

Електронний журнал «Ефективна економіка» включено до переліку наукових фахових видань України з питань економіки (Категорія «Б», Наказ Міністерства освіти і науки України № 975 від 11.07.2019). Спеціальності – 051, 071, 072, 073, 075, 076, 292.
Ефективна економіка. 2024. № 1.

DOI: <http://doi.org/10.32702/2307-2105.2024.1.48>

УДК 33.65.005

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EFFECTIVENESS OF AGILE MANAGEMENT IN THE PRODUCTION CHAIN MODEL

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ЕФЕКТИВНІСТЬ AGILE-МЕНЕДЖМЕНТУ У ВИРОБНИЧІЙ ЛАНЦЮГОВІЙ МОДЕЛІ

In practice, various production chain model types have been formed and successfully operated, the characteristics of which gradually become more complex. Considering the outlined specificity, Agile management has become a main component of modern production chain models, constantly adapting to their increasing complexity and changes in the business environment. By the outlined relevance and research issues, the article's purpose is to study the specifics of the formation and system of views on the effectiveness of Agile management in the production chain model. The research results indicate that assessments of the effectiveness of Agile management in the production chain model can vary, depending on the specific requirements and characteristics of each model. Thus, the conclusion is drawn that if flexibility and the ability to adapt quickly to changes are crucial, the perspective on the effectiveness of Agile management is directed towards these flexibility features in the production chain model. If it is crucial to rapidly release new product versions and gradually improve them, the perspective on the effectiveness of Agile management is determined by its ability to provide inertia and incremental development in the production chain model. If a clear understanding of customer requirements and rapid decision-making is crucial for the production chain model, the effectiveness of Agile management is determined by transparency and the level of interaction in the client-provider format. If achieving production goals and involving customers in determining priorities is crucial for the production chain, Agile effectiveness is focused on integrating customers into the development process. If maintaining a culture of continuous improvement or optimizing specific processes is crucial for the production chain model, the perspective on the effectiveness of Agile management is focused on the characteristics of their continuous improvement. Further research perspectives involve forming a theoretical foundation for the subsequent study of the impact of Agile management on specific efficiency indicators in various production chain models.

У практиці формуються та успішно функціонують різні типи виробничих ланцюгових моделей, характеристики яких поступово ускладнюються. Враховуючи виокремлену специфіку, Agile-менеджмент наразі є важливою складовою сучасних виробничих ланцюгових моделей, що постійно адаптується до їх зростаючої складності та змін у бізнес-середовищі. Відповідно до

наведеної актуальності та дослідницької проблематики, метою статті є вивчення специфіки формування та змісту поглядів на ефективність Agile-менеджменту у виробничій ланцюговій моделі. Результати дослідження свідчать про те, що погляд на ефективність Agile-менеджменту може бути різноманітним, оскільки він формується в залежності від конкретних вимог та особливостей виробничої ланцюгової моделі. Зроблено висновок, що якщо важлива гнучкість та здатність швидко адаптуватися до змін, то погляд на ефективність Agile-менеджменту спрямований на ознаки гнучкості виробничої ланцюгової моделі. Якщо важливо швидко випускати нові версії продуктів та поступово їх вдосконалювати, то ефективність Agile-менеджменту визначається здатністю забезпечити інерційність та інкрементальний розвиток виробничої ланцюгової моделі. Якщо важливе чітке розуміння вимог замовників та швидке прийняття рішень, то ефективність Agile-менеджменту виробничої ланцюгової моделі визначається її прозорістю та рівнем взаємодій у форматі «клієнт-виробник». Якщо для виробничої ланцюгової моделі важливе досягнення виробничих цілей та активна участь замовників у визначенні цільових пріоритетів, то погляд на ефективність Agile-менеджменту спрямований на інтегрованість замовників у процес розробки кінцевого продукту. Якщо для виробничої ланцюгової моделі важливе підтримання культури безперервного вдосконалення або оптимізація окремих процесів, то погляд на ефективність Agile-менеджменту спрямований на ознаки їх постійного вдосконалення. Враховуючи зміст сформованих положень, подальші перспективи дослідження полягають у формуванні теоретичної бази для подальшого вивчення впливу Agile-менеджменту на конкретні показники ефективності в різних виробничих ланцюгових моделях.

