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# Digital Transformation and its Potential Effects on Future Management: Insights From an ETO Context

Antoni Vike Danielsen<sup>1</sup>

<sup>1</sup> Department of Ocean Operations and Civil Engineering, Norwegian University of Science and Technology, Aalesund, Norway

**Abstract.** Digitalization has penetrated and transformed entire business models irrespective of industry belonging. Thus, digital transformation launches both possibilities and challenges for firms and their managers in how to execute (intra) organizational operations and strategies. This paper provides findings derived from an explorative interview study targeting required skillsets for future Engineer-to-Order (ETO) operations within the maritime industry. It has an introspective perspective, focusing on managerial perception of current and future needs to enhance efforts to digitalize ETO work further. Hence, as ETO firms tend to be conservative in their underlying dynamics of work it is important to gain insights on important skills and mindsets for successful leadership of digital transformation. The study heightens the effects of previous and future implications of digital transformation, while accentuating that new required skills are not only restricted to operators and engineers, instead it is equally relevant for managers to embrace such changing needs, as digitalization has resulted in blurred mechanisms for how to conduct management.

**Keywords:** Digitalization, Engineer -to-Order, Leadership Change

## 1 Introduction

The Internet boom started 20 years ago and then exaggerated on the promise as a source of fully disruptive technology- turning it into a speculative bubble. However, from the start of the internet boom the technology has eventually materialized into more rational business fundamentals who have become mainstream and in many cases mission and operational critical. Digitalisation, as such has become a “*global megatrend that is fundamentally changing existing value chains across industries and public sectors*” [1]

Based on these foundations we are today in the early loop of even more disruptive technologies as artificial intelligence, internet of things (IOT), cyber currencies as bitcoin, gamification, visualisation and augmented reality (AR), robotics, driverless cars, autonomous ships, whereas parts of these technologies has already become ubiquitous within selected industries and businesses during the last decade. Embarking and aiming to make the best use of the aforesaid technologies implies that a firm will face a digital transformation process. According to Parvainen et al. [2] “*Digital transformation is changes in ways of working, roles, and businesses offered caused by adoption*

*of digital technologies in an organization, or in the operation environment of the organization”.*

The definition mirrors the traditional research conducted in studies investigating manufacturing environments and systems, while missing (or intentionally disregard) its effect on management. However, this might have its consequences in not having managed to clarify some distinct differences in its dimension. For instance, digitalization and digital transformation are often used interchangeably, which has resulted in a blurred terminology usage, both in academic and professional environments [4, 5].

Hence, a digital transformation implies a larger change than e.g., converting a paper transcript into a digital representation (i.e. digitalization) as well as the process of technologically induced change that e.g., a software program can provide (i.e. digitalization) [3, 4]. As such, digital transformations have greater impact on organizations as they affect both intra and inter organizational aspects and thus, enforce a re-evaluation of future manufacturing strategies. Extant studies on technological advancement in manufacturing has greatly improved the understanding of effectiveness and efficiencies with regards to production processes, tools for information sharing, design, delivery and payment, including operator- and engineer perspectives, however, less has been said about its effects for managerial actions and possibly styles to handle its outcome.

This study picks up this deficit and aims to sharpen the understanding of potential changes to required skillsets for managers during digital transformations in the context of ETO. Based on theoretical and conceptual groundwork, the study delineates potential implications and opportunities regarding future required managerial capabilities. While the analysis is performed by the author, the recommended and reflected skillsets are defined and elaborated by 8 different executives and top managers operating in ETO firms.

The rest of the composition of the paper is as follows: A short presentation of relevant theory targeting ETO characteristics is introduced in chapter 2, and chapter 3 describes the methodological choices. Chapter 4 presents the findings, which also represents the frame of reference for the discussion and the concluding remarks in chapter 5.

