Effects of Digitalization on Vocational Education and Training: First Results of a Qualitative Study

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Abstract: Digitalization confronts vocational education and training (VET) with both challenges and potentials. However, concrete effects of digitalization are missing in research. Especially the perspective of training and learning departments seems to be interesting because the employees in these areas are the central actors in imparting the necessary competencies and skills to the employees of enterprises. Therefore, the main goal of this paper is to elaborate effects of digitalization on VET from the above-mentioned perspective. To reach this goal, we conducted a qualitative study by interviewing 20 experts of enterprise training and identified two main effects on VET.

Keywords: Digitalization, VET, E-Learning, Enterprises, Digital Learning

1   Digitalization in VET

For enterprises and thus for vocational education and training (VET), the ongoing digitalization has both, potentials and challenges [DOB19]. On the one side, the digitalization changes job profiles and job structures [Be15], [LLA18], [FO13]. Therefore, work tasks become more complex and more demanding for employees [PN14], [DM15], [HS16]. On the other side, the digitalization offers new potentials for education and learning in enterprises by enabling new forms of technology-based learning like mobile learning or game-based learning [AR16]. Despite this, there is a lack of research that deals with concrete effects of digitalization on VET [Ha18]. Initial empirical findings show, for example, the effects of digitalization in VET on learning content as well as on the design of curricula from the perspective of experts in the fields education and economics [SMM17]. Nevertheless, empirical findings from the perspective of training and learning departments of the enterprises are missing. However, this perspective is particularly relevant because the employees in this area are the central actors in imparting the necessary competencies and skills to the employees of enterprises. Therefore, the main goal of this paper is to elaborate effects of digitalization on VET from the above-mentioned perspective. Thus, we present insights from a qualitative, explorative study to address the following research question:

RQ1: What are the effects of digitalization on VET?

In the next section, we present the research method and framing of our study. Afterward, we describe first results of our analysis, before we finally give a conclusion and outlook.

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2   Method

To identify what effects digitalization has on VET, we chose to conduct a qualitative and explorative interview study [My13]. Our methodical approach had three steps:

First, we identified potential experts from enterprises in different sectors through research in practice-relevant journals. We searched for experts, who work in the field of VET and are in charge of the design of learning content in their enterprises. In order to ensure heterogeneity and to achieve a comprehensive cross-section for the research area, we involved experts independent of the industry. However, a bias for the Banking industry can be derived. We initially contacted the experts via e-mail and sent them a leaflet about the research project. In total, 20 of the potential experts from enterprises in Germany, Austria, and Switzerland accepted our interview invitation. The summarized characteristics of the sample are shown in Tab. 1.

Expert (Enterprise)	Industry	Expert (Enterprise)	Industry
Exp1 (U1)	Customer-Services	**Exp11 (U9)**	Banking
Exp2 (U2)	Telecommunications	**Exp12 (U10)**	Consulting
Exp3 (U2)	Telecommunications	**Exp13 (U11)**	Furniture
Exp4 (U3)	Engineering	**Exp14 (U12)**	Engineering
Exp5 (U4)	Banking	**Exp15 (U13)**	Automotive
Exp6 (U4)	Banking	**Exp16 (U14)**	Food
Exp7 (U5)	Engineering	**Exp17 (U15)**	Banking
Exp8 (U6)	Chemistry	**Exp18 (U16)**	Banking
Exp9 (U7)	Aerospace	**Exp19 (U16)**	Banking
Exp10 (U8)	Banking	**Exp20 (U17)**	Engineering