Keywords: Agile tools; Agile methodologies; production operations; iterations in work.

Ключові слова: Agile інструменти; Agile-методології; виробничі операції; ітерації у роботі.

Target setting. Currently, there is a growing trend towards the development of production chain models that function as complex structures focusing on the processes of organizing the production and supply of products, goods, or services. These models are oriented towards the stages from the initial production phase to delivering the production results to the end consumer. It is important to note that currently, various types of production chain models have formed and are successfully functioning in practice, and their characteristics are gradually becoming more complex. This complexity can vary depending on the specific industry, business model, or type of production. An important aspect is the emphasis on the staged nature of production. Additionally, some companies may employ a hybrid approach by combining various Agile methodology tools with the structure of the cascade model for specific aspects of their production process. Considering the outlined specificity, Agile management has become an essential component of modern production chain models, constantly adapting to their increasing complexity and changes in the business environment.

Analysis of research and publications. Currently, the challenges of Agile management in the production chain model are thoroughly explored by Yakubenko I. M., Kopishynska K. O., Bezdolna O. A., Mokhonko G. A. Significant contributions to the analysis of Agile tools have been made by Khomych O. V., Artemenko L. P. It is also worth noting that Christopher M. has made a substantial contribution to the identification and description of approaches to Agile management and the specifics of combining Agile methodology tools. However, in the current dynamic environment, it is crucial not only to focus on the methodology or individual Agile tools but also on the systematic analysis of the effectiveness of Agile management in the production chain model. It is because the existing Agile methodology is becoming increasingly unique, effectively incorporating adaptive, iterative, communicative, goal-oriented, optimization-oriented, cyclical approaches, and a self-organizing approach simultaneously. It is achieved through the flexibility inherent in its associated tools.

The wording of the purposes of article (problem). By the relevance and research issues, the purpose of the article is to study the specifics of the formation and

the system of views on the effectiveness of Agile management in the production chain model.

The paper main body with full reasoning of academic results. Certainly, it's important to highlight that a multitude of companies spanning diverse economic sectors leverage production chain models to structure their manufacturing operations and product or service supply. Prominent examples encompass Toyota, Apple, Procter & Gamble (P&G), General Electric (GE), and Zara (Inditex). The specificity of these models, as outlined in Table 1, entails variations in types and structures influenced by industry, company size, regional characteristics, and other factors.

Table 1. Analysis of the typology and structures of the production chain model

Company	Type of production chain	Structure of the production chain
Toyota	The production chain is based on the concepts of Lean Manufacturing	It can be divided into several key stages production planning and development (production begins only after receiving an order from the customer); quality assurance (detecting anomalies or defects in the production process, automatic production stoppage, and issue resolution before resuming operations); organization of production processes (continuous improvement); optimization of the workforce (individual units); delivery and logistics (involves delivering components and materials to production only when needed); personnel management system (initiatives for improvement).
Apple ta Procter & Gamble (P&G)	integrated global supply chain	It can be divided into several key stages research and development of production, suppliers, and logistics (collaboration with various component suppliers worldwide, manufacturing in large factories, quality control - each device undergoes compliance checks with company standards), storage and distribution (products are stored in warehouses and distributed to different regional and local markets), retail (products are sold through company-owned retail stores, online shops, as well as through partners and authorized dealer networks). The Apple chain also includes a service and maintenance stage (at this stage, post-sales services, repairs, and device upgrades are provided through official service centers and authorized service partners).

Продовження таблиці 1.

