Agile as a wave of digital transformation

Vera Krasavina¹, Nikolay Platonovskiy¹, and Gani Ibiev¹*

¹Russian State Agrarian University – Moscow Timiryazev Agricultural Academy, Timiryazevskaya St., 49, Moscow, 127434, Russian Federation

Abstract. New technologies are transforming modern production, it is becoming more technological. New products and services have spoiled the consumer with a breadth of offerings, which puts manufacturers in the difficult position of constantly improving their offer by analyzing sales performance and striving to match the overall demand for the product. With the globalization of the economy, competition is growing, and companies that can use new methods of flexible management will ensure the creation of a production management system focused on reducing costs, minimizing risks and increasing efficiency in today's market. Manufacturing has historically been slowly moving away from traditional methods. The industry is based on processes that date back to the first and second industrial revolutions, but today manufacturing companies are using modern technologies to transform their business processes in an agile way. In such an environment, manufacturers can easily innovate. Customer feedback improves this process. Changes can be made in the middle of a process and operations can be reconfigured to meet new requirements. Dividing processes into iterations creates a low-volume manufacturing approach, which means less risk and more flexibility. Agile manufacturing often accompanies digital transformation, as digital workflows break down silos, unify systems, and enable greater flexibility. In other words, agile operations are moving from “adapting to change” to “change to be adaptive”.

Keywords: Agile, Scrum, Kanban, Scrumban, globalization, agile manufacturing, digital transformation, lean production

1 Introduction

While agile production has its origins in the Kanban method of just-in-time auto manufacturing developed in the 1940s at Toyota, the modern agile framework for development was refined in the late 1990s by programmers looking for better ways to produce software. Rather than create a “waterfall” development pipeline that included specific stages, such as design and testing, agile development focused on creating a working product, the minimum viable product, as early in the process as possible and then iterating on the technology (MIT Technology Review, 2022).

Agile is most widespread in the field of information technology, namely in software development. The wave of digital transformation that will reformat businesses around the world has a big impact on how technology teams think of software development (Krasavina

* Corresponding author: semenov.venture@mail.ru

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Agile methods have firmly established themselves in the processes of creating software for e-commerce, banking, telecommunications and all those areas where business efficiency is directly related to the speed of response of software developers to customer needs.

2 Main part

For years a workforce becoming increasingly distributed and the frequent outsourcing of work to external vendors located across the globe. Perhaps fueled in part by an increasingly distributed global workforce, we see an explosive increase in Agile adoption across the functions of the enterprise (Digital.ai, 2021).

Agile is an iterative approach to workflow organization. He has proven himself in IT startups and small companies. Agile is a simple set of values and principles described in 2001 by a group of 17 software developers in a small document known as the Agile Manifesto. The manifesto emphasizes 4 values:

1. Individuals and interactions over processes and tools.
2. Working software over comprehensive documentation.
3. Customer collaboration over contract negotiation.
4. Responding to change over following a plan.

Today, flexible project management methods are a set of specific methods for organizing work. These include: Scrum is an Agile practice that relates to organizing a team Kanban is a system for organizing production and procurement that allows the implementation of the principle of “just in time” Scrumban is a management structure that occurs when teams use Scrum as their chosen way of working and use the Kanban method as a lens through which to view, analyze, and continuously improve their work with other less popular methods (fig. 1).

Today, the most popular agile product development methodology Scrum is already over 25 years old (Schwaber K., 1995), and 35 years have passed since the term appeared - it was first mentioned by professors Hirotaka Takeuchi and Ikujiro Nonaka of the Japanese Hitotsubashi University in their article "The New New Product Development Game, written in 1986. In it, the development of the project was compared to the fight around the ball in rugby - a technique called "scrum". Companies are increasingly realizing that the old, sequential approach to developing new products simply won't get the job done. Instead, companies in Japan and the United States are using a holistic method – as in rugby, the ball gets passed within the team as it moves as a unit up the field (Hirotaka T., Ikujiro N., 1986).

At its core, Scrum is a set of product development management principles that allow you to present to the end user (and customer) a working product/prototype with new features and capabilities with the highest priority.

