Design and design thinking role in a digital transformation

Vitalii Cherepanov\textsuperscript{1,2,*}, and Evgeny Popov\textsuperscript{1}

\textsuperscript{1}Ural Institute of Management, branch of Russian Presidential Academy of National Economy\&Public Administration (RANEPA), Ekaterinburg, Russia
\textsuperscript{2}Technical University of UMMC, Verkhnyaya Pyshma, Russia

Abstract. This article embraces a design and design thinking role in a digital transformation based on an author’s concept of digital transformation of industrial enterprise. Design is usually considered as a process of making something attractive or convenient, but in this research it’s role is displayed in a management context of processes, those should be changed with digital transforming solutions. Authors of this research found out that design practice in a digital transformation becomes a core competency, that allows to gain real practical efficient changes, those couldn’t be reached only by digital transformation cases implementation. Authors also found out that design as managerial practice allows to shorten digital transformation roadmaps, which are usually constructed with the same “bricks” of proof-of-concept, MVP and final projects, those shape the way as an IT project, but not as a project of process change based on digital solutions. The new suggested approach makes the way of digital maturity development more efficient and allows to get better results in a digital transformation project.

1 Introduction

Actual management practice contains hundreds of creative tools and analytical patterns, those support problem-solving and new solutions development process. But one of the main problems is that modern managers are focused on analytical, but not on creative practice [1]. This management characteristic could be easily noticed in any organization, when a new important decision or solution is being prepared. A manager asks subordinates to prepare a number of alternatives and, as usual, one of those points should be picked as preferable. This practice is very efficient, when a business environment is stable and changes slowly, but as we live in BANI-world\textsuperscript{†} or stay on the way of creating new transforming solution unknown before, this practice could ruin any promising project. It is very important to remark that in a modern world we, actually, have no chance to get an experience from previous generations [2], because our social and technological environment is absolutely different and brand-new, because we use technologies unknown to previous generations. More experienced managers and engineers just have no experience to conduct in a modern environment, but we steel can use well-known fundamental concepts in a current context.

\textsuperscript{*} Corresponding author: v.cherepanov@outlook.com

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One of the most popular practices of a new solutions and decisions development is design thinking [3]. It allows to provide new ways of actions in changing business context, based in empathy and potential users or customers needs analysis.

Design thinking as a tool could not be such efficient in a context of a digital transformation as in context of business problem solving [4], because in a classical design thinking paradigm design actors and non-design actors interact to create a new solution, but digital transformation doesn’t usually considers acting with people at all. In a authors’ concept of digital transformation [5] developed an idea that people are substituted by digital technologies in a digital transformation process, hence digital transformation creates a new vision of the same process, but not just makes some local changes for certain actors in it.

Ideas of productive thinking became popular in 1940s [6] and got new ways of creative engineering 1950s [7] those are still actual today. There are a lot of tools today, but the main vector is the same, they create extra alternatives for responsible for key decisions managers.

In this research authors not only review main approaches of design thinking, but also show, that industrial design and design concepts in general could be the core tool of creating digital transformative solutions and could allow to bring new applications of the same digital tools as for human-agent and machine-agents.

Despite common idea that design is just a process of making thing convenient World Design Organization supports the following industrial design term meaning:

“Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences.”

World Design Organization also emphasizes that industrial design is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. Keeping this meaning in mind, authors of the research found that design could be implicated in digital transformation process of industrial enterprise and deliver new value that was not in previous digital transformation process concepts clear.

2 Materials and methods

This research was developed basing on the following methods:
1. Discovering of scientific, analytical and information publications on a topic of the research.
2. Practical analysis and analytical reconstruction of a digital transformation cases.
3. Real digital transformation projects experimenting and experience with a number of industrial enterprises.
4. Scientific reconstruction of a number of design and digital transformation concept.

Before starting this research authors already published their own concept of digital transformation for industrial enterprise [1], that shaped the first steppingstone on these research. But authors also made deep analysis of other researches and practical points of view, before developing the first hypothesis and conclusions.

In this research authors also analysed a number of practical digital transformations cases and even run their own digital transformation projects, those gain extra arguments and facts, considered before coming to any conclusions.

Analytical base of the research was developed using web search, analytical system Teqviser, online library Wiley, Elsevier ScienceDirect, Springer Open, Informs, arXiv of Cornell University, insights of McKinsey, Boston Consulting Group, Board of Innovation, Bain&Co. and Strategy Partners were used.