Company	Type of production chain	Structure of the production chain
General Electric (GE))	Hybrid and extended production chain that can combine various elements and manufacturing methods to achieve optimal productivity and efficiency.	The process can be divided into several main stages research and development (development of new energy technologies, medical equipment, transportation systems, etc.), production and manufacturing of components (in-house production units or collaboration with suppliers for manufacturing various components, including turbines, medical equipment, aircraft, etc.), assembly and packaging (components can be assembled and arranged into finished products in large factories or assembly lines), quality control (each device undergoes compliance control with company standards), supply and logistics (working with suppliers and logistics partners to manage the supply chain and product delivery); retail (products may be sold through company-owned official outlets, distributors, or through partners in different regions); and services and maintenance (after-sales services, repair, and the modernization of their equipment).
Zara	"Fast Fashion"*	Currently, it can be divided into several key stages short production cycles (transition from the concept of new design to product release), vertical integration (many production stages are located within the company or controlled by Inditex partners (owner of Zara), including design, manufacturing, logistics, and distribution), volume distribution (production is limited to create an impression of exclusivity and increase demand), integrated logistics (in-house logistics system allowing rapid movement of goods from production to stores worldwide), and absence of ready-made stocks.

Note: / * Differs from traditional models in that, through short production cycles, it enables the brand to quickly respond to the latest fashion trends and promptly release new collections.

Source: formed based on [4]

Note that these are just a few examples. Currently, numerous companies utilize diverse and sometimes unique production chain models to optimize operations and achieve strategic goals. Considering the given statements, the diversity in production chain models and their management approaches tailored to each company's individual needs and strategies indicates increasing adaptability and flexibility. It enables a timely, high-quality, and operationally efficient response to changes in the business environment. Thus, Agile management in the production chain model is oriented towards an increasingly broad spectrum of approaches, including adaptive, iterative, communicative, goal-oriented, optimization-focused, cyclical, and directed towards self-organization. It is because, in Agile, there is no single approach that prescribes to the owner of the production chain model the ways for the most optimal utilization of available tools for the effective implementation of adaptive and iterative approaches

(including communicativeness, goal setting, process optimization, cyclic improvement, and fostering self-organization within the team, etc.). Moreover, they are not needed to that extent (as the management needs of owners of such a model are unique, and perspectives on their effectiveness are inconsistent).

Note that each of the Agile management approaches in the production chain model is a structure that operates under a flexible set of similar Agile tools (including Scrum, Kanban, Extreme Programming (XP), Lean Thinking, Feature-Driven Development, Crystal, Agile Modeling), as illustrated in Table 2.

Table 2. Characteristics of approaches to Agile management in the production chain model

Approach	Characterization of the approach	Specifics of forming and applying the approach
Adaptive	Agile seeks to create a management system that easily adapts to changes in the business environment, market requirements, and strategic goals of the production chain model. Teams must be prepared to quickly respond to changes and adapt to new circumstances.	composed based on their capabilities to maximize efficiency (these capabilities are ensured by a flexible set of similar Agile tools*). applied based on their capabilities to maximize efficiency. oriented towards varied perspectives on the effectiveness of Agile management.
Iterative	Agile utilizes iterations in the operation of the production chain model, where each cycle is intended to address a specific portion of tasks. This enables faster delivery of results and allows for changes based on learning throughout the development process.	
Communicative	Effective communication is key to Agile. Regular meetings, stand-ups, and other communicative practices help prevent misunderstandings and ensure understanding among all project participants.	
Goal-oriented	Agile sets clear goals and priorities for each iterative cycle. Teams focus on delivering specific value to the business and end-users.	
Optimization-focused	Agile strives for continuous improvement. Regular retrospectives allow teams to analyze their work and refine processes to enhance productivity.	
Cyclical	Agile uses iterative cycles for the continuous release of new versions of the product or its increments. This enables companies to quickly respond to changes and make improvements to the product at each stage.	
Self-organization	Agile encourages team self-organization by providing them the freedom to choose the path to achieve set goals and make decisions.	

