Strategic management of industrial enterprise digital maturity in a global economic space of the ecosystem economy

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Abstract. Most traditional businesses are now in the early stages of a digital transformation process that is essential to stay competitive. One of the distinctive features of the digital environment is the development of ecosystems that change the established rules of competition and business conduct, and break down the boundaries between industries. Therefore, the purpose of this article is to explore the possibilities and formulate recommendations for the use of business ecosystems as a strategic factor in the development of traditional industrial enterprises. The analysis of research in the field of creation and functioning of business ecosystems was carried out, the features and strategic advantages were highlighted. It was shown that the business ecosystem is only one of the successful management models in the digital economy. The factors of choosing the preferred model are picked out: the stability of the industry, the features of the value proposition and the level of coordination of partner companies required for its creation. The necessity is noted and clarification of some provisions in the field of strategic management as a methodology for managing the development of industrial enterprises (in terms of the limited scheduling, modular and "two-speed" format of the digital transformation strategy) is formulated. The characteristics of models for assessing the digital maturity of an enterprise as a tool for managing its development are given. In the context of the growing role of business ecosystems in economic development, it is proposed to supplement such model with a block for assessing the readiness of an enterprise for partnership. A model of strategic management of enterprise development in a digital environment has been developed based on an assessment of the gap in terms of digital maturity.

1. Introduction

Despite the great successes known to us today, most organizations are just in the beginning of the digital transformation path. So, according to [12], only 15% of companies have digital technologies implemented in more than half of their processes. About 20% of firms practically do not use these technologies at all. The remaining two-thirds of firms generate only 10-15% of their revenues from digital technology. At the same time, there is a strong correlation between the use of digital technologies and financial results: those 20% of companies that do not implement digital innovations have negative revenue growth rates and a decrease in EBITDA of up to 8% per year.

On the other hand the initial stages that are the most problematic, as noted in the study [3], it is. Digital transformation is significantly more complex than traditional management changing programs.
It is estimated [10] that only 5% of those companies that initiated digital transformation believe that they have met or exceeded the established expectations (compared to 12% of success for traditional transformations). At the same time, 95% of directors of large Western enterprises and 88% of Russian companies believe that a technological breakthrough presents more opportunities than threats. CEOs of Russian companies expect the following results from digital transformation: increased productivity and efficiency of processes (77%), reduced costs (60%), increased innovation (43%), and the emergence of new channels of interaction with customers (34%) [9]. Therefore, studying of the factors, concepts and tools that ensure the success of digital transformation for traditional (non-digital, or defensive) enterprises is an urgent task.

The last decade has attracted special attention of both researchers and practitioners to the creation and development of ecosystems that not only demonstrate maximum growth rates (according to the BCG Henderson Institute [16], 7 out of 10 largest companies in the world use the concept of ecosystems - Alphabet, Amazon, Apple, Facebook, Microsoft, Alibaba and Tencent), but also pose a significant threat to entire industries, breaking down traditional barriers between them and causing "tectonic" shifts. According to research conducted by analysts at Accenture [20], 76% of business leaders surveyed agree that current business models will be unrecognizable over the next 5 years, and ecosystems will be the main driver of change. In this regard, it is noted that ecosystems represent a new way of organizing economic activity, and the term “ecosystem economy” is also used [18].

However, the business ecosystem is not the only successful governance model in the digital economy. In addition, different formats of application and interaction with ecosystems are possible. Therefore, the purpose of this article is to explore the possibilities and formats of using business ecosystems to increase the competitiveness of traditional industrial enterprises in the digital environment.

2. Business ecosystem: entities, types, participants

Today there is no unambiguous definition of an ecosystem. A detailed analysis of various areas of research in this area was carried out in [14]. Here are some complementary definitions that reveal the essence of the business ecosystem:

- a dynamic and collaboratively evolving community of diverse actors creating a new value through increasingly productive and complex models of collaboration and competition [24];
- a network of cross-industry players who work together to define, create and implement market solutions for customers and consumers [20];
- a new way of organizing additional goods and services, in which many companies participate, cooperating and competing with each other to offer a complex product or service [18];
- a dynamic group of largely independent economic players who create products or services that together constitute an agreed solution. Each ecosystem is characterized by a specific value proposition (desired solution) and a well-defined, albeit changing, group of actors with different roles [21].