Main search criteria were the following:
Table 2. Keywords used in literature review.

<table>
<thead>
<tr>
<th>Direction «design» + «digital transformation»</th>
<th>Related topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design, design thinking, design solutions,</td>
<td>Design, design in management practice, digital</td>
</tr>
<tr>
<td>design management, digital transformation,</td>
<td>transformation, digitalization, digital</td>
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<td>digital transforming tools, digital</td>
<td>technologies, digital maturity, digital</td>
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<td>transformation context</td>
<td>transformation competencies</td>
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Digital transformation context and role of design and design thinking in it was modelled in scientific discussions and real digital transformation projects environment.

The current research was also based on scientific publications on design and related fields.

The first stage of the research was an analysis of the most popular views on design role in management.

3 The most popular views of a design role in management and in digital transformation process

Do we really know what design is? Are we quite aware of its role in management? How to find radically new digital transforming solutions, when project team has no previous experience of digital transformation?

These questions are very sharp for modern strategists, who aimed at real changes in their organizations.

An authors’ concept of digital maturity levels [8] delivered and idea that final point of digital transformation process is fully autonomous system as a block in transformed process or even as a system driving the whole process. This concept demands rather complicated approach of creating brand-new ideas of process management. Could design process be useful? Authors consider that design is the very practice to create such new digitally supported processes, because design value is rather wide and embraces almost every aspect of organizations and could deliver entire design transformation solutions.

Since it’s first appearance in 1950s the term “design thinking” became not only popular practice [9], but also considered as a new competitive advantage. But we should also keep in mind, that humans always focus on their convenience and emotional choice [10], that steers their creativity process.

On the contrary, industrial design is considered as a process of optimization functions, value and appearance of products and systems. It is usual to see a designer as a person with mock-ups, models and drawings, but we suggest the bigger role for designer, the new managers’ role that is aimed at creating absolutely new process technologies visions, those run towards digital mature processes and systems.

It is also usual to consider that industrial design is user-centered and allows to meet humans needs in a certain process. But there is also a point of view, that design could be a tool, that drives innovations in a whole organization [11], because of its nature to create absolutely new unknown solutions.

Some researchers consider that in a modern design and innovation process data is one of the most valuable components [12] allowing to find new interconnections and could be very useful in solving ill-defined problems requiring creativity to be solved. This point of view drives us to an idea that design is very close to digital transformation, because data is the key “ingredient” of a digitally supported processes.

It is also clear that digital transformation is closely connected with competencies of its participants [13], but authors published an idea [5], that lack of competencies in digital transformation could be shortened with a clear way of digital transformation and a bunch of
tools, allowing to make the certain digital transformation process a clear “practice”, but not just an “art”.

Nowadays we cannot find chief design officer in boards, if only we have no deal with a company, producing attractive products for mass markets. May be this tendency will appear, because design becomes day-to-day management practice and we now see, that absolutely new solutions and approaches demanded in everyday practice, but they should be somehow created.

Digital transformation today is usually based on a practice of implementing digital cases, those are considered as efficient practices, tested in one organization and delivered to another. Problems and limitations of this approach were already analyzed [5], but it should be remarked, that stable design practice in organization could be a way to stop “copying” and start “creating” digital transformative solutions, tailored to a certain organization. As an additional argument to it is a popular examples of “digital by design” organizations such as Google, Yandex, Amazon and so one. But this example couldn’t be delivered and used in a metals and mining companies because of the nature of those products and customers of these companies. So, we should provide not only way of copying some cases, but a way to create solutions of complicated vague problems, those could be designed for a certain enterprise.

4 Authors vision of design role in digital transformation process

The main digital transformation aim is to eliminate information asymmetry [5], that is very important in a context of incapsulating digital agents (machine-agents) in transformed processes. This asymmetry could be eliminated with the following ways:

- data or information become clear, structured and available to any granted agent human or machine;
- human is substituted by digital solution in process;
- digital twin allows to check process run statuses and key metrics.

Digital transformation process considers delivering transformative solutions, those allow to develop digital maturity of a transforming process. But in practice finding this solution is the most complicated task of a digital transformation in common becomes new activity for managers. Stepping this way, they use other digital cases as we remarked earlier, trying to adopt those cases to their organization’s practice. Speaking in general, managers even in digital transformation process just find and pick alternative, being focused on their analytical way of practice.