## **2 The Engineer to Order Business**

In ETO firms the product produced are often one of a kind, or one of very few. The products in question are often very different from each other. Repeat orders might be made where the manufacturer can use already made and tested design and fabrication processes. There are often very strict customer requirements, and they tend to be very specific, technical and precise, thus ETO products tend to be complex, highly technical and comprise a high level of added value with many levels of assembly [6,7]

These firms tend to operate as project-based organizations [6, 8], where engineering is the core activity [9]. In addition to its unique characteristics in production methods, design and engineering, the human and organizational factors are built on long traditions, posing hinders for new management approaches [10]. Despite this notion, there is an increasing focus on bringing new functionalities into ETO products, as well as introducing new business models, such as ‘power-by-the-hour’ and conditional

maintenance, moving away from the core paradigm of construction to a level of servitization, where new business models will be pushed forward and introducing new challenges. Also worth mentioning, is that ETO differs from firms working by the Make-to-Order (MTO) principles, which is heavily based on lean methodologies with a high level of standardization and manufacturing planning. Interestingly, MTO firms are already achieving a high level of benefits from an extensive use of digital tools, such as robotics and virtual reality, while ETO firms are more in its infancy in the implementation and the search for how to reap the benefits of extensive digitalisation and digital transformation. These new processes, activities and business models will in turn affect organizations, workers and hence, its management.

This development in combination with the increased competition from developing countries located in Asia, which previously were delivering low cost to an acceptable quality, now moving up the value chain due to learning outcomes derived from foreign direct investments, Joint ventures, offshoring and atomization and robotics, is pushing Western companies to speed up and reap the benefits of what digitalization might provide, in terms of new products and services creating new business models as well as increasing effectivity and quality of their production offerings.

The above development induces not only a focus towards potential benefits in form of digital improvements and efficiency but also in terms of organizational strategy and management skillsets.

### **3 Approach and Methodology**

The present research is conducted as a continuation of the former research project “Human Side of Digitalization” [3], which focused on organizational structures, leadership, employee skills and work-life balance in a digital context. As an extension to the results in the first phase, this study provides an additional understanding targeting potential challenges managers might need to reflect and act upon when entering a phase of digital transformation.

Based on a list of 14 identified experts in the Norwegian maritime industry we managed to interview 8 experts from equal number of firms during the period of April – August 2019. The experts were all top managers and senior executives within the firms they were working. They were carefully recruited based on their merits as experts recruited through the researcher’s network

Data collection was performed through semi structured interviews carried out in a maritime ETO environment, lasting on average 60-90 minutes. The interviews focused on managerial perception and understanding of past, present and future skillset requirements in the context of digital transformation [10].

To improve transparency, the findings and analysis is illustrated with quotes from the interviews.

## 4 Findings and Discussion

Overall, issue addressed by the executives interviewed where aspects they considered as important during a digital transformation, as well as their interpretation of it as a phenomenon in itself.

Almost all interviews started with some sort of reflection to digitization mentioning the use of e-mail as a tool for communication and Cad/Cam as a tool for engineering, which is understandable as both tools have been around for at least two decades. However, they should not be considered as a transformation neither as something new nor innovative. Thus, they all agreed that digital transformation is something more, and something that changes the business and the business offerings made possible. Our research thus takes a wider perspective on digitalization to contribute a better understanding of the challenges facing leaders in their effort for digital transition within their ETO based firms. Next section presents three key areas which according to the experts/executives deserve further attention: i) changes in leadership behaviour, ii) decision making and iii) social and cultural structures.

### 4.1 Top Management

The first sub grouping found in the key area of top management are the conflicting perceptions and actions of becoming more efficient while being explorative and innovative. These conflicting interests are termed ambidexterity. Ambidexterity is the notion of doing things with both hands. In business this means to pursue and balance exploration and exploitation, in terms of innovation and operational efficiency. An ambidextrous organization loosens up the rigidity and strict organizational hierarchies and enforce self-organizing [11]. This is in line with Snow et al. [12] perspective that digitalization will alter the ways of working both in terms of exploration and exploitation. All interviewees stressed the importance of acting on the dualism that ambidexterity presents. However, the focus of pursuing and managing this dualism within the organization, by enforcing an explorative perspective introducing new digital products and services seems to fade in the day to day operations, whereas ‘the next day’ operations are the most important. The findings point in the direction that firms tend to maintain focus on efficiency. Digital transformation is, as such, perceived more as a driver for increased efficiency, where new products and services are perceived more as tools to achieve greater efficiency. As one interviewee stated: “ *The driver for [digitalisation] is not to follow the buzzwords and all the issues around internet, and words like artificial intelligence and big data, that is not the driver....[...]... we have a very practical approach to this, thus making things more efficient and do it right the first time, that is what the driver is*”.

