PROCEEDINGS OF THE WEIZENBAUM CONFERENCE 2019
CHALLENGES OF DIGITAL INEQUALITY
DIGITAL EDUCATION | DIGITAL WORK | DIGITAL LIFE

AN INTERDISCIPLINARY EXPLORATION OF DATA CULTURE AND VOCATIONAL TRAINING

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ABSTRACT

In this interdisciplinary paper we discuss the intersection of organizational data culture and vocational education and training (VET). Building on a preliminary definition of data culture and an explorative analysis of data-related value propositions in the German VET market, we analyze how VET providers address organizational challenges in the wake of big data and digitization that affect many of today's organizations, regardless of their traditional industry. We argue that if organizations want to implement a data culture, their employees have to receive appropriate trainings that convey relevant skills and competencies.

KEYWORDS

Data culture; Organizational culture; Vocational training and education; VET, Data strategy

DOI: 10.34669/wi.cp/2.15

This work has been funded by the Federal Ministry of Education and Research of Germany (BMBF) (grant no.: 16DII115 – "Deutsches Internet-Institut").

1 INTRODUCTION

As they adapt to the challenges and possibilities of big data, today's organizations go through a lot of crucial changes. In their attempts to extract value from data not only do organizations explore new technologies (Ebner et al. 2014) but also business models (Hilbig et al. 2018), organizational structures (Wilberg et al. 2017) and cultures (Marr 2017; Vayghan et al. 2007).

In an ideal setting, these changes follow well-defined data strategies that eventually generate competitive advantages. Although there is no unified understanding of the data strategy concept, some authors underline its interdependence with the skills and mindsets of organizational members. Common notions revolve around the idea that new skills and mindsets, both technical and non-technical, must be adapted by organizational members in order to implement value-driven data analytics (Katal et al. 2013; Wilberg et al. 2017; Wilberg et al. 2018), embedded in an *organizational culture that supports the sharing and use of data* (Connors & Malloy 2007; Vayghan et al. 2007). However, these discussions often fail to include descriptions of the needed skills. Moreover, they lack a model of a supporting culture and its relation to changes with regard to employee skills and mindsets. In order to address these shortcomings and to better understand the interplay of employee skills and organizational culture in the wake of big data, we propose the following steps for an initial interdisciplinary exploration. First, we provide a preliminary definition of a concept that we call data culture. We derive this definition from a brief analysis of a real data-strategic transition that took place at IBM and was first documented in 2007. The analysis will be carried out using a model for organizational culture that has its roots in sociological systems theory and allows us to reflect on the interplay of organizational culture and the skill sets of employees in a structured manner. Building on that, we discuss vocational education and training (VET) as an enabling element for the implementation of big data skills in a given organization and the creation of data culture. We then proceed to combine our previous theoretical discussions with a brief exploration of the VET market in order to gain first insights about which employee skills are actually promoted. Here, we integrate a business model perspective and desk research with a focus on the value offerings of three German VET providers. In a last step, we synthesize our findings and provide an outlook for future research tasks in the field.

2 DATA CULTURE

In 2007 members of IBM's Enterprise Business Information Center of Excellence (EBI CoE) published a data strategy framework that they used for an internal transformation process regarding the enterprise-wide usage of data. At this point in time, IBM aimed to make important parts of their data available for reuse throughout the organization and it turned out that one of their main challenges was to tackle preconceived ideas and practices with regard to internal information silos. In order to overcome these practices, they focused on the elimination of mentalities and visions that were contrary to their goal, thus creating an organizational culture that was supportive of their new ideas (Vayghan et al. 2007). The framework comprises of 6 key elements that, according to the CoE's point of view, complement a successful implementation of an enterprise data strategy, two of which are organizational culture and employee skills (see Figure 1). However, while the authors

The 6 Key Elements of IBM's Internal Enterprise Architecture Program
1. Maturity Model for Data
2. Enterprise Program for Technical Data Architecture
3. Process Design for Creation and Maintenance of Data
4. Data Governance
5. Organizational Culture
6. Employee Skills

Figure 1. 6 Key Elements of IBM's Internal Enterprise Architecture Program according to Vayghan et al. (2007).