Scrum is a practice, which is incremental, and at the same time iterations are practiced while acting upon an appearing issue and adapting to then change in time and circumstances (Brinks H., Johnson P., 2019). It is characteristic that non-standard, dynamic and long-term projects, which are accompanied by a high degree of uncertainty about the final result, as well as a constant change of priorities, are not a problem for Scrum. Due to this, it is often used in the early stages, and only later they switch to the use of others methodologies, trying to save money and resources. In this regard, Scrum can be used by almost any type of organization - from start-ups with their high uncertainty to government customers with frequent changes in requirements and the frequent need to demonstrate the current version to report on the results. In addition, Scrum is focused exclusively on the customer, therefore, it considers only one factor as a goal - customer satisfaction with the results obtained.

It is worth noting that as companies grow in size, they lose flexibility - and this is a problem. Decisions are made longer, capacities are built up for a long time, it becomes more and more difficult to switch from product to product, the larger the company, the more dependent it is on large production batches. Such companies do not have the opportunity to see the needs of each client and adapt to them.

The competition is constantly growing and consumers no longer want to just buy a mass product, they want something special. Therefore, companies now need to adapt to the needs of each client. The ever-changing global market, spurred by the rapid development of developing markets and the appearance of new technologies, accelerated pace of most activities, from developing the new products to studying the consumers' feedback (Matyushok V., Krasavina V., Berezin A., Garcia J.S., 2021). The production processes have been functionally digitized during the last years, the next step in digitization that is being taken is the creation of smart interconnected factories, within manufacturing this is known as Industry 4.0 (Lemmens G., Noben S.). As Industry 4.0 is expanding more and more into practice, manufacturers are acquiring the technology that's driving the Agile evolution. Characteristics of Agile manufacturing include a customer-centric approach, a skilled workforce, rapid iteration, and continuous improvement of the company processes (Ciraldo J., 2021).

Let's single out a number of factors that force companies to apply agile methodologies.

2.1 High level of competition

The famous Hopkins triangle "fast - high quality - cheap", where you can choose only two points, no longer works. Today, customers want high quality, fast, and cheaper than others at the same time.
2.2 High rates of changes in the economic environment

Today it is impossible to predict what will be relevant on the market in the near future, long-term forecasts no longer work. The company has launched a new innovative product on the market - and old players have to pull their business up to new standards in the industry, otherwise you can be left behind.

2.3 Bureaucracy, sluggishness of companies

In large companies with a powerful bureaucracy, decision making is a very complex process that can negate any business transformation.

And here Agile enters the stage, whose main advantages are speed, adaptability and emphasis on the main thing. And periodic deliveries of a working product and a gradual increase in its functionality, along with the complete absence of bureaucratic delays, significantly reduce the time for obtaining the final result. For business, these are the most important indicators, since the rapid entry into the market provides many advantages.

Speaking about the advantages of Agile, it is important to note the disadvantages that are a direct consequence of them:

- reducing the importance of regulatory and technical documentation may lead to its irrelevance or even to the actual absence;
- short-term planning does not always take into account the need to scale the product, which leads to errors in the architecture;
- the emergence of new requirements after several iterations leads to fundamental changes in the architecture and reworking of already created solutions;
- accumulation of defects and a decrease in the quality of products due to solving problems in the simplest and fastest, but not always in the most correct way (Vichugova A., 2019).

Using Agile approaches in project management allows you to:

- increase the sales volume of products, and, consequently, the profit of the company, by identifying new markets and marketing strategies;
- reduce the costs of many business processes of the company;
- improve the quality of the product / service, according to the client's expectations and market requirements;
- increase labor productivity using non-material motivation systems (Non-material motivation of employees with the right management strategy can be a much more effective tool than financial incentives. There are a large number of methods of non-material incentives for staff: the provision of paid time off, additional vacation days; providing flexible working hours for employees; organization of corporate events; employee training; personal public praise; organization of competitions and quests among all employees; the possibility of continuous professional development; etc.) and talent management (Talent management is the systematic identification, involvement, development, retention and placement in the right positions of those employees who are valuable to the company: in terms of high potential (for the future) or criticality of their key positions for the business) in company.

Agile approaches integrate the best practices in the business and the talents of the organization, creating an environment conducive to mentoring, initiative, innovation, accountability, and achievement.


A trend regarding the manufacturing industry which has been prevalent over the last decades is the implementation of Lean Manufacturing. Industries have moved from the industrial age, towards the information/knowledge era (Uhl-Bien M., Marion R. & McKelvey B., 2007) and are now moving towards an agile era.