The second main grouping found under the key area of top management is the need for an effective strategy. Strategy is about setting a target for the firm and what the firm will become in the future. Our research indicates that the focus for creating and following a digital strategy is made on an ad hoc basis, although there were exemptions. Thus,

there is an interest to follow through on working on a digital strategy, but firms seem to lack a strong, dedicated and deliberated strategic focus. A common expression from our interviews is that there is an expressed wish for enhancing digitalisation and to move towards digital transformation of the firms, but in practice the firms fall easily back into day to day operations, where the focus on digital transformation becomes blurred. As one interviewee stated: “... *without any comparison, here we have the entire office, and then outside on the other side of the parking lot there are some barracks where they have put the IT department. Thus, every time, anyone has a problem with a computer, they have to put on outerwear to approach them...*”

The third grouping found under the umbrella of top management is strategic decisions. Strategic decisions are decisions made by the top management to enhance and push the strategy forward. One component and decision commonly made by ETO firms is the implementation of organizational wide ERP systems. It is acknowledged that implementing ERP systems are difficult. The majority of the experts agreed that the use of digital communication as ERP systems introduce and promote are not well utilised. One argument acknowledging their statement is that the input, output and use of information between the different software systems were difficult and not sufficiently taken care of or managed during the implementation and later the use of the ERP system. The lack of effective implementation leads to suboptimal processes and intra organizational communication outside the system and integrated processes the ERP presents. Further, leading to flow of data outside the dedicated channels and systems. Organization wide system integration is expressed as difficult, and in some cases could lead to operational interference. These integration difficulties are seen as barriers for the further digitalisation processes, and in particularly where developing digital services are the objective. Decisions on the scale of IT and ERP system integration needs to be made in front of, or in parallel of the development of new digital services. As one interviewee stated: “...*thus, a senior executive need to have interest to know that if we were to be a global organisation working digital, it has to be anchored at executive level and distributed down throughout the organization*”

## **4.2 Organization**

Trust is an essential component of organizational life and leadership. The greater the trust the less the control and surveillance mechanisms will be within the organisation. Trust is also a component between the leaders, managers and co-workers, and that each part act in the best interest for all parties and the company as a whole. In our research we found that the experts believed that the co-workers and managers need to have a high level of trust and confidence that the development and implementation of new digital technologies will be beneficial for them, and not seen as tool for reduction in manning and layoffs. As one interviewee stated: “...*and that I think a digital leader also has to understand. He cannot know, and he needs to have trust and confidence in his organization... that they work for the best for the company*”.

Organizational culture is another subgroup found and derived from Organization as a key subject. Organizational culture is evolving within the borders of the organization, with an explicit focus on thoughts and opinions among people. Our research shows that the experts perceive that there need to be a strong culture and attitude within the organization to accept new thoughts and ideas. This implies that there has to be a culture and attitude accepting new and innovative tools, processes and technologies within the organization. As one interviewee stated:

*“... I do not believe the curiosity regarding digitalization, is a culture per se, it is more a culture of being curious of new innovations and technical developments....”*

Motivation and a will to change among the co-workers are important both in terms of implementing new technologies and products within the organization, but also as a mean for providing new product and service offerings. It is acknowledged that there will be opposition to changes made in organizations. It should be reasonable to suspect that, due to the form and type of change that digitalization represents, the older should express greater resistance and be in a stronger opposition to this category of change . However, our experts perceive that resistance and opposition in the context of digitalization is not about age, but more about general interests in digital technology. Their expression was that many youngsters (digital natives), are not necessarily digital savvy. There is a difference in being fluent on social media and superficial use of software, versus being skilled in digital technology and sophisticated use of software. Thus, our findings indicate that the willingness to change and adapt is more about the interests of the individual rather being a digital native or digital immigrant. As one interviewee stated: *“...I have many reports who are positive to those things [digitalization and digital technologies], but the knowledge and understanding for it and how to benefit from it [make effective use of the technology] is scarce... and when the day it comes that they will have to change, then it becomes a challenge.”*