The rapid development of ecosystems became possible only with the advent of digital technologies. The features of digital business ecosystems include:

- ecosystems have a clear focus on creating value for customers in the form of an integrated solution that no company can provide separately;
- Ecosystems consist of several organizations interacting through a network of fluid, semi-permanent relationships linked by flows of data, services and money. At the same time, relations have the character of competition and cooperation at the same time;
- the strength of the ecosystem lies in the fact that no one participant (player) needs to own or manage all the components of the solution, and that the value that the ecosystem generates is greater than the total value that each of the participants can contribute individually;
- ecosystems use network effects, which allows them to quickly scale;
- in ecosystems, participants are constantly and jointly developing, and along with this, the ecosystem as a whole is developing. The strategic advantages of using ecosystems are following: an access to a wide range of opportunities, the ability to quickly scale, as well as flexibility and
sustainability [21]. Therefore, McKinsey analysts conclude that for traditional (defensive) enterprises, the ecosystem is a way to maintain a competitive position in business and to resist challenges from digital competitors [24].

However, research shows that the ecosystem is not the only successful governance model in the digital economy. Like any other model, it has certain problems (the problem of limited control and the resulting problem of determining the optimal level of openness for the ecosystem, the problem of capture of value, as well as problems of a subjective nature associated with the unwillingness of companies to partnership). According to research by the BCG Henderson Institute, less than 15% of the 57 ecosystems studied were sustainable in the long term [16]. One of the options for the typology of business models that are successful in the digital economy is shown in Figure 1 [21].

![Figure 1. Digital business model typology [21].](image)

The classification criteria are:
- modularity, reflecting the ability of the components of a product or service, as well as the companies involved in their creation, can be easily combined with each other;
- the level of coordination, which determines the necessary degree of control of the companies involved in the creation of the product (service).

The ecosystem is the preferred management model in the following cases [21]:
- for unpredictable but highly malleable business environments that require collaboration with other companies to share risk, provide additional opportunities and quickly build a new market before competitors mobilize, or when industry boundaries are already changing;
- there are promising areas of development that an enterprise can explore and use (for example: the use of blockchain technologies or artificial intelligence in a "non-digital" business);
- the individual components of the solution can be easily and flexibly combined, but a sufficiently high level of coordination is required to identify the necessary partners, as well as to coordinate their actions;
- if you can take advantage of access to external capabilities to ensure the growth of your flexibility and scaling.

As can be seen from Figure 1, there are two main types of ecosystems: a centralized ecosystem, usually represented in the format of a digital platform, and a solution ecosystem, or an adaptive ecosystem. Centralized ecosystems are successful when industry boundaries are stable and the problem (the basis for customer value creation) can be clearly defined. Responsive ecosystems are more flexible. They form when industry boundaries change and there is an opportunity to create new value through the use of digital technologies.

Ecosystem actors play different roles (Table 1).

| Lyman et al. [20] | The ecosystem playbook [24] | Pidun et al. [21] |
|------------------|-----------------------------|------------------|
The most important from the standpoint of creating a successful ecosystem is the role of an orchestrator, which not every company can handle. At the same time, for many companies, being a supplier or complementor (participant) in a business ecosystem can be the most attractive role, moreover, there is an opportunity to participate in more than one ecosystem.

The decision to create a business ecosystem, or to participate in it, belongs to the class of strategic ones, since it can have a significant impact on the competitiveness of an industrial enterprise in the future.

3. Methodology for managing industrial enterprise development in a digital environment

Strategic management acts as a development management methodology. Since digital technologies have led to significant changes in the operating environment of companies, an increasing number of researchers note the need to adjust a number of key provisions of strategic planning [8]. The study [3] shows that several postulates were formulated regarding the necessary changes. First of all, this concerns the binding of the strategic planning process to certain periods of time. This approach fails to ensure success in a rapidly changing, turbulent digital environment. Enterprise strategy, in essence, should be both relatively stable and flexible at the same time. This contradiction has always been one of the key ones in strategic planning. The strategy cannot be limited to the listing of fixed sequential steps, implemented in the foreseeable future by order. It must be perceived as a living, breathing process [3]. In an ever-changing digital world, strategy is not something that can be determined every three to five years, it is a “moving target”, it must be constantly updated, so its development is never completed [15]. Thus, Agile technologies become not only a tool for implementation, but also for strategy development. The resolution of this contradiction is also possible through the use of the modular principle of building a strategy [5], which is based on the well-known classification of strategies into corporate, business strategies and functional.

The strategy is the main tool for ensuring the success of digital transformation [17]. It is it which ensures the integrity of the approach as opposed to the implementation of local, often loosely connected projects for the introduction of digital technologies that are not able to provide significant competitive advantages. The strategy sets the focus for business transformation, which allows us to prioritize digital technologies and projects. The essence of the digital transformation strategy is to use digital technologies as a tool that provides a winning position for a firm in its industry, possibly changing the industry itself [11]. Since the process of digital transformation of an industrial enterprise is quite long, it will be largely traditional areas of activity to support its functioning and ensure investments in development during this period [2]. However, managing digital and non-digital activities requires different approaches. Therefore, as it happened with the introduction of IT systems before, it is expedient to use a “two-speed” (bimodal) approach to the formation of an enterprise strategy, which involves taking into account the specifics of fundamentally different types of activities [5].

