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# The roles of top management in digital transformation

Evgenii Artemenko <sup>1</sup>

<sup>1</sup> Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russian Federation

E-mail: Evg\_art@mail.ru

**Abstract.** Digital transformation denotes the final stage of coverage with digital technologies – from digital competence through digital consumption to digital transformation. Digital economics is based on deep integration of business and IT strategies. Digital transformation is a change in business processes based on data analytics. Not external resources, as it was believed earlier, become, however, the main source of these data, but a company's internal processes. Apart from the technologies, the key factor of a successful digital enterprise is people. It is human capital that acts as the main resource when forming a business model based on data. Conventional IT models can no longer meet the growing digital necessities of business. Big data analytics departs from IT divisions and ceases to be a prerogative of CIO. The key objective of Chief Digital Officer (CDO) is corporate restructuring, formation of the vision and comprehensive activity plan for transformation of business processes, products, and services into a digital format. Digital technologies and artificial intelligence are not a cure-all problems that are present in the market and in a specific company. Digitalization is not a substitution of real business processes, but is additional to them.

**Keywords.** Digital transformation, Big Data, Chief Information Officer (CIO), Chief Digital Officer (CDO), Machine Learning, Predictive Analytics, Artificial Intelligence, Internet of Things

## 1. Introduction

Any discussions on digital transformation of a modern enterprise's IT division are based on an axiom that it is necessary to shift emphasis from infrastructure to applications and analytics. It is this that can support a worthy level of communication with consumers in a company and help the IT service management to respond in time to constantly changing business requirements. This process is called "Digital transformation". In a wider sense digital transformation denotes the final stage of coverage with digital technologies – from digital competence through digital consumption to digital transformation [1].

Digital transformation of business requires team work – this condition plays a key role. The paradigm of the modern market consists in IT taking the foreground of business initiatives, above all in everything concerning the making of profits from data. Today, as never, it can be said that the thing is data – their collection, integration, and use of analytics to transform information into the real value for business [2].

The problem of data analysis is much more serious than it may appear at first glance. In the epoch of digital transformation the outdated methods are unable to give strategically important information



for business, which thereafter becomes not so much a matter of development as survival of a company. The boundary dividing losers and winners in the digital worlds passes at the data level. Today data and their analysis become a nucleus of any IT-strategy and business platform. In order to stay competitive, companies are to learn to think globally and scale fast – technologies of big data, Internet of things and computer-aided learning are the best resource for it. It is already now that business learns to lower its costs and augment profits by using predictive analytics. No company can stay competitive under the conditions of digital economics if its business model is not based on data. Digital economics is based on deep integration of business and IT strategies – a modern company must function as a huge IT division, not allowing any contradictions between technologies, people responsible for their implementation, and the business interests [3].

## 2. Methods

### 2.1. Digital transformation

Yet several years ago digital transformation was considered a complex and resource-consuming process the realization of which is required by far from any company, but the rapid development of the technology component in the operations of leading enterprises and the first successes of digitalization have made the Russian business pay attention to the necessity to implement new technologies. One of the factors emphasizing this tendency is the presence of digital conversions in various industries (from telecom and financial sector to retail and the state segment).

With time the term “digital transformation” evolutionizes. Initially it meant a use of new technologies, the end targets being determined by business structures insufficiently clear. Thereafter digitalization began to aim at increasing efficiency of a company on account of optimization and automation of existing business processes, data analytics coming to the fore in implementing the strategy of digital transformation. Now digital transformation can be given another definition – it is a change in business processes based on data analytics [4].

Modern companies have a great amount of data which hide valuable information on their internal and external operation. Not external resources, as it was believed earlier, such as social networks, forums, news feeds, become, however, the main source of these data, but a company’s internal processes, such as postal communications, presentations, archives of digitalized documents, the outcomes of operation of such systems as ERP, CRM, SCM, HR, ECM. Thus, data growth rate is ensured on account of digital interaction channels between employees and partners.

The development of technologies results in data storage becoming relatively inexpensive, due to which a problem arises to use them as fully as possible. Nobody needs data analysis for the sake of data analysis. It is needed to derive additional profits, or bring new services to the market, or reduce expenses. The most important thing in this context is to set correct business tasks the solving of which will be aided by data analytics [5, 6].

