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Abstract. Digital technology adoption is not new; however, digital transformation in industrial organization is recognized as a contemporary phenomenon. Extant literature, however, offers limited guidance on how the socio-technical system could culturally evolve during the digital transformation. Our limited research focused on the exploration of cultural preparedness in traditional large-scale organization with global footprint. With multi-case study research design, we collected data from three industrial organizations, and perform data analysis with grounded theory approach. Our results are a collected set of values, assumptions, and artifacts pertinent to the cultural preparedness of industrial organizations.

Keywords. Digital transformation, culture, values, assumption, case study, industrial organization

1 Introduction

Advancement in digital technologies underline the unprecedented integration of cyber and physical worlds [1]. Most commonly cited digital technology options fuel the digitizing and digitalizing trends e.g. advanced algorithms and artificial intelligence-aspired data science, machine learning, self-learning systems, AI engineering and industrialized AI, API gateways, cybersecurity mesh, industrial automations, cloud computing and 5G-enabled distributed cloud for industrial/ smart factory applications, SaaS to PaaS, industrial internet of things (IIoT), robotic process automations (RPA), cognitive science, internet of behaviors (IoB) etc. [2][3]. Only considered as limitation, however, technology is bringing multiplex opportunities for businesses. Not only businesses; excited by plethora options and evolution speed, the predominant focus of research community remained to digital technology adoptions [4]. This excitement to capitalize on digital technology advancements has led to tiring efforts on digitizing businesses at an unprecedented pace [5]. Unambiguously and arguably technology is transforming value chains, business operations, and the whole competitive spectrum [4], [6].

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Certainly, digital transformation is a socio-technical phenomenon [1]. Social embeddedness of the deployed technologies impacts value generation and business transactions [7]. Because large changes, like digital transformation, consequence in prudent design updates to the social and technical systems of an organization [8]. These updates involve organizations' goals, people, infrastructure, processes, technology, and their culture [9]. Socio-technical perspective therefore strives to delineate best-fit between aspired technological adoptions and the people [10], [11]. Bringing socio-technical perspective to digital transformation enables collective attention to organizations' structures, people in these structures, the strategic goal-setting and the delivery of goals (as tasks), and the technology as an enabler for desired business performance [12], [13]. Enabling congruence in socio-technical system drive cultural preparedness for digital future of its people, structures, and the tasks [14].

An organization' culture covers all aspects of its "*learned response*" to business challenges and value integration activities of its people [15]. Culture operationalizes macro and micro level organizational mechanisms of change [16], thus it holds regulating role during transformations [17]. Organizational culture furnishes a system of accepted meanings for the employees to interpret a change situation and the response actions [18]. Nurturing organization's culture enables innovativeness, flexibility & agility, engagement, superior financial performance, and hence sustained competitive advantage [19]. Whereas stagnated culture becomes a liability, a source of resistance and increased inertia, and leads to loss-making business [19]. For example, in Kodak's (the film company) sluggish cultural response to digital filming technologies led to loss of market share, 80% decline in its workforce, and stalled the futureproofing of the company [20]. Despite such recorded cases in literature, limited literature on cultural preparedness for digital transformation is a known dilemma [6], [12].

In the current research, our focus is on "how" [21] of the cultural changes can foster the digital transformation of industrial organizations [22], [23]. Our aim is not to predict a universal model of cultural change however to explore its emergence [23] within a single context of digital transformation. Accordingly, this study attempts to answer the main research questions: ***How industrial organizations prepare their culture for digital transformation?*** Herein this research excludes devising cultural diagnostics tool [24]. Rather discusses the cultural preparedness for organizational *values*, *assumptions*, and *artifacts* [15] that propel the digital transformation.

2 Methodology

Culture ties distinctive characteristics of an organizational system; each organization has its own culture. While the social mechanisms of change embedded in the context relay cultural preparedness digitally transforming organization, a contemporary phenomenon. We deployed qualitative case study which is an accepted research approach to investigate a phenomenon embedded in its context wherein the phenomenon and the context are inseparable [25]. We interviewed digital transformation experts and business executives of three (3) multinational industrial organizations with rich history and collective revenue of over eighteen (18) billion euro. For the results presented in this short paper we included the analysis of sixteen (16)

semi-structured interviews from the case companies (see Table 1). All these interviews were conducted in 2019 and during Q1 of 2020 (prior to the pandemic).