This approach could be slightly easy in large corporations, where corporate competency and R&D centers deliver inner digital solutions catalogue, where transformative solutions could be found. It is clear, that first try of this solution before including it into corporate digital catalogue was maybe just an experiment, but the late usage becomes just another “alternative pick”. Successful digital transformation could be stable practice of creating new way of transforming process arrangement, that allows to substitute humans or analog machines with new digital technologies, but also allows to create new paradigm of interactions and fields of responsibility and frames of solutions making process for any agent in a transformed process.

Common digital transformation process is very similar to IT project, because starts with hypothesis, then goes to proof–of-concept, new digital product MVP and after that, to a real digital product development. This way is used in hundreds of organizations, but we should remark, that it is not digital transformation in its core, because nothing is usually transformed. Authors suggest implementing design practices in digital transformation process. It is quite common to use design thinking in software development [14], but we before showed that design thinking is not quite good practice for digital transformation. It could be more efficient to use design and industrial design practices in digital transformation.
Digital transformation concept [5] could be widened with a new process design stage, where digital transformation manager is supposed to make the following steps:

- mock-up new transforming process scenario, where human and analog machines could be substituted with digital solutions;
- design new humans and machines agents roles, responsibilities, decision making frames and criteria of stop acting or interacting;
- develop new criteria of compensations for human-agents and humans substituted by digital solutions;
- design a new product and entire process vision and detailed scenarios;
- specify functional and technical requirements to new digital solutions based on the actions and/or decision those solutions should make in a process after running stage of its digital transformation;
- organize a development process of a new digital solution already connected with other process agents and actors, those will participate in it;
- arrange test runs of the new process scenario, maybe, with new human and machine-agents and interactions.

Main difference of this approach from common “case-based” practice of digital transformation is that it will be new design process with tailored digital solutions and clear interactions landscape for every participant instead of just one more try to implement not adequate by design to a certain process “alien” digital solution.

This new digital transformation approach demands design competencies from process managers and design transformation managers, but it also brings new results and effects as following:

- well specified from functional and technical point of view digital solution could be developed without proof-of-concept and event without MPV, because its development could be arranged not by agile approach, but by waterfall development approach;
- speed of this approach is much higher and process design is always cheaper, then physical experiment in a real environment.
- Managers will get tailored solution, but not just another “alternative”.

This steps will be design an a digital transformation framework and supported by process mock-ups templates in order to arrange design process and make it stable and more efficient. Authors suppose that this approach in their own concept of digital transformation context [5] will deliver organizational and economical efficiency to digital transformation practice.

5 Conclusion

Main results of the research contain the following conclusions:

1. Not only design thinking as a creativity tool, but mainly design practice should drive digital transformation in organization.
2. Management in a vague environment and with complicated solutions should be based on design.
3. Digital transformations doesn’t mean implementing digital solutions, it means changing processes and their actors roles with digital solutions support that leads to a digital maturity development.
4. Design as a managerial practice becomes a core competency in a digital transformation context, because in a new process there are no well-known and well-tested alternative, there are only new solutions and roles, based in digital technologies.
5. The main design focus in a digital transformation context is a substitution of a human and analog machines with digital technologies or changing process in the way, leading to keeping it active without humans at all, but entirely for humans needs.

6. Digital transformation could be more efficient, when its design brings new meanings in a business context, that made the changing process conscious for its participants.

7. Design should be focused on creating new processes and interactions between human-agents and machine-agents, but not just on picking any alternative, because every solution should be tailored to a specific organization.

8. If digital transformative solution is designed the way allowing to construct roles, responsibilities and frames of decision-making process of human-agents and machine-agents in a new process running scenario, in most cases proof-of-concept and even MVP phase for digital transformative solutions could be skipped.

Authors consider that design practice can be real game changer in a digital transformation. They also suggest that design thinking is very important practice to use, when transforming solutions catalogue is already created and digital transformation is close to be based on Digital LEAN practice. But design thinking is not useful, when radically new solutions or process should be developed and empathy with needs analysis are not enough to change the situation. In this business environment core design practice is probably more efficient.

Authors will continue their research on design role in digital transformation context, because this field allows to get radically new answers on sharp questions concerned with digital transformation practice of a modern organization.

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