The main direction in which Russian companies invest is analysis of transaction data, i.e. data related to business operations. There are several reasons why so much attention is given to transaction data analysis. First, the companies have already accumulated a sufficient amount of such data due to using transaction systems to draw up both internal and external reporting. Second, today the main task of applying big data analytics is to increase operation efficiency. It can be solved by analysis of internal transaction processes. By adjusting this work, it is easier to move to complex analytical tasks with employing various sources of information.

The second place is taken by customer analytics, and investment in this direction rapidly gains momentum. One of the main tasks here is personalization of offers and creation of unique user experience. Such a demand comes from the fact that under the conditions of diminishing buying ability of Russian people the companies have to sell not just goods but also those positive emotions related to their purchases.

The third place is taken by flow analytics. This is because Russian industrial enterprises gradually begin using capabilities of Internet of things, such as receiving data from cameras in real time. These data become another source of information for big data analytics.

As a rule, companies use the collected information for analytical planning, which indicates the presence of long-term plans for digitalization and inclusion of data analytics into daily operation. In digital processes, however, one should not forget the necessity to observe business interests, which is important for understanding which data should be collected and analyze, and what outcome the company wants to receive [7].

When choosing the solution for data analysis, the companies are primarily guided by matters of easiness of implementation and use, and costs. Moving on to the technology level, it becomes clear that for modern companies it is important for the solution to be able to operate without employing additional experts, so that configuration and customization of this solution might be relatively easy, so that the solution is well integrated with transaction systems. This is related to the fact that companies increasingly have not technical specialists, but business users who need data analytics. Even usual employees of call centers face the necessity to process even more information when contacting clients. This tendency can be expected to grow in future, and simple decisions that business representatives may use without employing IT-specialists will be becoming more popular.

With time there will be more information for analysis, also because there will appear new sources of data, for instance, as a result of computer-aided interaction processes, therefore it is already now that companies should focus on selective collection of information which is less voluminous but more valuable for business. The optimal amount of data for storage can be determined proceeding from the tasks in each specific situation. Whereas in future various solutions will be more frequently taken using algorithms based on big data, the main aim the companies face today is to collect as much reliable data as possible and learn to be guided by real business tasks.

A considerable growth of monetary investment in data analytics solutions can be expected. In the first place, financial influx into storage systems will grow. And, it goes without saying, there will be growing investment in software, in IT services which accompany them. It should be expected that in the immediate future big data analytics will become an ordinary process, therefore Russian companies have to be implementing and developing this trend on a permanent basis. Data analytics is no longer a report launched once a day or once an hour, it is a standard practice of working with data at all stages of a company's operation, at that big data analytics will be more integrated with artificial intelligence solutions [8].

Digital transformation touches on a company in entirety and reflects digitalization of added value, not being limited by separate functions or roles. Digital transformation is about culture of doing business, about a transfer into a digital sphere on not separate processes but an entire organization. Now, when companies are adopting a project-based approach, it is necessary to take into account a digital aspect at once – from investment application and planning of periods and volumes of works to offsets with contractors and exchange of closing documents with them. Everything can be digitized, and qualified employees are relieved from routine and focused on achievement of results.

In the modern world any serious process requires a thorough and operative analysis. At that, due to the growing scale of changes in all the industries, the management have to take more decisions per unit of time and do it increasingly faster. Under the conditions when the amount of information doubles yearly, and the amount of data inside a company often grows at even higher rates, one of the key distinctions of a successful company from an unsuccessful one is collection and storage of quality data on all activities, processing of these data and packaging in an easy and understandable form. Those who implement a proper process of business-analytics earlier than others, take business solutions of higher quality, do it faster than the competitors, ultimately ensure the growth of their business. It is already insufficient to just look at data once a month or once a fortnight at accounting meetings. When business owners and executives have all necessary performance indicators of the company at hand, the business processes become as transparent and objective as possible. It becomes

simpler to manage the team and take tactical and strategic decisions, and the company becomes more efficient [9].