Table 1. Research data context

Research Data origin	**Case_Alpha**	**Case_Bravo**	**Case_ Charlie**
Business focus	Offshore & Onshore Energy OEM	Wood processing and Energy production	HVAC & Electric Power OEM
Footprint & revenue	Global; multi-billion €	Global; multi-billion €	Global; multi-billion €
History	+120 years history as engineering & manufacturing; Nordic company	+120 years history as process & manufacturing; Nordic company	+ 80 years old engineering & manufacturing; Nordic company
Interviewee profiles	• VP Digital Transformation • VP Open Innovation • Director Digital Culture • Director business development • GM Business OD • GM Open Innovation	• VP IT & Digital Transformation • VP SCM • Director SCM • Director IT (business unit) • Director IT & Digitalization (business unit)	• VP/Head of a Business-unit • VP Services Business • Director Enterprise Architecture • Director IOT Platform Architecture • Director/ Head of Digital Product Management

We performed grounded theory-based data analysis of the data [26]. The data analysis led to a compilation of organizational culture *values*, *assumptions*, and *artifacts* [15] the leaders in our case organizations are prioritizing to focus for digital tranformation. Interview transcriptions and data analysis results are captured in NVivo.

3 Results and Discussion

All the three cases have had history of successfully futureproofing their businesses since decades. Our initial analysis guides that the stated cultural preparedness in the strategy (published) materials appear quite similar, however, there were quite some peculiarities in practice [19]. Still, there were few common however implicit values revealed during the data analysis process. These commonalities could have been the consequent of successful survival over several decades in a similar industry i.e. engineering, manufacturing, and process. All our case companies value code of conduct based on: ***precision***; ***accuracy***; and, ***authentic knowledge***. This led to open communication culture where people have built-in assumptions on what matter an individual can speak to get appreciated, and in which matters not to participate. In most parts of these organizations, the foremost reason for technology adoption is given to ***operational efficiency*** – their business model evolved at considerably slow, however, at a consistent rate. It is noted that ***disruptive ideas*** for technology adoption are appreciated when communicated from higher-ups in the ***business hierarchy***. However, it is accepted that

the adoption of technologies for improving technical efficiency in lieu of cost effectiveness [27] are promoted by individuals or a team with authentic knowledge. Another, commonality in these cultures is assumptions related to customer reach and collaboration. Customer collaboration is meant to be the discretion of sales and marketing team.

Our case companies are undertaking digital technology adoption seriously with program-like initiatives on corporate, business division or functional teams' level. All the three companies approach digital transformation as a big opportunity to bring customers and business operations closer, not just a business imperative. Our analysis led to three common purposes as the targeted outcomes of digital transformation: ***agility***, c***ustomer-centricity***, and ***collaboration***. We note these three outcomes are ubiquitous as global trends of digital transformation across all industries, however, with our collected data couldn't specify the cause of this commonality.

Our data analysis results show that all three case companies are approaching cultural transformation in a discernable manner. The Case Alpha, deployed cultural preparation by updating values on corporation level with a top down approach. The cultural preparedness in Case_Bravo is taken a top-down route however with focus on developing new artifacts mainly the work procedures, modern systems & tools, and ways to manage development and operational projects. In Case_Charlie, the responsibility of cultural change predominantly remained with individual business units and support functions, herein the top leadership encouraged the middle management to take responsibility for enabling cultural-drive in their respective business lines.

Hereunder, *fig. 1* presents the collective focus cultural preparedness learned from the interview experts of our three cases.