The study [13], based on the analysis of activities and surveys of more than 2000 companies from various industries and countries, identifies six types of strategies that allow various enterprises to successfully operate in the digital environment: Platform play, New marginal supply, Digitally-enabled products and services, Re bundling and customizing, Digital distribution channels, Cost efficiency. The first three are mostly offensive, targeting new demand, new supply, or new business models. The second three are defensive in nature, as they aim to improve what the company is already doing. At the same time, a clear pattern was revealed: the bolder the digital strategy, the greater the likelihood of a successful digital transformation.
The transformation of traditionally established industries as a result of ecosystem development allowed M. Jacobides to conclude that in an increasing number of sectors the firm and even the industry have ceased to be significant units of strategic analysis. Instead, the focus needs to be on competition between digital ecosystems that transcend traditional industry boundaries and change the very nature of competition. Competition is increasingly associated with the search for new ways of cooperation and interaction, and not just with the proposal of alternative proposals. Therefore, for many midsize companies, the key strategy is to embed into many ecosystems [18].

According to [10], the digital transition brings together different management practices, linking strategy development with its execution, using cross-functional collaboration and constantly adapting. To address the dilemma between focusing on future success and the need to adapt to an uncertain and volatile external environment, there are a number of principles and approaches in the digital transformation management arsenal:

- the "fail fast" principle, which implies the fastest possible rejection of initiatives that have turned out to be unsuccessful;
- the concept of step-by-step development (stepping-stones) [19], when a bold vision of how digital innovation can change the industry over time is combined with a set of short-term, highly effective initiatives that allow us to move step by step towards the digital future. These steps are organized in successive waves, each of which moves to a predetermined point on the horizon, adapting to changing conditions and opportunities and re-evaluating what is most promising;
- "pilot projects” practices with their subsequent scaling in case of success.

With all the features that are inherent in the digital transformation strategy of an enterprise [7], it should still focus on the formation of competitive advantages of the enterprise, which implies the effective use of existing ones and the development of those that are missing. To assess the success of the company's movement along the path of digital transformation and as a tool for determining priority areas for further development, digital maturity models of the enterprise are used. Comparative characteristics of a number of used models are shown in Table 2.

**Table 2. Models for assessing the level of digital maturity of an enterprise.**

| Model name                        | Developer                        | Key areas of assessment                                                                 |
|-----------------------------------|----------------------------------|----------------------------------------------------------------------------------------|
| Digital Transformation Index (DTI)| Arthur D. Little                 | Digital Transformation Framework: a) Strategy & Governance; b) Products & Services; c) Customer Management; d) Operations & Supply Chain; e) Corporate Services & Control; f) Information Technology; g) Workplace & Culture. |
| Digital Maturity Model (DMM)      | Deloitte                         | 5 core dimensions: Customer, Strategy, Technology, Operations and Organisation & Culture. The 5 core dimensions are divided into 28 sub-dimensions, which in turn breakdown into 179 individual criteria on which digital maturity is assessed. |
| Digital Acceleration Index (DAI)  | DigitalBCG                      | 4 building blocks: Business strategy driven by digital, Digitize the core, New digital growth, Enablers |
| Digital Maturity Model 4.0        | Forrester                        | 4 key areas: Culture, Technology, Organization and Insights                               |
| Digitization Piano                | Global Center for Digital Business Transformation, an IMD and Cisco Initiative | Similar to 7 notes, 7 Transformation Category are highlighted, constituting the most important elements of the organization's value chain: Business Model, Structure, People, Processes, IT Capability, Offerings, Engagement Model. |
To determine the most priority areas for development, it is necessary to assess the digital divide in two dimensions:
- compared to key competitors and market leaders;
- regarding the "model of organization of the future", that is, those conditions and factors that will determine the company's competitiveness in the long term.

4. Model of strategic management of industrial enterprise digital transformation based on digital maturity assessment

The three-phase model of digital transformation, developed jointly by IMD and Cisco, is the most common and visible today. At each of the phases, you need to get an answer to one key question: 1 - why transform, 2 - what to transform and 3 - how to transform. The implementation of each stage requires the selection of appropriate methods and tools [4]. The model of strategic management of the digital transformation of an enterprise based on the assessment of digital maturity is shown in Figure 2.