Note / * The tools: Scrum, Kanban, Extreme Programming (XP), Lean Thinking, Feature-Driven Development, Crystal, Agile Modeling

Source: formed based on [1-3; 5]

The data presented in the table indicate that each approach is composed of a specific set of tools, applied based on the needs and capabilities to maximize efficiency, as interpreted by us through the ability to achieve strategic goals and optimize production, logistics, and other processes in the production chain model. For example, the Scrum tool can be used to launch production or logistical iterations, typically lasting 2 to 4 weeks, forming small, self-contained teams working in sprints (i.e., the team's work lasts for 2 to 4 weeks), creating a facilitator who helps the team implement Scrum in the breakdown of the final product or addressing a specific production problem [4]. The Kanban tool can be used to track a set of production or logistical tasks on a board, where each card represents a separate task, to limit the number of tasks that can be in progress simultaneously, or to define metrics for measuring the speed of task movement through the system [1-2]. Extreme Programming can be used for product development by two manufacturers to improve its quality or ensure compliance with customer requirements. Lean Thinking can be used to eliminate waste, unevenness, and overload in the production process or analyze a specific workflow to identify and eliminate unnecessary steps [3; 6]. Feature-Driven Development (FDD) is used to define the structure of a specific production program, distribute production functions, or allocate responsibilities for producing a product among factories based on their expertise. Crystal can be used to adapt to different projects and teams based on customer or market requirements to facilitate self-assessment and improvement of teamwork in a specific direction [6]. Agile Modeling is used to create diagrams and interaction models within a team, engaging stakeholders in the modeling process. These tools are just a few among many that are variously composed and utilized in Agile management [4-5].

The format of composing and using these tools depends on the accepted view of Agile management effectiveness in the production chain model (Figure 1).

If the production chain model must adapt quickly to changes in the business environment, market requirements, and technological innovations, the perspective on the effectiveness of Agile management is focused on the flexibility features of such a

model, particularly how responsive it is to changes in demand, the competitive environment, and other factors.

If it is crucial for the production chain model to quickly release new product versions to the market, gradually improving them, the perspective on the effectiveness of Agile management is focused on characteristics of inertia and incremental development. This initiates and progressively alters the process iterations for the step-by-step enhancement of the product.