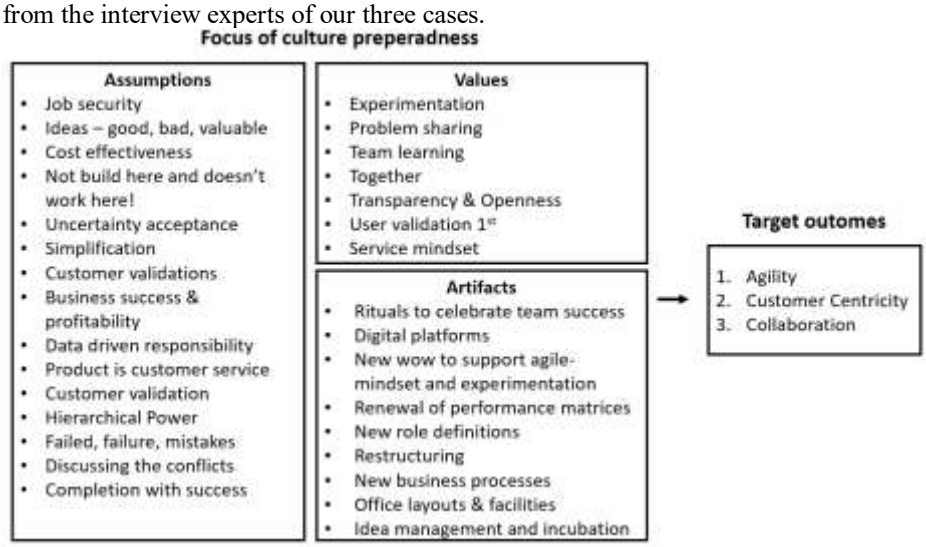

Figure 1. Focus of cultural preparedness in the case industrial organizations.

Organizational values are enduring beliefs that guides the preferable mode of conduct its people apply to get things done [16]. Living both in implicit and explicit fabric of organizational culture, the values are acceptable behaviors in pursuit of "*a*

roadmap for future action" [15]. Our case organization are very much focusing to build & reinforce values of experimentation, problem sharing, team learning, together, transparency & openness, as well as user validation to be first step of developing new products. All these values promote service mindset. To be at service-of-customers drives towards agility and promote beyond formal-hierarchy collaborations to integrate expert knowledge, and seek for externals' involvement. It is not typical in traditional formalized organizations. These values originate from deeply held assumptions validated during the organizational experimenting and learning in response to environmental challenges [23].

Cultural values in their manifestation are explicitly discussed while assumptions remain as tacit believes to interpret day-to-day situations and response behaviors of people as individuals and in a group [17]. Discussed in the introduction section, prior focus on digitizing and digitalization alone has led to job insecurity due to assumptions that automation and artificial intelligence is competing with human competence and workforce. With the insecurity about jobs in a precision-liking culture, people tend to assume that they do not have "*good enough idea*" to share and collaborate on with other colleagues. One expert directed their focus on correcting this assumption by involving people while "*an idea is going through different phases".* Ideation and implementation of ideas involves "*a lot of uncertainty*". By involving people during different phases help to accept uncertainties and discussion of the conflicts. The conflicts are between either different ideas (customer/business problem can be solved by multiple ways) or idea implementation approach. In both cases, the leaders have strong role in updating the assumption that "*conflicts are necessarily bad"* rather constructive conflicts can simplify the solution and its implementation tasks. This shall include validating that "*we make sure it's actually something the customer wants".* Another, relevant assumption the leaders in our case organizations are targeting is business success versus profitability. The cost-conscious culture inherits that successful business are profitable because of cost efficient operations. Such related assumptions trigger most economical responses in within formal hierarchies. While integrating tasks done with cost on top agenda though result in low-cost solutions, which however offer low customer value; result is loss of business and low profitability. Another related assumption in the adoption of new innovations to the business operations: if the tools, systems, and way of working is not based on the existing processes then those are thought to not align to work with our old processes and tools.

Most apparent layer of organization culture is formed from numerous artifacts. The artifacts are workable solutions tested over the course of group actions. Artifacts covers all e.g. dress code, tools, work procedures, methods, business processes, rituals of reward and punishment, IT platforms, as well as the governance structures. In their seminal work, Schein (1990) remarked that the first things a new entrant/employee in organization observes and feels are its artifacts. Our exploratory research reveals that case companies are working on developing rituals for celebration, renewal of performance matrices, new role descriptions, office layouts & facilities upgradations, renewing way-of- working for agile-mindset and experimentation, idea management and incubation hubs, new business processes, and restructuring the organizations. However, expect in case Alpha, we could not specify a sizable restructuring to support digital transformation. Meanwhile, all the case organizations deployed new structures functions and teams) in this regard.

Insofar, analyzed data analysis does not specify which company's approach is best working, neither it is purpose herein. Result however reveal that targeted cultural values and assumptions – what to cease and what to instill – remained with leadership-assumed role and competencies to deploy transformative urgency [28].

4 Conclusions & limitations

Although digital transformation is the new normal for business organization. However, cultural preparedness is response to the need for speed for futureproofing business organizations. Our limited data analysis of the three industrial organizations resulted in compilation of assumptions, values, and artifacts being focused by their leadership. The findings are promising and need further investigation. The future extension of their research will include more data from the case organizations as well we shall explicate on the role of leadership competences and needed role in preparing organizational culture. Alongside the importance of formalization, hierarchy, and integration of organizational structures shall be discussion.

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