Chapter 2
How Can I Help You Today?
The Rise of Virtual Assistants in Human Resources Management

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ABSTRACT

The pandemic context has fast-tracked the digital transformation of many organizations that pursued to dramatically change their organizational processes to survive in a global digital economy. While virtual assistants (VA), a specialized artificial intelligence-based chatbot, such as Alexa or Siri, have penetrated our private lives, many organizations are still trying to understand and evaluate why and how to integrate these technologies into their employees' workday. The study explores whether VAs can be used to support human resources (HR) trainee management software in a German organization and how it can be done. Four key HR areas of self-service, onboarding, training, and knowledge management were explored. Interviews were conducted to analyze which VAs' functions can be reused to support trainee management software in these four areas. The technology affordances and constraints theory were used to analyze data collected. The results showed that a VA's functions can support trainee management software especially in the areas of self-service, onboarding, and training.

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INTRODUCTION

After two years of pandemic, there is a widespread agreement that digital technologies have made our lives easier while global economy is becoming more digital as businesses are being more and more affected by digital technologies such as the Internet, mobile connectivity, cloud computing, big data, artificial intelligence (AI), Internet of Things, predictive and data analytics and other emerging digital technologies (Soto-Acosta, 2020). The COVID-19 context has accelerated the digital transformation of organizations and entire industries such as retail and education. Digital transformation is about radically rethinking how an organization uses technology, people, and organizational processes to fundamentally change its performance (Kane, 2019). Moreover, the pandemic impact on organizations has provided opportunities for new business models that are based on a combination of AI tools and traditional business models.

The field of Artificial Intelligence (AI) has gained more and more interest over the past 10 years as the underlying technologies are now able to fulfill the requirements to process large amounts of data (Io & Lee, 2017; Liao et al., 2019). Artificial Intelligence typically indicates a broad class of information technologies that allow a computer to execute tasks that normally require human cognition, including decision making. By identifying and learning reoccurring patterns in large sets of data, AI-based software tools or chatbots, understand, process, and answer user queries in textual or vocal form (Saukkonen et al., 2019).

A Virtual Assistant (VA) is a specialized chatbot that serves a specific purpose, that is, supporting users (Battineni, 2020). Virtual Assistants can be seen as a Digital Innovation as they fulfill the three criteria of Digital Innovation stated by Nambisan et al. (2017). First, VAs have a so-called innovation outcome, as they enable new services within the company (Tambe et al., 2019). Next, VAs use digital tools (e.g., data analytics and deep learning) to enable desired innovation outcome, and finally, the innovation outcome can be used and adapted to different contexts, for example, healthcare or Human Resources Management (HRM) (Laranjo et al., 2018; Tambe et al., 2019).

In the field of HRM VAs have not made as much progress yet compared to the other areas (Tambe et al., 2019). One of the main reasons why AI in general is rarely used in HRM is that some HR functions or some HR activities are unstructured, including recruitment, training, and maintenance (Jantan et al., 2010). For instance, it is not easy to measure what constitutes a "good employee," assuming that most of the time "job requirements are broad, monitoring of work outcomes is poor, and biases associated with assessing individual performance are legion" (Tambe et al. 2019, p. 21). Factors such as "constraints imposed by small data sets, accountability questions associated with fairness and other ethical and legal constraints, and possible

adverse employee reactions to management decisions via data-based algorithms" (Tambe et al., 2019, p.15) make it more difficult to use AI-based tools in the HR function that in other organizational areas. However, recent advances in cognitive AI technologies triggered opportunities for VAs to increasingly be used for different tasks in HRM (Liao et al., 2019) and will increase in the next 5 years (Saukkonen et al., 2019).

Within the field of HRM, scholars have proposed different areas where VAs can be used, for example, recruitment (Asher, 2017; Soutar, 2019) or training (Koeva et al., 2016; Sekhri & Cheema, 2019; Mohan, 2019), but to our best knowledge, no studies could be found on how VAs can be used in the area of the unique German dual vocational training apprenticeship.