Before moving on to digital transformation, it is required to perform work on formalization and structuring of business processes, since the purpose of digital transformation is primarily to configure business processes on the base of IT products. It is worth to begin with key and root business processes, successively including new roles and functionality. For digital transformation it is necessary, in the first place, to clearly define the goals, to understand what problems inside the company it is necessary to solve, what resources of the company it will allow to save. Then, depending on these goals, it is necessary to employ specialists, experts in a specific domain to discuss hypotheses aimed at solving these problems. Each hypothesis has to be thoroughly formulated, paying special attention to the criteria of its success. In implementing new technologies the company has to take into account that this work cannot be strictly standardized, there always remain in it many unknown values, therefore employees and executives have to be ready for changes in the conditions of a project or hypotheses, must think broadly and try to see opportunities of its application where they are not at times obvious [10].

### 3. Results

#### 3.1. Chief Information Officer or Chief Digital Officer?

Outdated methodologies of analysis reduce a company's competitive ability. In the epoch of digital economics big data processing technologies, artificial intelligence and computer-aided learning become strategically important resources for business, human capital continuing to play the most important role. Apart from the technologies, the key factor of a successful digital enterprise is people. It is human capital that acts as the main resource when forming a business model based on data. This is true not only for specialists on the sphere of data science and computer-aided learning – responsibility for implementation of new methods is also borne by top managers including CEOs of enterprises.

The business model of a digital enterprise is based on well through-out politics in the sphere of organizational culture of the company and human capital. In order to start working with technologies - the role of an IT executive and his/her team which will have necessary skills and abilities in order to use data efficiently becomes increasingly more significant.

The transformation process is traditionally headed by a business leader who has his/her own concept of conversions within the frameworks of a digital environment, but the key contribution to the formation of this concept is often made by a CIO who wields information on technological resources of the enterprise. In more recent times the head of an IT department was primarily responsible for a wide range of technical problems: from planning and upgrading of computational capabilities to data migration. With the advent of a digital epoch the emphasis in operations of an IT division is shifted to retrieval of information valuable for business from new or already accumulated data. If a company's IT executive is able to use the power of data more fully and, as a consequence, to deeply understand the internal processes, he/she can become the driver of changes that will increase the value of all digital conversions [11].

Most CIOs of modern enterprises acknowledge that conventional IT models can no longer meet the growing digital necessities of business. In the absence of appreciation of this simple truth the digital gap between what the IT department does and what is really required to business can very quickly become a gulf unbridgeable for the enterprise. The IT division should not be positioned as a center for saving of expenses, such strategy is knowingly unsuccessful for the CIO of a modern enterprise. A reduction in the price for a terabyte, expenses of infrastructure or a curtailment of numbers of employees is not a cure-all. Operative implementation of modern technologies, such as virtualization, convergent or cloud solutions, will help much more than manipulations with equipment or staff. Digital transformation of an enterprise is impossible without reevaluation of the structure of an IT service, up to the reevaluation of each employee's role.

The concept “digital transformation” is much wider than just an application of relevant IT technologies. For a long time a company’s IT-strategy depended on the general strategy and development of the organization. Today IT as a source of growth points for business causes companies to rebuild the business processes for themselves. New tendencies change the role of CIO inside a company, the requirements to his/her competences and cross-boundary collaboration [12].

As a rule, CIO is accountable directly to the managing or operations director. This makes it possible to keep abreast of the key goals of business, offering products and technologies for their achievement. With the appearance several years ago of a new position of CDO (Chief Digital Officer) in the context of digital transformation talks arose about reassignment of CIO. In the ideal situation CIO is CDO’s right hand, a tool to implement projects on the part of IT. The determination of the place and character of interaction of CIO and CDO is one of the main difficulties when a company faces the commencement of the digital transformation process. Ideally CIO and CDO should be one and the same person. By the moment when the company is ready to single out a separate functional unit CDO, CIO has accumulated experience of implementation of projects connected to data processing, i.e. CIO has skills necessary for searching for and implementing new solutions in data processing. A deep understanding of IT ecosystem of the company at first becomes an advantage. If the company’s structure provides for two functional units, CIO must be responsible for the infrastructure, having CDO as the principal business-customer.