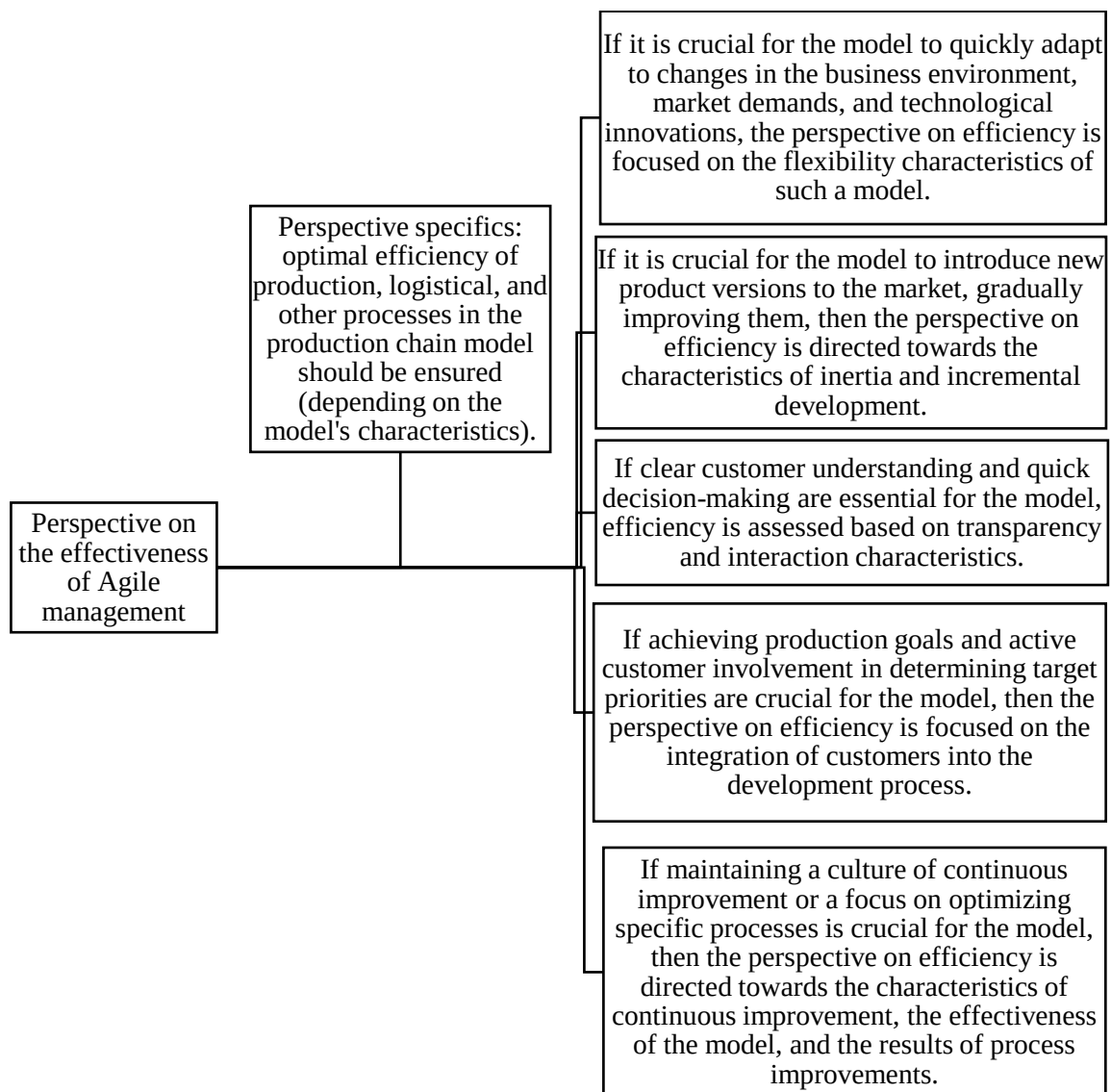


Figure 1. Possible perspectives on the efficiency of Agile management in the production chain model

Source: formed based on [2; 5-6]

If a clear understanding of customer requirements and rapid decision-making is crucial for the production chain model, then the perspective on the efficiency of Agile management is focused on transparency and interaction characteristics (as effective and frequent communication within the team and with stakeholders is essential).

If achieving production goals and active customer involvement in determining target priorities are crucial for the production chain model, then the perspective on the efficiency of Agile management is directed towards the integration of customers into the development process, which is the foundation of the model.

If maintaining a culture of continuous improvement or a focus on optimizing specific processes is crucial for the model, then the perspective on efficiency is directed towards the characteristics of continuous improvement, the effectiveness of the model, and the results of process improvements.

Therefore, overall, the efficiency of Agile management in the production chain model is determined by the company's ability to quickly respond to changes, maintain a high level of product quality, and ensure a high level of customer satisfaction.

According to the perspectives on the effectiveness of Agile management in the production chain model, its pyramid is quite diverse in terms of characteristics related to the optimization of production, logistics, and other processes, as exemplified by Zara and General Electric (GE) (Figure 2).