Organizations and educational institutions cooperate to teach trainees expertise and train them on how to apply this knowledge within the companies. The dual vocational training apprenticeship concept, firmly established in the German education system, is based upon a combination of on-the-job training within a specific company and classroom-based training provided by a vocational school to apprentices also called trainees (German Federal Ministry for Economic Affairs and Energy, 2017). Every organization that uses this approach needs to coordinate and monitor its trainees to keep track of their learning process as well as their upcoming tasks. This coordination and monitoring are usually done by HR employees using a trainee management software. Virtual Assistants could be used to automatically perform these tasks. Considering that some of these tasks are repetitive while other are unstructured, could potentially a VA handle them in the same manner as a HR employee in the context of the post-pandemic realities?
To fill the gap in this literature we advance two main research questions:

1. *Can Virtual Assistants be used in trainee management software?* and if so,
2. How can Virtual Assistants be used to support trainee management software?

Since the use of VA to support trainee management software represents a new avenue of exploration, the Technology Affordances and Constraints Theory (Majchrzak and Markus, 2012) was chosen because it can help to "[…] explain how and why the same technology can be repurposed by different actors or has different innovation outcomes in different contexts" (Nambisan et al. 2017, p. 8). This theory was used to analyze the innovation outcomes of VAs used to support trainee management software.

Data were collected via a single case study. This research design was selected because the phenomenon of interest differs from every other occurrence as the usage of VAs differs from the everyday usage of trainee management systems (Yin, 2018). We performed nine interviews with HRM experts working for the organization

DigiSol (not the real name) and five interviews with employees from four of their organization clients. DigiSol is a 200-employee German IT services providing HRM software called Magellan to their clients in the aviation and banking sectors, which includes a trainee management module.

Recent studies have shown that many organizations are still not ready to use AI in HRM as processes, jobs, and technologies will have to change with the introduction of the AI (Jia et al., 2018). By showing which HRM tasks can be supported by VAs, organizations may be better informed when considering the usage of a VA in their trainee management system. The main contribution of this research is that a new, relatively unexplored field is analyzed, which can lead to a better understanding of the current AI-based technologies and how they can be used in a post-pandemic global economy. This might provide a solid foundation for more research in this field.

VIRTUAL ASSISTANTS AND HR PROCESSES

It has been suggested that the best choice for an information system (IS) that supports HR processes is a decisions-support system (Cao, 2010). Recently, it has been shown by several scholars, that many of the tasks accomplished by HR managers using decisions-support systems can now be automatically achieved by VAs (Buzko et al., 2016; Tambe et al., 2019; Sekhri & Cheema, 2019). For instance, HRM-related tasks, such as providing a service point for employees (Buzko et al., 2016; Klopfenstein et al., 2017), identifying recruitment performance assessment, onboarding, training (Tambe et al., 2019; Sekhri & Cheema, 2019) as well as gathering and managing knowledge can all be executed by VAs (Tambe et al. 2019). Thus, VAs can execute four key HR tasks: supporting employees in daily HR tasks, onboarding, training, and managing knowledge.

Self-Service – Supporting Daily Tasks

Virtual Assistants can provide support to employees during their daily tasks (Singh et al., 2018). Virtual Assistance consists of different supported tasks. For instance, executing search queries on employees in an efficient way so that the HR employee can work with the results more quickly than searching for it by themselves (Birzniece, 2011; Meyer von Wolff et al., 2019). Khurana et al. (2017) show in their study how a VA that was programmed to answer HR-related Frequently Asked Questions, was able to reduce the number of questions asked per day by 83%. By answering nearly all HR-related questions, VAs free time for HR employees and reduces repetitive work (Asher, 2017) and increase productivity (Brandtzaeg & Følstad, 2017).