discuss the first 4 key elements of their framework at length, their discussion of organizational culture and employee skills does not provide the same depth. By not providing at least a simple definition or model for organizational culture and its data-strategic impact or any information on relevant employee skills with regard to big data, they leave questions unanswered that have become increasingly relevant in the time passed. In terms of a data culture model, we propose to analyze the IBM data strategy framework from the point of view of systemic organization theory. From this perspective, most of the key elements of the IBM framework refer to what is understood as the formal side of an organization as they represent what a given organization formally expects from its members in terms of programs, communications channels and people (Kühl 2018). Then there is the right side or rather visible side of an organization[1]. It represents the façade (Kühl 2018), showing what is supposed to be seen in terms of a curated public image. *Organizational culture, however, is not a formal structure or a façade but represents the informal side of an organization*. It includes emergent practices that build on implicit expectations towards the behavior of organizational members. These practices don't follow any kind of formal agreement, and sometimes even don't comply with them (Kühl 2018). In a way, an organization's culture thus seems intangible. And yet, it can evolve because the model states that there is an underlying recursive process at work, where changes on the formal side impact the informal side that again supports the consistency of the formal design. Now, if the aim of an organization that handles big data is to extract value from it (Hilbig et al. 2018), for our preliminary definition we might envision data culture as a special form of organizational culture in data-driven organizations. It is thus a set of informal practices and corresponding mindsets (expectations) that facilitate the extraction of value from big data. Since data culture itself is intangible, it cannot genuinely be controlled but only affected by the redesign of formal structures within an organization[2].

Organization	**Programs**	**People**	**Communication Channels**
Visible Side			
Formal Side	• Maturity Model for Data • Enterprise Program for Technical Data Architecture • Process Design for Creation and Maintenance of Data • Data Governance	• Employee Skills	
Informal Side	• Organizational (Data) Culture		

Figure 2. The 6 Key Elements of IBM's Internal Enterprise Architecture Program transferred to a Data Culture Model leaning on Kühl (2018).

[1] This side is called "Schauseite" in original German sources.

[2] Given this intangible nature it might be advisable to refrain from concepts such as data-driven culture which implicate one-sidedness and thus might evoke the notion of direct steerability.

Going back to IBMs enterprise data strategy framework, all but two of its key elements belong in the programs section on the formal side (see Figure 2). The maturity model, the technical data architecture program, process design and data governance policies first and foremost aim to provide and implement predefined decision criteria for internal stakeholders and can therefore be classified as programs. None of the key element directly addresses communication channels and only one of them refers to the third structural type (people), namely the 6th key element, called employee skills. While all of these elements have an impact on data strategy in the IBM framework, in related publications some authors especially emphasize the importance of formal changes with regard to an organization's personnel, their respective skills and mindsets. For example, Ebner et al. (2014) emphasize the role of key organizational members for the implementation of big data strategies whose absorptive capacity can be a key driver for innovation. They further state that if employees don't understand the value of an IT system, they will rarely make use of it. Wilberg et al. (2017) state that organizations need to train their employees, including new skills that enable the organization to extract value form big data. Vayghan et al. (2007) as well as Connors & Malloy (2007), who documented data initiatives in major institutions, both stress the importance of new mindsets when it comes to data management in organizations. Building on our previous definition of data culture and these statements, we assume that a data culture can only be developed in a company if employees generate an understanding of the new digital technologies in use and build an awareness for possibilities of using data. *Data culture thus provides a direct link between an organization's capability to provide employee training and development and its transition towards a data-driven future.* According to our model, organizations that keep developing their employee's skills, create a change on the formal side that impacts the informal side where data culture is located. To provide a better understanding of the skills and mindsets in question, in the following section we discuss the concept of VET in companies and analyze the value propositions of three external VET providers who offer employee trainings for companies that strive to implement data awareness and analytics.

3 VOCATIONAL EDUCATION AND TRAINING

Vocational education and trainings are defined as knowledge-intensive services that follow the characteristics of services itself: intangible, immaterial, integration of an external factor, uno-actu principle – production and consumption at the same time (Schlutz 2006; Rippien 2012). On an operational level, VET is part of the human resources department of an organization and aims to qualify all employees for current and future tasks (Oechsler 2000). Depending on the needs, various vocational trainings – also known as on-the-job-trainings – can be implemented in organizations on two distinctive levels. Either as an individual training of the employee or the collective training of a whole company which directly effects corporate and organizational development (Hilbig 2019). In line with a growing body of research, we argue that in order for organizations to implement a data culture as a facilitating element for value extraction from big data, their employees have to receive appropriate trainings that convey relevant skills and competencies. Because of that, vocational education and training of employees becomes a key task for organizations that aim to stay competitive in a dynamic, globalized and digitized world. In order to provide a first understanding of the skills in question, we analyzed the value propositions within the business models of three VET providers as a first impulse for future research.

4 VALUE OFFERINGS IN THE GERMAN VET MARKET

To collect initial insights on how VET providers address the needs of today's organizations with regard to big data, we conducted an initial desk-research to analyze their value propositions. Desk research is an important instrument of qualitative research and makes material accessible that is not primarily collected but draws on secondary sources such as on- and offline texts, films, audio files or objects (Mayring 2010). A lot of information about companies is available through websites, databases, social media channels or press articles, allowing an initial description of new training approaches through document analysis.

