Sociotechnical perspective of digital servitization: an investigation of employees' competencies

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Abstract. Digital servitization is a current theme that enables new ways of creating value with the adoption and progressive integration of digital technologies, having a tremendous impact on industries, society, and the economy. These technologies applied to servitization allow the collection and intensive use of real-time data from customers, products, and services to offer new solutions. However, companies' offer of digital servitization faces the challenge of managing a complex system in which the actors involved play new roles and develop new capabilities. This study aims to diagnose the main skills that employees must have to adapt to the context of digital servitization. We used several case studies to analyze nine leading digital services companies in the market. Based on this diagnosis, a framework was developed with the main competencies that we found. Organizations can use the framework to support making decisions about hiring employees by professionals in the field with interest in improvement and by academics who aim to expand research on this topic. The intention is not to criticize the current hiring method but to provide a method to complement the current selection process.

Keywords: Digital servitization, Sociotechnical systems.

1 Introduction

In recent decades, organizations worldwide have invested increasing efforts to expand the service business beyond the traditional product business. Servitization is the most used term to describe product companies that increasingly turn to service businesses to achieve competitive advantages [2]. Recent servitization literature has focused on understanding how digital technologies can support these different service offerings.

The use of digital technologies, such as Big Data, IoT, and AI, allows for the collection and intensive use of real-time data from customers, products, and services to offer new solutions [13]. In this way, digital servitization enables new ways of creating value with the progressive adoption and integration of digital technologies, exerting a tremendous impact on industries, society, and the economy [9]. However,

companies' offer of digital servitization faces the challenge of a complex system in which the actors involved play new roles and develop new capabilities.

The introduction of digital servitization limits an organization's ability to design and manage its sociotechnical systems. Sociotechnical systems theory approaches complex organizational work design that recognizes the interaction between people and technology in the workplace. According to this approach, organizations have a dual function: (1) technical: related to the coordination of work and the execution of tasks with the help of available technology; and social: referring to the means of relating people to each other in order to make them work together. One of the main contributions that sociotechnical theory brings is the intelligent and critical analysis of positions, tasks, social roles that make up the production processes and the introduction of humanistic values in the design of positions and production systems. Thus, one way for the organization to increase its ability to deal with problem domains of sociotechnical systems is to recruit high-quality employees to engage in abstract, turbulent and complex environments, such as the digital servitization environment [7]. Therefore, selecting a professional aligned with the context of digital servitization is a way for organizations to gain a competitive advantage over their competitors.

The "Future of Jobs" report published by [17] surveyed the pace of change arising from digital transformation in 26 developed and emerging countries, including jobs, skills, and workforce strategies needed for the fourth industrial revolution. The report discussed troubleshooting complex systems, e.g., with the development of skills by workers that are important for the next five years, overcoming the need for other common skills such as people management, emotional intelligence, content skills, etc. Because in contexts such as digital servitization, it is especially important to have some skills of qualified individuals who can adopt a more holistic and complex approach [15].

When selecting future employees, companies must constantly update their recruitment methods to find capable candidates with the necessary level of systemic skills that best fit their organization's requirements and objectives [10]. [11] argue that despite growing research interest in organizational aspects of the shift to servitization, the question of organization specifically for digital servitization remains underexplored. According to [12], some challenges are mentioned for digital servitization that includes insufficient IT structures, lack of technical skills, inadequate business processes, high risks, and implementation costs. [8] state that as digitization represents a radical change in organizations, people's reluctance to change or indifference to the need to change may be their most important cultural barrier. This barrier is often underestimated and often unrecognized by companies, thus reinforcing the depth of cultural transformation needed. Corroborating [6] reinforce that one of the major barriers to the digitization of services is the lack of qualified employees to develop and provide such services. Therefore, companies face the challenge of recruiting employees with a profile compatible with this new technological context to implement digital servitization. Although such studies have been important to elucidate digital servitization's strategic and operational role, we note a lack of analysis on the competencies (ie, details and complexities) that these

employees must-have. Therefore, more research is needed to identify the competencies that affect this new context.