Agile organizations are different. Traditional organizations are built around a static, siloed, structural hierarchy, whereas agile organizations are characterized as a network of teams operating in rapid learning and decision-making cycles. Traditional organizations place their governance bodies at their apex, and decision rights flow down the hierarchy; conversely, agile organizations instil a common purpose and use new data to give decision rights to the teams closest to the information. An agile organization can ideally combine velocity and adaptability with stability and efficiency (Brosseau D., Ebrahim S., Handscomb C., Thaker S.).

In manufacturing, this concept is closely related to lean manufacturing. Its goal, as you know, is to achieve minimal labor costs, minimal terms for creating new products, guaranteed delivery of products to the customer just in time, high quality at minimal cost. Agile may include the concept of agile, but it also adds a new key factor - the idea that customer needs must be met quickly and efficiently.

Manufacturing has historically been slow to leave traditional methods behind. The industry is rooted in processes that date back to the first and second Industrial Revolutions, but companies are leveraging technology to develop more Agile capabilities (Ciraldo J., 2021).

In other words, the application of Agile in production is the transition of the company's lean manufacturing system into the digital era. However, digital transformation is a complex process. In order to adopt an agile way of working within the manufacturing industry, it is essential to overcome the resistance of change, this especially for the successfully middle-management. This could be achieved by creating awareness about the value of the practices of an agile way of working could create. This could be done by explaining the tools and values of agile as an extension to Lean principles and practices, which will help to point out the benefits (Brinks H., Johnson P., 2019).

The business benefits of an agile production system are multifold and add value on multiple levels:

The *individual worker* becomes a connected worker and gets personalized instructions on his personal device. Connected workers are empowered to work smarter and can solve potential problems in innovative ways. Through mobile training on the smartphone, continuous learning is enabled. Employees can pull a training session in line with customer needs and can self-train for new skills on-the-job.

For *teams*, increased collaboration usually results in better team performance. Teams are transformed into a Connected Workforce. Know-how sharing and supporting each other is facilitated. The automatic and flexible coordination of tasks allows working in larger and more diverse teams.

For *the company*, an agile production system results in increased factory output, better workforce utilization, operational flexibility, reduced production costs and increased customer satisfaction (WORKERBASE, 2021).
Since agile refers to the ability of a company to change its production to meet unforeseen changes in customer requirements, in addition to the benefits that this approach brings, there are a number of challenges:

- Sudden increase in demand (more than expected due to the liking of the new product) will cause shortage. Meanwhile if the demand of a product with a high production rate decreases drastically this could result in a number of products that could not be sold.
- To become an agile manufacturer the company will need to invest in trained and highly skilled labourers who are competent to be agile.
- The change in machinery to produce the new products requires high costs.
- Continuous need to keep the machinery and workers up-to-date to new technologies, and to keep the company competitive due to the short product life cycles.
- The complexity of the new machinery could lead to a higher increase in breakdown of the same machinery, which will lead to an increase in production down time.
- The maintenance to keep the machinery in good working condition increases the costs due to higher costs of the parts.
- Intensive planning and management of such systems is required, since a shift is being introduced from mass production ideology to agile manufacturing (Agile manufacturing).

Today, from startups to manufacturers with decades of history, companies are turning to agile design, development, and manufacturing to create innovative products at lower costs (MIT Technology Review, 2022). It has become the new way for manufacturing companies who want to secure their economic future. The agile way of working is giving engineering firms a new, powerful tool for handling the technical and organizational complexities in projects as well as the fast-paced product cycles by empowering employees, building self-organizing teams and following an iterative, feedback-driven approach where the customer always has a voice (Neumeyer A.).

Companies from the manufacturing industry seem to recognize and verify the trends introducing the agile era, whereas they indirectly suggest to recognize the importance to become more adaptive (Brinks H., Johnson P., 2019).

3 Conclusion

As more manufacturers adopt agile management practices, it's clear that this methodology, pioneered for software development, can be applied to manufacturing plants as well. In recent years, manufacturing companies have faced incredible challenges: they need to be able to quickly respond to extreme fluctuations in demand, find solutions to problems in supply chains, and focus on disruptive products that have entered the market. Companies need to adapt and evolve in the face of uncertainty. From small start-ups to large enterprises, agile management approaches can help companies transform to remain competitive regardless of market conditions. Overall, applying agile methodologies should be a priority for every manufacturer.

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