The proactivity of VAs is another reason for increased efficiency. Virtual Assistants would show relevant information proactively to the users by realizing a prescreening of received resumés, gather a wide range of data, for example on the applicant's experience, and request for HR selection representative to start the process of application analysis (Nawaz & Gomes, 2019).

Onboarding

Onboarding represents the HR process of providing the necessary information and knowledge that are needed for a new hired employee to successfully start in the new job (Westberg, 2019). Organizations often think that onboarding happens automatically and naturally because an employee connects and exchange with other employees over time. Thus, several organizations do not make onboarding a priority (Hu, 2019). This can be problematic as a recent study showed that 25% of the new employees leave before they finish their first year because of a lack of understanding and guidance (Harpelund (2019). A well-planned onboarding process that includes a mentor (Asher, 2017) results in about 50% more productivity from the new employee (Harpelund, 2019). A common problem in onboarding is that new employees do not get a good first impression of the organization during their first days (Westberg, 2019). Virtual Assistants can be used to support the onboarding process by (1) providing relevant information to the new employee during a question and answer (Q&A) session, and (2) disseminating information about the new employee across the organization more quickly, which may lead to a faster welcome in the organization (Nawaz & Gomes, 2019).

Training

It has been shown that the use of AI during the training process, can significantly decrease the number of resources needed to provide support during and after training (Buzko et al., 2016). Using AI for training employees enables more efficient knowledge transmission via a personalized teacher (a chatbot). The chatbot communicates with the student and teaches different learning materials during the chat session (Winkler & Söllner, 2018; Mohan, 2019). Student's responses during the chat are analyzed by a VA that generates feedback to the trainee on whether the answer was correct or not (Koeva et al., 2016). Thus, VA can provide automatic, direct, and instant feedback to the student helping him/her to learn and accelerating the training process. After the learning objective is completed, the VA can generate a test that must be answered by the trainee to verify their knowledge (Koeva et al., 2016).

Managing Knowledge

Managing organizational knowledge requires the ability to capture new knowledge, share it, and reuse it in various contexts by various employees or AI (Tsui et al., 2000). A Virtual Assistant represents a potentially major source of precious knowledge for organizations. By asking the users about new information, new processes, or new systems in its organization, a VA can collect an important quantity of data and hand it over to experts, who can create new knowledge out of it (Meyer von Wolff et al., 2019). Another feature of a VA is its ability to quickly redirect a user to another human if a question cannot be answered. In this case, the answer of the human becomes new knowledge and should be saved and integrated into the VA (Massaro et al., 2018; Verleger & Pembridge, 2018). Furthermore, a VA can also help creating better social environment in organizations by analyzing the underlying social structures using data collected from the organizational social media or conversations between employees (Tsui et al., 2000; Tambe et al., 2019).

In conclusion, VAs can be used to support different HRM tasks, namely onboarding, training, and managing knowledge. In addition, VAs can be used as a self-service point (Sekhri & Cheema, 2019). Being able to answer questions on various topics quickly and doing this faster than humans, VAs constitute a viable option for supporting employees during their daily workday (Meyer von Wolff et al., 2019).

THEORETICAL DEVELOPMENT

Modern Digital Innovation Management Theories

During the last decade, the research in digital innovation management theories progressed by analyzing in more detail several aspects of digital product and service innovations (Nambisan et al., 2017). Some researchers began to identify the dilemmas that come with the management of digitalization (Tilson et al., 2010), and more and more researchers started focusing on the outcomes of digital innovations, on the required conditions for digital innovation to emerge, and on the problems which can be solved by digital innovations (Nambisan et al., 2017). According to Nambisan et al. (2017), the three fundamental questions when it comes to innovation management are: 1. “How do innovations form/evolve?”, 2. “How should actors/entities organize for innovation?”, and 3. “How [do] the nature of innovation and the organization of innovation interact?” (Nambisan et al., 2017, p. 224).