![Figure 2. Model of strategic management of industrial enterprise digital transformation based on digital maturity assessment.](image-url)

Enterprise digital maturity models reflect the main drivers and directions that require transformation to ensure the success of digital transformation [1]. A comparative analysis of the models presented in Table 2 showed that the most frequently considered key areas for assessing digital maturity are: 1) strategy and business model, 2) consumers, 3) organizational culture and personnel, 4) operational processes, 4) IT [4]. In this case, the following should be noted.
Firstly, an enterprise's digital maturity and strategy are two-way. On the one hand, digital transformation should ensure the future competitiveness of an enterprise in a dynamic and uncertain environment. Based on this, the target level of digital maturity of the enterprise is determined. On the other hand, when developing a strategy, it is necessary to take into account the current level of digital maturity, which determines the size of the strategic gap and allows to determine priority areas and development projects [6].

Secondly, setting targets for the long term has always been challenging. However, the high speed and non-linear nature of the changes taking place today have made it even more difficult. Typically, the “point on the horizon” that defines the goals of digital transformation is determined by the CEO based on the work of a specially organized group. For this, not only a wide arsenal of methods of analysis and forecasting is used, including analysis of big data, but also a vision of the future enterprise based on weak signals is being developed [3, 10, 19]. In addition, when determining the target level of digital maturity, it is necessary to assess the size of the gap so that the developed strategy and plans are, albeit ambitious, but realistic.

Thirdly, the key condition for the competitiveness of an industrial enterprise in a digital environment is the speed of a decision-making [22]. To reduce the time to overcome the digital divide, various approaches can be used:

- cooperative models, including the possibility of participation in ecosystems discussed above;
- the concept of minimum viable product (minimum viable ecosystem).

Considering the previously justified need to analyze and assess and the possibility of applying the business ecosystem model by the enterprise, it is proposed to include in the digital maturity assessment model one more area that characterizes the enterprise's ability to work together: the creation of cooperation (partnership). As a basis, we can take the Ecosystems Capabilities Index developed by Accenture [15], which assumes an assessment of six aspects: vision / strategy, culture, talent management, partnership architect, technology fit and innovation.

Partly these aspects coincide with the traditional directions for assessing digital maturity (strategy, culture and technology, talent management can be included in the direction of "personnel"). Taking into account the fact that within each direction a corresponding system of indicators is formed (for example, in the Deloitte DMM digital maturity assessment model, five main dimensions are divided into 28 sub-dimensions, which, in turn, combine 179 evaluation criteria), there are two options for assessing:

- to evaluate the index of ecosystem capabilities for all selected aspects, excluding duplication of indicators with other aspects;
- to supplement the composition of the estimated indicators for duplicated areas based on their characteristics from the standpoint of ecosystem capabilities.

Thus, ensuring the competitiveness of industrial enterprises in the digital environment requires the implementation of appropriate transformations. The success of such transformations is largely determined by the digital transformation strategy, which sets key priorities and ensures the completeness and consistency of digital projects implemented by the enterprise. An effective tool for prioritization is a model for assessing the level of digital maturity of an enterprise. To take into account the increasing role of ecosystems in economic development and the possibility of an enterprise's participation in one or more ecosystems, it is proposed to determine the readiness of an enterprise for partnership as a part of an assessment of digital maturity.

5. Conclusion

1. In the digital environment, strategic management as a methodology for managing enterprise development is undergoing certain changes. Instead of tying strategic decisions to specific time periods, strategy becomes a flexible and lively tool that integrates development and execution. The basis for developing a strategy is the assessment of the gap in the level of digital maturity of the industrial enterprise between its current and target values.
2. Strategic analysis shifts the focus from individual companies to competition among digital ecosystems, which often break down traditional industry boundaries. The very nature of competition is also changing: mechanisms of interaction and cooperation are beginning to play an increasing role.

3. Considering the growing role of business ecosystems in economic development, developing a successful digital transformation strategy requires analysis and decision-making on the creation and/or use of ecosystems in order to strengthen the competitiveness of the enterprise. Since the ecosystem represents only one of the successful business models of the digital economy, the first step is deciding whether to use it. The next step is to choose an ecosystem role role (orchestrator or participant). As practice shows, for most enterprises, the most preferable role is the role of a partner or supplier. The third step is choosing one or more ecosystems in which the enterprise can participate.

4. Each ecosystem is characterized by its own level of openness, while certain requirements may be imposed on the ecosystem participants. To meet such requirements, it is proposed to supplement the model for assessing the digital maturity of an industrial enterprise with a group of indicators characterizing its ability to partner.

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