Thus, we approach this problem through the following research question: ***What are the main skills that employees must have to adapt to the context of digital servitization?***

The objective of this study is to diagnose the main skills that employees must have to adapt to the context of digital servitization. Based on this diagnosis, a framework was developed with the main competencies that we found. Organizations can use the framework to support making decisions about hiring employees by professionals in the field with an interest in improvement and academics who aim to expand research on this topic. The intention is not to criticize the current hiring method but to provide a method to complement the current selection process. We use the theory of socio-technical systems to explain the interrelationship of an organization's social and technical aspects, highlighting numerous competitive advantages in aligning the individual with the job profile. We used the model proposed by [5], forming a specific model for our study, dividing competencies into three areas. We used several case studies to analyze nine leading digital services companies in the market.

The structure of the article is divided in Section 1, the introduction is presented, in Section 2, the methodology used in the work is described, in Section 3, the results are presented, finally in Section 4, the discussion with the conclusion are presented.

2 Methodology

Our study adopts a qualitative approach through a multiple case study to understand the competencies that human resources must have to adapt to the context of digital servitization. The decision for the qualitative analysis of the case studies stems from the recommendations of [16]. They suggest using this approach when the aim is to explore a new phenomenon and build theories based on an in-depth analysis of the field. This approach is based on collecting data with various representatives of the studied environment who provide insights and understand the context of the problem [1]. The cases were selected by theoretical sampling; they were selected because they were particularly suited to shedding light on the constructs [4]. We intentionally chose digital service companies from different segments to produce contrasting results that can offer a broader view of the phenomenon and facilitate the generalization of results. Thus, we carried out an exploratory study based on semi-structured interviews with nine companies that are a reference in the Brazilian market. Table 1 presents the background of these companies:

Table 1. Background of the companies from multiple case study method

Case company	Area description	Data Source
Company A	Digital financial market	Partner of makes capital

Company B	Design studio that executes digital projects	Founder
Company C	Beauty and cosmetics with digital sales	Innovation analyst
Company D	Digital bank in the area of payments	Produtc manager
Company E	School of creative methodologies in the area of education	Founding partner
Company F	Digital bank	Management analyst
Company G	Information technology	Senior manager
Company H	Paper products by subscription	Co-founder
Company I	Female workforce application	Executive Director

Our study used the model proposed by [5] that presents a wider variety of skills, wherefrom challenges and trends that externally affect the industry suggest a competency model. These competencies are grouped into four classes: technical, methodological, social, and personal. As this study focuses on finding the main competencies specifically in the context of digital servitization, we chose to separate them into three groups for better understanding (Figure 1): (1) nature of the actions: it is the meeting of social and methodological competencies, contemplates the nature of the actions, and the competencies were separated between strategic, tactical and operational; (2) personal competencies: which includes the transferable and innate characteristics of human resources; and (3) professional skills: refers to the technical skills of employees.

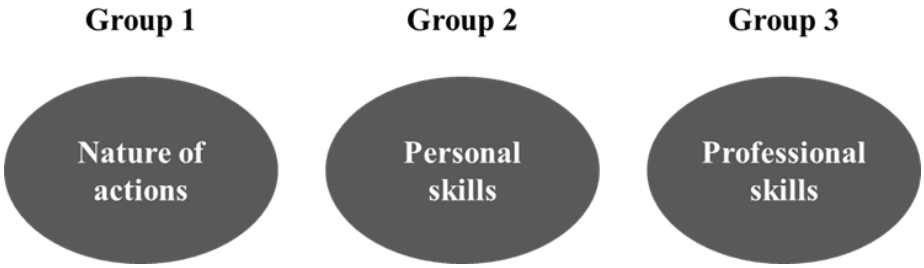

Fig. 1. Model to analyze competencies for digital servitization. Source: adapted from [5].

3 Results

This section of the study presents our findings based on the theory of socio-technical systems in the context of digital servitization, using three groups to classify competencies: nature of actions, personal competencies and professional competencies (Figure 1).

In the group referring to the ***nature of actions*** (Group 1) the following competencies were found: strategic vision, knowledge of the organization's culture, tactical vision, leadership/human relationship, and operational vision. The strategic vision competence refers to the subject's ability to propose and implement actions that positively impact the organization's relations with the market and society and effectively impact the organization's survival. The competence knowledge of the organization's culture determines if the subject knows its culture if it dominates the ethical and moral values, beliefs, habits, behaviors, and internal and external policies shared by its members at all hierarchical levels. The tactical vision competence is the human resource's ability to propose and implement actions that positively impact the organization's management model. The leadership/human relationship competence refers to the ability that the subject has to deal with situations in which there is conflict, knowing how to listen, put himself in the other's place, and create a relationship of respect, credibility, and trust among all of the team. So, operational vision competence is the ability to propose and implement actions that positively impact the company's operations, as in the case of improving equipment operation processes, adopting new technological resources, or even new IT devices.