To analyze digital innovations and answer these questions, Nambisan et al. (2017) suggest to use the theory of the Technology Affordances and Constraints theory as a conceptual tool. This theory can be used to analyze the innovation outcomes of an

existing digital innovation in a new context (Majchrzak & Markus, 2012; Nambisan et al., 2017) as well as to compare innovation outcomes in already known contexts (Nambisan et al., 2017). This theoretical lens focuses on the technology affordances, which according to Majchrzak & Markus (2012) are "[…] what an individual or organization with a particular purpose can do with a technology or information system" (Majchrzak & Markus, 2012, p. 1).

Affordances reflect the potential usages that come with the use of an IT artefact. Examples of the outcomes of potential IT affordances are, for instance, sharing information or increasing productivity (Majchrzak and Markus, 2012). IT affordances are then matched with the users' needs in a specific context to understand the relationship between the technology features and the users (Nambisan et al., 2017).

VAs Affordances

We conducted a literature review on human resource management and AI to identify and analyze which affordances may become available with the implementation of a VA into a trainee management software. Altogether, we identified ten affordances and we labelled them by following authors' recommendations[1].

The first affordance identified is **Increase Efficiency**, which means that a user needs less information to complete a task without increasing the time they need to complete it. As shown by different studies, the employees work more efficiently when they use VAs to search for something rather than searching for it on their own (Birzniece, 2011; Meyer von Wolff et al., 2019).

With an increase in efficiency often comes an increase in productivity, which is the second identified affordance: **Increase Productivity**. It represents a decrease of time needed to complete a task while not increasing the information needed for it (Brandtzaeg & Følstad, 2017). Productivity can also be increased in the training process when the VA is also available on mobile devices, which increases connectivity between the teacher and the student (Gonda et al., 2018). The third affordance identified is **Reduce Needed Resources**. Khurana et al. (2017) have shown that their VA was able to reduce the number of questions handed over to the HR department by 83%, which reduced the resources needed in the HR department significantly. Employees tend to forget where to find needed information, which can result in a waste of time and resources, something that the VA can easily prevent (Westberg, 2019). Besides reducing the needed resources, VAs can reduce the workload of employees (Asher, 2017), resulting in the fourth identified affordance: **Reduce Workload**. This can be achieved by using the suggestions for alternative solutions feature of a VA, which can result in less workload (Brandtzaeg & Følstad, 2017; Yawalkar, 2019). The workload can be reduced even further by using the VA

to obtain an overview of unstructured information, so employees do not need to summarize this information (Meyer von Wolff et al. 2019).

Being able to solve the tasks with less workload, resulting in less stress during the day, leads to the fifth affordance: **Enhance Working Atmosphere**. As shown by Asher (2017), the implementation of a VA reduces repetitive work, which lowers employees' frustration by the monotony of their job and results in overall increase of happiness at work. Also, during the training process, employees will be less likely to become frustrated when working with a VA, as the AI tool can generate questions based on the learner's interests and provide tips if the learner cannot solve a problem. The help and support provided by the VA results in more motivated employees (Oudeyer et al., 2016; Winkler & Söllner, 2018; Ruan et al., 2019).

The sixth affordance identified as **Increase Information Availability**, would enable a user to access more information. As shown by Klopfenstein et al. (2017) and Meyer von Wolff et al. (2019), VAs are accessible at all times within the environment in which they are installed and are not bound by space or time, so users can obtain the needed information anytime they want. The seventh identified affordance is **Increase Information Sharing**. This affordance is enacted via different VA-supported functions that provide users with information without having the user search for them. In addition, proactively sharing information about a task that a user is currently working on (Nezhad, 2015) leads to better-informed employees overall (Nawaz & Gomes, 2019). The eighth affordance identified is **Increase Communication**. This affordance is enacted by feedback functions of VAs which collect feedbacks from employees, summarize it, and hand it regularly over to managers (Mohan, 2019; Nawaz & Gomes, 2019). The same strategy can be used in training where VAs can be used to gather feedbacks from the trainee and enable the teacher to enhance their lessons based on them (Winkler & Söllner, 2018; Gonda et al., 2018).