VET provider A is a classic training and consulting company that offers full-service for qualification processes, training logistics and seminars. The company is active in the fields of HR, organizational development and information technology. Their training modules are divided into 4 traditional subject areas: IT governance, IT applications, IT operations, IT development and personal and professional development. For each main subject area different seminars with optional certifications are offered. VET provider A focuses on classical information technology topics such as IT security, network technology, database systems or business intelligence. In addition, certifications are offered for products from private providers of information technology such as Microsoft, IBM, SAP, Oracle or Adobe. In the field of digital transformation, training courses on data engineering and data science are also provided.

VET provider B primarily focuses on digitization and industry 4.0. Competencies and profound methods in these fields are conveyed by focus training courses e.g. on the data-driven company or by coaching sessions on all aspects of agile project and innovation management or corporate culture in the digital age. VET provider B also offers consulting services in order to transfer the skills that were acquired in the training courses to real life scenarios in the company itself. By combining online workshop methods with on-site analysis, a roadmap for sustainable digitization strategies, innovative business models and the necessary change management will be provided. Topics in additional e-learning courses range from the basics of industry 4.0 to enablers such as big data, data mining, machine learning and artificial intelligence to blockchain and quantum computing. According to VET provider B, it is primarily a question of corporate culture to successfully overcome the challenges of digitization. This might explain why there is an almost equal number of e-learning courses covering topics such as mindset, new work, leadership and corporate culture in the digital age. Another module block deals with strategies and business models of digitization such as digital business models, digital ecosystems and platforms, or corporate start-ups. Moreover, VET provider B also offers the development of individual learning management systems, e.g. based on Moodle. The individual development and production of video tutorials, interviews, webinars, interactive graphics or animation can also be purchased. Furthermore, VET provider B also offers delegation trips for a cross-national and cross-industry knowledge transfer in terms of industry 4.0.

Unlike the VET providers that were discussed before, VET provider C focuses solely on online trainings. Aiming to increase data awareness for their customer's organizations, they focus on a small selection of data-related technologies as well as the basics of data-driven work and decision making with descriptions that align with existing job assignments in the market. On the one hand, VET provider C offers trainings for would-be data analysts. Here, the focus is on the application-oriented teaching of Python for the preparation, analysis and visualization of business data as well as basics in statistics. On the

other hand, VET provider C offers trainings on a more advanced level for would-be data scientists. Here, they teach machine learning with business data and provide advanced knowledge of big data technology frameworks such as Spark and Hadoop.
Among their customers are digital agencies, start-ups and larger enterprises: from automobile manufacturers to telecommunications providers and pharmaceutical companies.

5 ANALYSIS

Building on the discussion of only 3 VET providers and their value propositions, we can already state that there is a big amount of VET offerings in the current market that address a vast number of skills revolving around the broader challenges of big data for today's organization. In our sample, every VET provider has its own focus, for example, VET provider B and C put data awareness and data engineering competencies much more in the spotlight while the significantly larger VET provider A relies more on traditional information technology trainings. Moreover, all VET providers in this study have in common that they address a whole range of different organizational members in a B2B-setting, including managers, project managers, IT personnel and other internal stakeholders. Thus, the contents of the VET services do not just address technically trained stakeholders such as IT personnel. While some of them focus on teaching additional technical skills to non-technicians, others avoid technical concepts altogether and rather focus on business aspects or organizational development in the context of big data. Moreover, even though all analyzed VET providers offer classical learning content for organizational members in IT positions, offerings such as data awareness (VET C) and corporate culture in the digital age (VET B) indicate an awareness for the importance of new data-related skills for a wider range of organizational members. These value propositions aim to include all organizational members, thus creating an impact that goes beyond formalized role assignments within an organization. Referring to our initial discussion of data culture in this paper, it is interesting so see how at least one VET provider (B) emphasizes the potential impact of organizational cultures on digital change. And yet, their understanding of how to transform organizational culture remains unclear. In general, it is hard to state which of the new competencies discussed above correspond to the ones that were mentioned by Ebner et al. (2014), Wilberg et al (2017) or Vayghan et al. (2007). Moreover, further research will be needed in order to clarify how and under which exact circumstances the offerings discussed above have an impact on data culture. For future research it might thus be advisable to focus on individual organizations, their specific data challenges and the respective subset of relevant internal stakeholders. The same approach would also allow for an empirical testing and in-depth discussion of the initial data culture model that we presented in this paper.

6 CONCLUSION

This paper provides first thoughts on how data culture can be a facilitating element for organizational data initiatives and data-driven transformation. Based on a sociological model of organizational culture, we introduced a preliminary definition of data culture, describing it as a set of informal practices and corresponding mindsets that facilitate the extraction of value from big data within an organization. Building on statements from academic literature, we discussed how vocational education and training provides a possible impact for the development of a data culture. Finally, we conducted an initial desk research to analyze how value offerings in the VET market currently address this situation. Our preliminary results indicate that while we can provide an initial theoretical framework and definition of data culture and its connection to VET services as an enabling element, additional research has to be conducted on how these

services support the evolution of organizational data culture on an operational level.

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