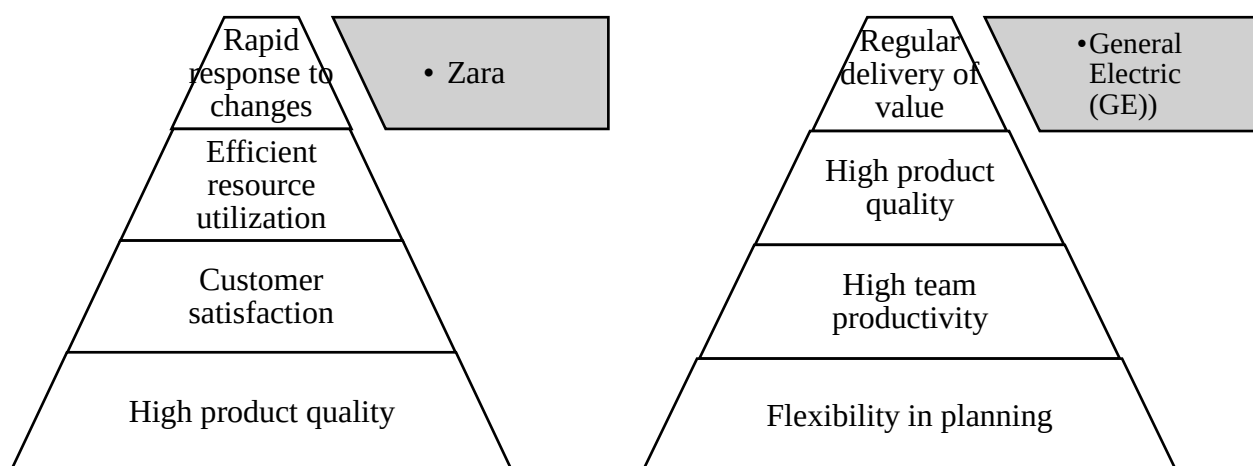


Figure 2. The pyramid format of Agile management effectiveness for Zara and General Electric (GE) based on the characteristics of the optimization of production, logistics, and other processes.

Source: formed based on [4]

According to Figure 2, it can be noted that some of these characteristics include [4]:

1. Responsiveness to changes is present if an Agile team can quickly adapt to changes in market demands, technologies, or company strategy.
2. Regular delivery of value in the production chain model is achieved when each participant in the chain can adjust their activities to the release of new versions of products or services that bring real value to users.
3. Customer satisfaction is present if Agile processes ensure the satisfaction of the needs and expectations of customers and end users.
4. High product quality is present if Agile processes ensure high-quality standards and the conformity of the final product in the production chain model to these standards.
5. Effective resource utilization is present if there is optimal use of resources (particularly if unproductive expenditures are absent).
6. Flexibility in planning is present if Agile processes ensure the agility of management teams to easily adapt (in terms of planning) to changes in project conditions or the business environment.
7. High team productivity is present if Agile processes contribute to the creation of highly productive teams.
8. Team self-organization capability is present if Agile processes contribute to the creation of teams capable of making decisions and solving production, logistical, integration, and other tasks independently, ensuring flexibility and speed of execution.
9. Regular process improvement is present if Agile teams systematically monitor improvement opportunities and implement changes.
10. Open and effective communication is present if Agile processes contribute to creating communication that ensures clarity and interaction among all participants in the model chain.

In fact, in any format, effectiveness pyramids in the production chain model ensure the alignment of its core processes (production, logistics, and others).

Conclusions from this study and prospects for further exploration in this area. The research results indicate that assessments of the effectiveness of Agile

management in the production supply chain model can vary depending on specific requirements and characteristics of each model. Thus, the conclusion has been drawn that:

1. If flexibility and the ability to adapt quickly to changes are crucial, then the assessment of Agile management's effectiveness is focused on these flexibility features in the production supply chain model.
2. If it is important to quickly release new versions of products and gradually improve them, the effectiveness of Agile management is determined by its ability to provide inertia and incremental development in the production supply chain model.
3. If a clear understanding of customer requirements and quick decision-making is important for the production supply chain model, then the effectiveness of Agile management is determined by transparency and the level of interaction in a customer-producer format.
4. If achieving production goals and active customer involvement in defining target priorities are crucial for the production supply chain model, then the focus on the effectiveness of Agile management is directed towards integrating customers into the final product development process.
5. If maintaining a culture of continuous improvement or optimizing specific processes is essential for the production supply chain model, then the perspective on the effectiveness of Agile management is aimed at the characteristics of their continuous improvement.

The further research perspectives involve establishing a theoretical foundation for the subsequent study of the impact of Agile management on specific performance indicators in various production supply chain models.

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Стаття надійшла до редакції 12.01.2024 р.