In the ***personal skills*** group (group 2), the competencies found were: communication skills, proactivity, problem-solving, adaptability, learning ability, motivation for learning, ability to work in a group, and flexibility. The ability to communicate refers to the subject mastering a verbal language, listening, communicating clearly and objectively, creating empathy and generating interest, listening to the message, processing it, and providing the appropriate response. We call proactivity competence when the professional make it happen instead of waiting

for it to happen. Problem-solving competence is linked to the development of emotional intelligence (essential for the correct analysis of the situation and choosing the best ways to conduct its outcome); it can also be defined as identifying the sources of errors and improving processes. The competence adaptability - the subject must have resilience, which is how a person resists and faces changes, whether sudden or gradual, as the person will transform to live from this new scenario under new conditions. The competence of learning ability refers to the person solving everyday problem-situations and using learning principles to interact with the input of information; the person analyzes and acquires structures that were not previously known. The competence motivation for learning is the willingness of the subject to learn, accept and act on challenges more frequently, putting himself in place of the apprentice. The ability to work in a group can deal with conflicts, discuss ideas, and present different points of view on a certain subject relevant to the work, following rules proposed in a group. Flexibility competence is easily adapting to different environments, activities, or situations, being open to changes, willingness to deal with different tools, ideas, interactions

In the ***professional skills*** group (group 3), the following skills were found: entrepreneurship, formal qualification (graduation), qualification by experience, basic IT knowledge, advanced IT knowledge, organizational skills, and technical skills. Entrepreneurship competence refers to the professional who has his initiative, idealizes new methods, and carries out actions to dynamize the service and develop products. The formal competence qualification (graduation) refers to the subject qualifying with a complete 3rd degree (higher education in the area required by the company). The competence qualification by experience refers to the amount of professional experience in expertise. The competence basic knowledge of IT is when the professional notion of languages or operating systems, notions of networks, knowledge in performing backups, optimization of resources, the notion of programming logic. The competency of advanced IT knowledge refers to mastering the knowledge of programming, and web development, knowing the IT architecture of advanced systems, mastering security actions, and knowing project management. Organizational ability competency is the professional's ability to organize their activities, act within contexts defined in standards, and perform tasks effectively. Competence technical capability refers to technical qualification through predetermined knowledge to perform specific activities, moving from operational tasks to more strategic ones. See below in Figure 2 the framework propose of competencies that employees must have in the context of digital servitization.

Group 1 Nature of actions	Group 2 Personal skills	Group3 Professional skills
Strategic vision	Communication capability	Entrepreneurship
Knowledge of the culture of the organization	Proactivity	Formal qualification (graduation)
Tactical vision	Troubleshooter	Experience qualification
Leadership/Human Relationship	Adaptability	Basic IT knowledge
Operational vision	Learning ability	Advanced IT knowledge
	Motivation for learning	Organization capacity
	Ability to work in groups	Technical capacity
	Flexibility	

Fig. 2. Framework of competencies that employees must-have in the context of digital servitization

4 Discussion and Conclusion

Given the competencies found in our research (see Fig. 2), in group 1 we observed that it is not enough for the subject to be just an operational professional but to have ownership of the strategic and tactical vision to work in digital service environments. In group 2, it was possible to conclude that the subject must demonstrate flexibility both in work and personal relationships to change environments, making sense to relate to the context of digital servitization that is constantly changing. Finally, from the competencies found in group 3, we understand that the subject must have specific technical knowledge when they mention that one of the challenges for the implementation of digital servitization includes insufficient IT structures and lack of technical skills on the part-human resources.

The competencies cited in the highest number among all in our research were: problem-solving as the most cited, followed by adaptability, learning ability, and proactivity. Thus, for organizations that work in the context of digital servitization, we can say that personal skills have a greater degree of importance, as the professional will always need to be willing to learn new concepts in this environment of constant innovation. Therefore, professionals who work or wish to work in the context of digital servitization should prioritize their personal skills, but without putting aside professional skills, as these must already be incorporated into the professional or will be learned during the experience.

This study has some limitations, such as the number of companies studied, which can be expanded in several cases and to different contexts beyond Brazil in future research. In addition, we suggest that future research expands this discussion to deeper levels, exploring the competencies found from a statistical model to obtain greater assertiveness in the ideal profile.

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