and concluded as “creative destruction.” Technologically leading countries are also well known as high-tech export performers.

Companies are unable to maintain their competitive edge in the market with conventional project management practices, and as a result, they are directed to teams managed under different frameworks under the program umbrella and want to update them with a new approach in areas where processes are inadequate [1]. It is stated that one of the most important factors hindering project and implementation success in

traditional sectors is the lack of functional communication between stakeholders. However, in today's e-government applications there has been a rapid transition to a period where security is discussed, technologies are compared, customer satisfaction and product quality are more important than ever [2]. These applications such as blockchain, e-citizenship, and digital identity, developed with new methods and providing solutions, eliminate centralism [3].

## 2 Literature Review

R&D projects with the share allocated from the gross national product are encouraged, supported and followed by ministries, universities and R&D organizations. However, it is not possible to support to all projects since given the number, content, quality and limited resources of research and projects produced together, there is a scarce resource management requirement [4]. From this point out, traditional assessment software does not guarantee in the context of continuous improvement and learning, and research in light of more than 80 percent of these programs fail within the first 18 months [5]. This leads teams to present a running software to the requester in short circuits, moving forward with more frequent approval and feedback, and collecting tools to intuitively collect data as opposed to traditional methods. As a result of the above reasons, some questions may occur. The most important of these questions is how can companies easily measure performance when creating a team, but how can they measure and evaluate the performance of those teams when they create multiple teams? As we can see, while it is possible to diversify the questions, the need for high competition in today's uncertainty makes the idea of having teams that are fast, agile and compliant attractive. But institutions have difficulty deciding whether to meet the criteria to make such a strategy a reality. Especially in projects that require technology, situations that produce unnecessary results are often encountered despite the large costs incurred for a long time [6]. When the outputs of R&D expenditures such as company-level (micro) and country-level (macro) and export patents are analyzed, R&D expenditures sometimes do not lead to positive output as expected. R&D expenditures were taken as a share of GDP, exports and patents were examined at the micro level, with large amounts of R&D expenditures in Turkey, the largest exporters and 36 OECD countries and 7 emerging markets at the macro level.

R&D expenditures made by 36 OECD countries and 7 emerging market economies, the number of patents obtained between Information and Communication Technologies and their export to the Computer, Electronic and Optical sectors. In the table, since the R&D expenditures of some data should be concluded positively; This is because both patent applications and their exports show positive performance in the Information, Communication and Technology sector. Although some countries have high R&D expenditures, the number of patent applications is low and consequently the evaluation of the suitability of exporters in the high technology, information and communication technology sector (Tables 1 and 2).

While traditional agile formulations and recommendations highlight individuals and interactions on processes and tools, this analyze shows today's complex software systems and distributed teams. Management model that is provided by this analyzed

**Table 1.** Result of analyzed 241 companies in Turkey. Source: Turkish Exporters' Assembly

|                      |                                       |
|----------------------|---------------------------------------|
| 108 of 241 companies | Export Performance > R&D expenditures |
| 44 of 241 companies  | Export Performance = R&D expenditures |
| 89 of 241 companies  | Export Performance < R&D expenditures |

system establishes the risk criteria used to prevent and reduce risk [7]. In Agile software development, not only is the interaction between individuals and each other more important than the process and the tools used, but the operation of the software is more important than the documentation in detail. Customer contributions are also more important than contracts and contracts, while responding to changes is more important than following a straight plan [8].

### 3 Agile Transitions Can Not Only Be the Job of Information Technologies

The digitalization we use as a concept, which is actually emptied of the content with the sentences we adorn, is similar to the youth talking about sexuality in adolescence: Actually, nobody knows exactly what it is, but it is always talked about.

Doing more and more the same things kills the talent within us and prevents us from seeing new ways and opportunities. Imagine a child learning to walk, ride a bike. While the child is doing this, there is no target for a year later, no planning, no success metrics. There is only courage and willingness to do so.

Agile transitions can not only be the job of information technologies.

What should we do, as the above assumption is unlikely to be true? We have to learn to look at it multi-dimensionally once we make decisions on such initiatives in our organizations. What are these dimensions?