The position of CDO is related primarily to digital technologies and their development, the necessity to include them into companies’ operational activities, therefore difficulties arise with determination of the sphere of his/her responsibilities. In many organizations the obligations of CDO and CIO partially coincide within the framework of one position. This happens because the management of the strategy of digital transformation is inseparably linked to the company’s technological base. The key objective of CDO is corporate restructuring, formation of the vision and comprehensive activity plan for transformation of business processes, products, and services into a digital format. Keeping in mind that CIO is responsible for all IT-infrastructure of the company and determines the prospects of its development, it is desirable for CIO and CDO to remember that all new solutions must be capable of being fully integrated into the general IT architecture [13].

Conspicuous is the fact that for a successful CIO the personal qualities are not less important than professional ones. The modern CIO must be a business leader with strategic thinking. The main competences go away from IT. CIO must be able to build relationships with other business leaders, closely work with financial, HR and marketing departments of the organization. In addition to the knowledge of know-how a CIO is required to be business-oriented with excellent skills of interpersonal communication and people management.

CIO must demonstrate a strategic approach to work. CIOs work with top management to influence and direct business for the most efficient use of technologies. They help to understand how digitalization can transform business and assure additional growth. Apart from interaction with top management, best CIOs spend much time with buyers, focusing on innovations, in order to create services that will improve possible development options of a company at the same time inside and outside the organization.

Changes in the organization influence the role of CIO in a company – from line manager he/she passes to a “flexible” CIO. The focus of attention of CIOs is shifted toward creating a base for digital conversions, ensuring flexible IT capabilities, which enables a faster response to changes in actively developing markets and assurance of digital innovations based on adaptive, but stable information systems.

With the development and spreading of digital technologies business faced not only possibilities of searching for new solutions of previous tasks, but also new, earlier unknown tasks that require people able to work them out. CDO is a company’s conductor in digital solutions and products, a person who must see and understand how business can be improved and the company developed using new information technologies. CDO must view the digital world on a global scale, understand what technologies exist, where they can be applied, and, which is most important, where they can be useful.

Depending on the company's maturity CDO can perform various functions and tasks – from a motivator at the stage of appearance of first initiatives in regard to transformation and digitalization to an architect of IT systems with practical implementation of changes and innovations into business processes.

It should be noted that in a number of cases CDO is deciphered as Chief Data Officer. Chief Digital Officer acts in the role of Chief Data Officer at the stage of processing of technological data. CDO analyzes information coming from equipment, own products, using such technologies as computer-aided learning and artificial intelligence, with a view to receiving a full picture by the result of implementation of technology solutions into the company's operations to improve credibility of forecasts in the interests of business units, to find solutions improving and accelerating current business processes. In this context the main objective of CDO is to separate the sense and value from data in order to develop business.

There are examples when CIO undertook the tasks of CDO and coped with them successfully, not changing the name of the position and remaining concurrently director for information technologies. But these are rather situations when CIO broadened the circle of his/her tasks, undertook new obligations, accepted new rules of the game oriented at developing social networks, product promotion channels and new monetization models. What is the difference of CDO from CIO? CIO arranges a technical basis and its fully functional operation, correlating the company's goals and resources, bears responsibility for setting up a unified information system of the company and is responsible for the organization of all information flows. CDO focuses on the strategic goals of implementing this or other technology [14, 15].

CIO always feels good and calm when all IT systems operate stably. CDO must, however, evaluate risks in this conservatism, support changes, search for new possibilities to expand zones of influence of the company in the market through mastering of big data. In other words, CIO manages a company's IT-infrastructure, and CDO coordinates the process of the company's transformation brought about by the development of digital technologies.

The ideal situation for business appears when CIO and CDO interact productively. CIO can be in a certain sense the right hand of CDO when CDO acts as generator of ideas, and CIO as performer. Situations when CDO and CIO become rivals, commence to compete for the budget and initiative, for business customers and business partners should be avoided.

The project of the plan for formation of new subdivisions which was prepared by the Ministry of Economic Development and Trade states that in the immediate future all Russian state companies and corporations will have managers in digital transformation. This makes one once more pay attention to the new position of CDO and emphasizes its importance on the national level.

The tasks of CDO are related to management of digital transformation. They can vary depending on the company's maturity, on the current level of development of business and technologies. As they started to talk about CDO position relatively recently, not all companies yet have distinct definitions of obligations and requirements to this position. But some general features of the digitalization specialist can be described even now [16].

What qualities and skills must an ideal CDO have? What knowledge and experience are necessary for this position?