Tab. 1: Sample Characteristics

At the **second** step, we conducted all interviews via phone from March to Mai 2018. The interviews lasted between 18 and 80 minutes (Ø= 43 min; $\overline{x}$ =39 min). For conducting the interviews, we used a semi-structured interview guideline where one section of questions addressed the effects of digitalization on VET (e g. *The effects of digitalization include, for example, the increasing automation of routine-based activities, the increase in individualized work steps or the increase in complex, cross-process activities. What effects will these developments have on VET?).* Due to the flexibility of a guideline, the order and the concrete formulation of the questions could be adapted ad hoc during the conversation [Fl14]. At the **third** step, we recorded the interviews on tape and transcribed them afterward, so a further in-depth-analysis was possible. With the help of a structured content analysis approach, we analyzed the empirical data [Ma14]. In this step, we anonymized the transcribed recordings and coded the relevant statements by using the software MAXQDA. The coding was conducted by two independent researchers through a continuous analysis of the transcripts, followed by a mapping of the codes to the core topics. Afterward, we translated the relevant statements into English.

3   Findings

In order to answer RQ1, we identified two main effects of digitalization on VET - Organization of VET (OVET, see Tab. 2) and Increasing Learning Needs (ILN, see Tab. 3). Regarding **OVET**, we identified three categories that describe changes because of increasing digitalization. Six experts stated that the effects of digitalization change the way of learning in enterprises from traditional forms like classroom training to various forms of e-learning (**OVET1**).

OVET	Exemplary Quotes
OVET1: Shift from traditional forms of learning to e-learning (n=6)	"We have a large number of employees and topics that affect many employees, which, if the learning content allows it, can be offered more easily via digital learning or at least make supplementary offers. This has grown very strongly in recent years." (Exp15)
	"We are doing more webinars instead of seminars in order to be able to present content at short notice without having to bring the whole staff into the head office." (Exp10)
OVET2: Enrichment of learning opportunities (n=5)	"Digitalization offers many more opportunities for learning because the workforce is also distributed with smartphones, tablets or laptops, which can be used to access e-learning. [...] there are many more opportunities for VET." (Exp20)
OVET3: Individualization of educational pathways (n=3)	"The individualization of education pathways is becoming more and more exciting. [...]. For example, we no longer have a standard training catalog, [...] instead it is much more the approach: "I have to pick you up individually where you are (according to individual learning needs)"." (Exp13)

Tab. 2: Organization of VET

Nevertheless, the experts made it clear that e-learning does not replace classical forms of learning but is much more of a complementary learning offer. E-learning enables enterprises to reach a large number of employees with less effort than classroom training. Especially for topics that affect many employees, the experts consider e-learning as a very useful option to convey the necessary knowledge on a large scale. A central driver in this context is an increasing need for place and time independent learning. Therefore, the place of learning is not a static dimension anymore and getting more variable. Thus, learning concepts like mobile and micro learning increasingly obtain more importance because they can address this development and enable, for example, work integrated and situated learning. The next effect, also related to a shift to e-learning, is an **enrichment of learning opportunities** in VET (**OVET2**). A central driver that makes this possible is an increase distribution of mobile devices like smartphones, tablets or laptops among the workforce. These represent the necessary access technology to be able to reach employees with various forms of e-learning. Thus, enterprises have the opportunity to enrich their learning offers and, for example, offer situation-related learning content with technology-enhanced

forms of learning, e. g. in the form of short learning units (micro learning) on mobile device (mobile learning). Furthermore, the widespread use of e-learning makes it possible for learning to take place in a less time-bound manner. The learning process can thus be extended depending on the needs so that enterprises can increasingly promote self-determined learning of their employees. Along with that, an **individualization of educational pathways** takes place (**OVET3**). The learning opportunities offered by enterprises are increasingly changing from training measures, which have to appeal to a broad audience, to individual education and training paths. This development is supported in the context of digitalization by the fact that data on the learning progress of learners can be analyzed in a simpler way (learning analytics). Thus, new and individual learning paths become possible which can increase the effectiveness of the training measures.