Processes, organization, tools, infrastructure, finance, technology and of course human resources. When planning transition processes, we should definitely consider all these dimensions in an integrated way. The essence of the word, 'agile' transitions cannot be the business of organization and information technologies. It is necessary to take off these works with a team of all functions.

Especially the human dimension; Since human is the factor that will manage and develop the whole process, human resources must be prepared for this job much more.

Pre-measurement and analysis; It is possible to address the concept of agility, agility in seven dimensions in a person:

- Personal awareness
- Openness to feedback
- Environmental awareness
- Agility in change
- Agility in relationships
- Cognitive agility
- Determination to succeed

**Table 2** The country's R&D expenditures, the number of patent applications in the field of Information and Communication Technology (ICT) and their exports in the Computer, Electronics and Optics sector. Source: OECD&WIPO

| Country         | ICT Patent Applications | R&D Expenditure as a share of GDP (%) | ICT Exports (Million\$) |
|-----------------|-------------------------|---------------------------------------|-------------------------|
| China           | 23.368                  | 2,15                                  | 674.210                 |
| United States   | 17.831                  | 2,79                                  | 199.303                 |
| Korea           | 5.317                   | 4,55                                  | 166.757                 |
| Chinese Taipei  | 303                     | 3,30                                  | 153.727                 |
| Singapore       | 240                     | 1,95                                  | 134.847                 |
| Germany         | 2.850                   | 3,04                                  | 130.316                 |
| Japan           | 11.840                  | 3,21                                  | 96.572                  |
| Mexico          | 44                      | 0,49                                  | 77.168                  |
| Netherlands     | 562                     | 1,99                                  | 68.894                  |
| France          | 1.335                   | 2,19                                  | 34.735                  |
| United Kingdom  | 1.459                   | 1,66                                  | 33.294                  |
| Switzerland     | 356                     | 3,37                                  | 31.415                  |
| Czech Republic  | 22                      | 1,79                                  | 27.992                  |
| Poland          | 81                      | 1,03                                  | 18.686                  |
| Italy           | 335                     | 1,35                                  | 16.784                  |
| Ireland         | 190                     | 1,04                                  | 16.102                  |
| Hungary         | 74                      | 1,35                                  | 15.919                  |
| Slovak Republic | 8                       | 0,88                                  | 14.767                  |
| Canada          | 979                     | 1,59                                  | 14.112                  |
| Belgium         | 200                     | 2,70                                  | 13.551                  |
| Sweden          | 1.588                   | 3,40                                  | 12.627                  |
| Israel          | 768                     | 4,54                                  | 10.045                  |
| Austria         | 175                     | 3,16                                  | 9.706                   |
| Spain           | 220                     | 1,21                                  | 7.663                   |
| Denmark         | 137                     | 3,05                                  | 7.055                   |
| Romania         | 19                      | 0,50                                  | 4.449                   |
| Australia       | 417                     | 1,79                                  | 4.333                   |
| Russia          | 277                     | 1,11                                  | 3.801                   |
| Finland         | 541                     | 2,76                                  | 3.686                   |
| Portugal        | 39                      | 1,33                                  | 3.376                   |
| Turkey          | 133                     | 0,96                                  | 2.516                   |
| Norway          | 90                      | 2,09                                  | 2.396                   |
| Estonia         | 9                       | 1,29                                  | 1.750                   |

*(continued)*

**Table 2** (continued)

| Country      | ICT Patent Applications | R&D Expenditure as a share of GDP (%) | ICT Exports (Million\$) |
|--------------|-------------------------|---------------------------------------|-------------------------|
| Lithuania    | 5                       | 0,90                                  | 1.627                   |
| South Africa | 46                      | 0,82                                  | 1.411                   |
| Latvia       | 1                       | 0,51                                  | 1.334                   |
| Greece       | 20                      | 1,13                                  | 1.200                   |
| Slovenia     | 6                       | 1,86                                  | 1.177                   |
| New Zealand  | 35                      | 1,37                                  | 605                     |
| Luxembourg   | 30                      | 1,26                                  | 568                     |
| Chile        | 8                       | 0,36                                  | 302                     |
| Argentina    | 3                       | 0,54                                  | 144                     |
| Iceland      | 0                       | 2,10                                  | 73                      |

When you evaluate your human resources and leaders in these seven dimensions (with different measurement assessment tools and development center practices available in the market), you will actually see the adaptability of each individual and how they will react to the process. So how do you measure to achieve these results?