- A combination of qualities of an excellent technical specialist and market analyst, manager.
- Versatile experience in internet-marketing, electronic commerce, transaction business.
- Ability to work with data, derive benefit from them.
- Understanding business processes of the company.
- Ability to work gradually, paying attention to detail.
- Experience in development of business, realization of large-scale projects.

Obligations and objectives of CDO:

- Analysis of the market for technologies and new digital solutions, searching for a suitable solution for business.

- Formation of architecture of data management (it is necessary to understand what data are required for business, where and how to store and process them, who will use them).
- Budget agreement.
- Development of a portfolio of digital products and services.

A certain paradox is that the technologies and software platforms for automation of production processes, creation of new digital services are more than enough, but few can make a money-making mechanism out of these components, even repeat the success of another. This is the key objective of CDO – not just to digitize business and implement new technologies, but clearly to understand what profits these innovations can bring to the company.

Despite the fact that CDO is responsible for digitalization and heads the project of transformation, his/her area of responsibility is not limited with one project. Digital transformation will in any case touch upon all subdivisions of the organization. The success will highly likely depend on to the extent the board of directors of the company and other CxO will trust the opinion of CDO, support his/her ideas and provide an opportunity to demonstrate his/her qualities in searching for solutions in response to the challenges of the market. The position of CDO today becomes all the more important, since the funds assigned to them are spent to minimize risk and ensure development of business.

The analysis of additional information is necessary to account for market risks, analyze the competitors and collect diverse information from the ecosystem consisting of partners and customers. Such ecosystem implies the necessity of plain connection, fast exchange and analysis of various types of data, and also efficient interaction between all the participants of business processes. An obvious tendency of the recent years can be distinguished - big data analytics departs from IT divisions and ceases to be a prerogative of CIO, as it was several years ago. It is expected that the representatives of business units will exert more influence on decision making regarding analysis of big data. So far, CIO are responsible in a higher degree for these implementations, but the experts predict that in the immediate future their share will be reduced, a great number of solutions will be taken employing CDO. Data analytics and formulation on its basis of the respective strategy is just the main task that CDO faces. If one bears in mind the general global tendencies, CDO has in his/her zone of competence analysis of information coming from the equipment, own systems and assets of the company, arrangement of work with various tools among which there are not only data analytics, but also artificial intelligence and computer-aided learning. At that, CDO must focus on the strategic goals of implementation of this or that technology, understanding also both the possible benefit and possible risks during implementation of projects. One should not forget that data analytics includes a great many aspects, such as management of data, of their safety, relevancy, and integrity [17, 18].

## 4. Discussion

### 4.1. Disadvantages of digital technologies

In order to make digital transformation as efficient as possible, two things should be perceived. First: digital technologies and artificial intelligence are not a cure-all, not a medicine for all sicknesses and problems that are present in the market and in a specific company. Second: digitalization is not a substitution of real business processes, but is additional to them. Proceeding from these two basic principles, one can efficiently configure the process of digitalization of any business.

At that, one has to bear in mind that if digitalization is viewed as some digital medicine for business, it has not only limitations in application, but also side effects. Namely: artificial intelligence can make not less errors than a human being, even more in certain situations, since AI is less flexible, for today it is rigidly linked to algorithms penned by man [19].

There is a certain experience of interaction of man and his computer assistant (AI). And this experience has shown that today it is as a performer that artificial intelligence is efficient. Providing to AI an autonomy that is greater than necessary, the company increases risks related to the non-ideal nature of computer algorithms (penned by man), and also to the desire of the market to use these imperfections for its own purposes.



Hence the second principle of efficient digitalization – harmonious integration of computer technologies and artificial intelligence into real business processes, i.e. those where, one way or another, people take part (manufacturers and consumers, partners and competitors). In terms of competition, one should realize that we oppose our own technologies to the computer technologies of the competitors, and knowledge and experience of our personnel to people's competences. Therefore, just as it is not worthwhile for man to compete with the computer in terms of speed and accuracy of calculations, one should not count on conquering a live competitor with any IT tool [20].