### **4.3 Leadership**

The ability to understand the business you are in are paramount in being able to exercise effective leadership. This implies that effective leaders need to have the skills and know-how, not just about the business they are in, but also to understand the principles of the technology that render the industry and businesses. During our research we found that the majority of the respondents acknowledged their belief that there is a lack of skills and understanding of new digital technologies among leaders and executives. Our interviewees believe there are many thoughts and wishes of new product and service offerings due to digitalization. The lack of a sufficient skillset renders the leader less likely to understand how to, why doing and what resources and expertise will be needed to explore the opportunities digitalisation may provide. As one interviewee stated: *“A leader, an executive, in a firm cannot know everything about digitalization, but he has to surround himself with people who can give advice, who knows and have competence within that area”*

Another interviewee stated: *“...you have to express a clear opinion on what you want to achieve. This will challenge leaders in a greater degree, as more technical*

*savvy environments in the organization are very keen to continuously find and try new technology and create intelligent things... but you need to have a business case. You cannot just do it for the sake of technology but do it because you will earn money on it”.*

Following Shipper and Davy [13] leadership skills follow two broad categories a) interactive skills and b) initiating skills. Their model is useful in the context of traditional industries with less extensive rate and pace of environmental and organizational change, as most ETO firms have traditionally operated within. However, such a model falls short in a digital context with high pace and scale of change. Because of digitalization and the increasing complexities of technology and organizational structures, the power will tip more from the vertical to the horizontal organizational axis. This will challenge leaders, as their behaviour will face greater scrutiny and decisions more questioned due to a broader and deeper skillset among peers and reports. Thus, leaders must accept greater transparency of their decisions. As one interviewee stated: *“For some leaders, especially those of age, who are used to withhold and govern through access to information, [...] That will not work, it will hit them hard. They do not understand that there is so much available information from other sources, which makes people able to verify what has been done. Especially in the aftermath.” [...]... that means that those leaders that are used to govern and manage by withholding information, will face a real backfire. It will not work. A leader has to acknowledge that issues has to be transparent”.*

The third grouping under the umbrella of leadership is the skills and expertise in change management. Change management per se is not about operational leadership nor management. It is more about changing the organization to work differently in its environment. With the increasing pace of change due to digitalization, some of our interviewees believe that organizations will be kept in a continuous state of change. Change initiatives and implementation of new technology and processes will not manifest itself throughout the organization. This leave organizations in a state of continuous flux. Leaders will have to manage and lead in a more fluid environment with higher pace and a higher level of uncertainty. As one interviewee stated: *“With digitalization you got the technological development a different way. You got continuously improvements, you needed and wanted more. Also specialised workers. It became necessary to digitalize drawings. Everything. And now we have the possibility to automate our warehouses and automate our logistic operations. It is like a tsunami”*

## **5. Conclusion**

ETO firms can be innovative and explorative in terms of product development and one-time technical solutions, but digitalization proves novel challenges and new forms of innovation, both in terms of developing new products and service offerings as well as novel processes and the utilization of the new technology within the organization. This alteration requires new skills and different mindsets for successful leadership and management of digital transformation. The new technological trajectory may render parts of the traditional management and leadership skillset outdated and in extreme



cases obsolete. Through our research we have identified three key areas which according to the experts/executives deserve further attention: i) changes in leadership behaviour, ii) decision making and iii) social and cultural structures.

Our contribution is twofold. For the practitioners we provide insight into key areas a leader should give attention to and address while implementing and developing new leadership- and management skills pursuing digital transformation. For the academic community we provide additional insight into the scarce literature of the possible effect that digitalization might have on management and leadership within ETO firms.

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