#### 4 Agile Performance Methodology

Agile-Scrum model that is based on observers, developers, and repeats is framework of application development. Many of these models assume that modern software projects are quite complex, hard to coordinate team and it will be difficult to plan them all from the beginning. In order to reduce this confusion, six main criteria have been established. These six main criteria have 84 sub-criteria, so that in this framework there are 90 criteria.

First main criteria is agility index. It is the name given to a roof management for the management of agile-scrum complex projects to ensure that a product originally imagined and conformed to the design is produced at a fast, predictable cost and quality. The realization of the designed product is not carried out in the form of gradually realizing a list of requests prepared by the customer/user as detailed as possible [9]. Instead, the functions requested and defined by the customer/user are developed and revised within two or four-week periods called Sprint. This user-based requirement definition is described as a User Story and included in the job list. At the end of each Sprint, a functional piece of software is finished and can be delivered to the customer.

Second is the Performance measurement. Performance assessment one of the important step for decision making in competitive environment. The most important stage of the performance evaluation is the adjustment of the appropriate criteria. The performance measurement of teams is presented with 18 criteria as the most basic interpretable indicator, considering many criteria.

Third criteria measurement of planned iterations index which is designed to ensure that parts or functions of the product are delivered and evaluated on a regular basis. 16 measurement is designed to improve traceability by keeping progress and issues on a daily basis and ensuring they are localized for solving problems without receiving any complaints from the customer.

Fourth one is agile goal index is defined as a specific goal to ensure that the team is gathered around a higher goal that exceeds all stakeholders' goals. Due to the nature of the work, the requirements of the product are not determined once in a while, but there is a target and definition to guide the team in each iteration to re-evaluate each delivery and make adjustments according to the situation.

Fifth criteria is customer satisfaction. Agile approaches focus on logical customer satisfaction. After all, the customer is the reason to develop the product in the first place [10]. In this section, 12 metrics are designed to participate in the basic key performance indicator process by obtaining net promoter score Calculation from the questions about determining Customer dissatisfaction to identify some Customer Satisfaction problems common in the project.

Last criteria is wellness of team. Discovering ways to motivate agile teams is positively correlated with output quality. Based on the work to be done, it is necessary to use the right resources to the teams and to control the team autonomously with a product accumulation and product owner in which the needs are handled correctly.

## 5 Importance and Drawback of Agile Modelling

Giant organizations have started to break up into tiny pieces. Because organizations growing as far as Titanic could not turn the rudder. Each piece sets its own rules, they set their own 1–2 week goals in an innovative environment, and they work only by drawing vision, without making medium and long term planning. In other words, we will witness that large companies will evolve into a new structure consisting of many start-ups. All the strict corporate working rules and ways of doing business in the old world will be left behind in the agile working culture. Institutions, on the other hand, will break down all their rules and change their educational perspectives in order to adapt their employees to this new world and to feed the new culture. Although the Agile model solves the problems completely, it has an effect on determining the method of dealing with the frequently encountered problems.

Agile model applications and being agile in communication has a high effect on describing the error and scoping performance of the team. This model lead to release your product and engineering management which can cause to improve your performance of product, team and work environment.

## 6 Conclusion

In order to catch the income level of developed countries, developing countries should invest in R&D in order to increase exports of goods and services. This will not only reduce the current account deficits, but also increase the welfare of its citizens. The

team in R&D is very important for countries to achieve their goals. Therefore, the management of these teams should be carefully considered.

For teams that do not manage effectively, their inefficient teams, whose spending is far from producing an outflow, will result. Although inefficiency has various negative effects at both micro and macro levels, it can be understood from the analysis above, even though it causes time losses and productivity decreases. It is useful to use metrics in Scrum, to look at the product performance of the team, and to evaluate the maturity of a plan. Measurements made during the sprint run allow direct identification of problems while the team is working on jobs. Although Scrum prioritizes flexibility in the process, this measurement model built by us will allow things to be carefully planned, give full priority to customer requests, avoid risks, take into account all possibilities.

Our primary focus is to discover different ways to ensure the reliability of metrics, as this is the only factor for long-term use of metric programs that show strong potential in dictation.

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