## 5. Conclusions

The article considers:

- 1) Fundamentals and evolution of the “digital transformation” concept.
- 2) The objectives and content of the company's digital transformation.
- 3) Current forms of digital transformation.
- 4) Prerequisites for the practical implementation of digital transformation.
- 5) Digital transformation process influence on CIO role in a company.
- 6) The reasons for the CDO position appearance.
- 7) The challenges facing the CDO.
- 8) The format of the cooperation between CDO and CIO.
- 9) The requirements for CDO position.
- 10) The limitations for digital technology application.

## References

- [1] Wu L, Chiu M L 2015 Organizational Applications of IT Innovation and Firm's Competitive Performance: A Resource-Based View and the Innovation Diffusion Approach. *Journal of Engineering and Technology Management* 35 25–44
- [2] Bril A R, Kalinina O V, Ilin I V 2017 Financial and economic aspects of IT project management (2017) Proceedings of the 30th International Business Information Management Association Conference, *Vision 2020: Sustainable Economic development, Innovation Management and Global Growth*, 2972–2980
- [3] Bharadwaj A, Sawy O El 2013 Digital Business Strategy: Toward a Next Generation of Insights *MIS Quarterly: Management Information Systems* 37 (2) 471–482
- [4] Ilin I V, Levina A I, Abran A, Iliashenko O Yu 2017 Measurement of Enterprise Architecture (EA) from an IT perspective: Research gaps and measurement avenues *ACM International Conference Proceeding Series*, F131936, 232–243
- [5] Jayachandran S, Hewett K, Kaufman P 2004 Customer response capability in a sense-and-respond era: the role of customer knowledge process *Journal of the Academy of Marketing Science* 32 (3) 219–233
- [6] Setia P, Venkatesh V, Joglekar S 2013 Leveraging digital technologies: how information quality leads to localized capabilities and customer service performance *MIS Quarterly: Management Information Systems* 37 (2) 565–590
- [7] Granados N F, Gupta A, Kauffmann R J 2006 The impact of IT on market information and transparency - a unified theoretical framework *Journal of the Association for Information Systems* 7 (3) 148–178
- [8] Popchev I P, Orozova D A 2019 Towards Big Data Analytics in the e-Learning Space *Cybernetics and information technologies* 19 (3) 16–24
- [9] Bolsunovskaya M V, Shirokova S V, Loginova A V, Gintciak A M 2019 IT Project Team Management based on a Network-Centric Model, 165-168, 8604232
- [10] Chiasson M, Davidson E 2005 Taking industry seriously in information systems research *MIS Quarterly: Management Information Systems* 29 (4) 591–605
- [11] Borremans A D, Zaychenko I M, Iliashenko O Yu Digital economy 2018 IT strategy of the company development *MATEC Web of Conferences*, 170, 01034

- [12] Dennis D, Walsh F 2015 Align Business Strategy with Information Technology *Guidelines of IT Management* 23 1–16
- [13] Horlacher A, Hess T 2016 What Does a Chief Digital Officer Do? Managerial Tasks and Roles of a New C-Level Position in the Context of Digital Transformation *49th Hawaii International Conference on System Sciences (HICSS)* 5126–5135
- [14] Dyatlov S A, Didenko N I, Lobanov O S, Kulik S V 2019 Digital transformation and convergence effect as factors of achieving sustainable development *IOP Conference Series: Earth and Environmental Science* 302(1), 012102
- [15] Sibanda M, Ramrathan D 2017 Influence of Information Technology on Organization Strategy *Foundations of Management* 9 (1) 191–202
- [16] Webster J, Watson R T 2002 Analyzing the past to prepare for the future: writing a literature review *MIS Quarterly: Management Information Systems* 26 (2) 13–23
- [17] Ilin I V, Shirokova S V, Lepekhin A A 2018 IT Solution concept development for tracking and analyzing the labor effectiveness of employees *E3S Web of Conferences*, 33, 03007
- [18] Bagaeva I V, Iliashenko O Yu, Borremans A D 2018 Theoretical and methodological aspects of the competence approach to the evaluation of the organization's personnel *MATEC Web of Conferences*, 193, 05060
- [19] Kotter J 1995 Leading change: why transformation efforts fail *Harvard Business Review* 73(2) 59–67
- [20] Ilin I V, Levina A I, Lepekhin A A 2017 The complexity of requirements engineering approach as a potential critical-success factor of software project *Proceedings of the 30th International Business Information Management Association Conference*, 2578–2590