Furthermore, the experts see an **increase of learning needs (ILN)** because of digitalization. They describe that working life is becoming more fast-paced. For example, products change at ever-shorter intervals, which at the same time increases the learning needs of employees (e .g. training for products or for new production processes). In this context, the experts observe that the learning frequency increases but the learning duration decreases. In addition, learning content is faster becoming obsolete. Thus, the experts state that it is crucial to integrate learning at the workplace, for example, to reduce interruptions of the actual working process. In the next paragraph, we show three different categories that the experts described in this context.

The biggest change perceived by the experts due to the increased need for learning is the growing **importance of demand-oriented learning** (**ILN1**). According to the experts, this development is closely linked to the concept of performance support. This means that employees spend less time in classic classroom training and receive more support at their moment of need, e. g. at their workplace when a problem with a machine occurs. As digitalization makes the activities of employees more complex and less predictable, this form of learning is becoming increasingly important. In order to support the employees, situational and demand-oriented learning content is necessary. The experts describe that the provision of learning content is, therefore, evolving from a push to a pull mechanism. Thus, employees mainly learn when they consider the learning content to be relevant or when they have a specific problem. Closely linked to this aspect is the **demand for small learning contents**, as these are particularly suitable to satisfy the employees' demands for individual and situation-specific support with technology-enhanced learning formats in their moment of need (**ILN2**). The experts attach great importance to these small and short learning contents, especially since only these characteristics make it possible to reduce work interruptions to a minimum and still integrate learning into every day working life. For example, one expert in the banking branch sees great potential for small and short information units to inform field staff about market reactions or new products via their mobile devices (Exp18). Therefore, the enterprises spend great efforts to keep the (e-)learning content as short as possible. Another important point mentioned by the experts is that a **high level of knowledge** is increasingly becoming a critical competitive factor for the enterprises (**ILN3**). Customers expect their business partners to have a high level of knowledge as digital information platforms are increasingly making the market

situation more transparent and competitors more comparable. This problem is particularly relevant in the retail sector, where customers have a good overview of the market via numerous digital information platforms such as price comparison portals. If the suppliers and business partners do not have significantly better and more up-to-date knowledge as their customers, the customers may perceive the advice as superfluous [SFV16].

ILN	Exemplary Quotes
ILN1: Demand-oriented learning and performance support (n=9)	"Due to the diversity of the topics and also due to the technical possibilities it changes in such a way that more and more is learned at the moment of need." (Exp14)
	"So if someone learns for himself in 70% of the cases [70:20:10 model] simply because he or she is personally faced with a task, then I have to rather see what is so possible on-demand. Digitalization also helps here." (Exp13)
ILN2: Need for short learning units (n=3)	"The contents must be short so that the employees are not delayed for long in the normal workflow." (Exp7)
	"In the last three years we have shortened our e-learning by more than half and now offer learners formats of less than a minute." (Exp3)
ILN3: High level of knowledge as a competitive factor (n=2)	"Learning [...] is becoming more and more central. [...]. The customer has high demands on his contact person and his supplier and there must be a very high level of knowledge." (Exp4)

Tab. 3: Increasing learning needs

4   Conclusion and Outlook

Bringing it together, our findings show a positive perspective on the effects of digitalization on VET from the view of training and learning departments. The technological possibilities complement classical measures of VET and allow new learning opportunities like performance support at the workplace with micro content on mobile devices. E-Learning helps enterprises to communicate important information as well as learning content to their employees in a faster and more efficient way. This also makes it possible to design educational offers more individually and to tailor them better to the learner with the help of data analysis. In addition, the experts stated that the new e-learning formats help to shift the learning more to the place of the event or the moment of need. Thus, employees receive information in their moment of need, for example at their workplace or on-site at the customer premises. However, what remains unconsidered by the experts are the problems and challenges that enterprises perceive with regard to digitalization. Since the successful implementation of e-learning depends to a large extent on the appropriate didactical preparation of the learning content, future research should

examine which problems and challenges enterprises perceive in the didactical preparation of learning content. These findings would make a major contribution to both science and practice in making digital learning more successful in enterprises as well as in other contexts.

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