The last two affordances are not only enacted by VAs function but also flow from the implementation process of a VA. The ninth identified affordance was **Generate Knowledge**. This affordance results mainly from the implementation process as the existing knowledge in an organization must be collected and structured in a practical way to generated pertinent training data for VAs (Tambe et al., 2019). Here, every possible data point is collected and organized, which may lead to the discovery of new knowledge (Tambe et al., 2019). Also, the existing knowledge must be maintained to prevent it from becoming outdated which leads to the last affordance: **Maintain Knowledge**. Using the feedback function of VAs, the users themselves can maintain the knowledge by giving feedback on whether an answer was helpful or not (Cao, 2010; Singh et al., 2018). To address the two main research questions, we propose five research propositions (see Table 1) that were tested on the data that were gathered from the case study.

Table 1. Research propositions and related identified affordances

#	Research Proposition	Related Affordances
1	Virtual Assistants (VAs) can be used to increase the efficiency and productivity of organizations using trainee management software.	Increase Efficiency, Increase Productivity
2	The implementation of a VA into a trainee management software can be used to reduce the workload of an HR employee and the resources needed for a specific task.	Reduce Workload, Reduce Needed Resources
3	VAs supporting trainee management software can be used to enhance the working atmosphere and increase the communication in an organization.	Enhance Working Atmosphere, Increase Communication
4	VAs can be used to increase the amount of shared information and to remind employees and thereby increase the information availability overall.	Increase Information Availability, Increase Information Sharing
5	VAs can be used to manage knowledge by enabling more options of generating and maintaining knowledge.	Generate Knowledge, Maintain Knowledge

METHODOLOGY

An explanatory case approach (Eisenhardt, 1989) was adopted to identify relationships between an "observed state of a phenomenon and conditions that influence its development" (Avgerou, 2013, p. 428). Following Eisenhardt's (1989) methodological recommendations, we anchored our problem definition and preliminary construct specification in extant literature and crafted our data collection instruments accordingly.

The selected organization was DigiSol (not the real name), a German IT consultancy firm with 200 employees that develops and sells banking and HR management software called Magellan consisting of different modules. Besides developers, the organization employs several consultants - HRM specialists, that analyze DigiSol's clients HR processes and provide recommendations on how to improve them. One of Magellan's modules, called Training, is dedicated to the management of trainees. It is used to coordinate and oversee the management and to plan and review their tasks at different worksites and their educational objectives. At the time of the writing (February 2022), DigiSol was still in the process of testing a Virtual Assistant for their Training module.

Interviews were the main method of data collection and were based on a protocol made from the extant literature and research. Two types of informants were selected: based on the recommendations provided by the heads of HR Department and the Development Department, we first selected several key stakeholders involved in the VA development – managers, developers, and consultants. Overall, nine interviewees were selected. Then, based on the firm consultants' recommendations, we contacted

six client organizations that were participating in the VA testing process. Four organizations (called here Client organization 1, 2, 3, and 4) were interested in our research and five interviews were carried on. The five interviewees were involved in at least two VA test sessions in their respective organizations. Thus, overall, fourteen interviews (see Table 2) were conducted via Zoom that lasted between 35 to 75 minutes.

Table 2. Interviewees OVERVIEW

Organization	Position	Time in this position
DigiSol	Head of Digitization Department	2 years
	Customer Support Consultant	3 years
	VA Project Manager	2.5 years
	VA Software Developer	5 years
	Head of the HR and Organization Department	14 years
	Consultant for the Solution Integration	3 years
	HR Systems Consultant	10 years
	Head of Development, Product Owner	1 year
	Consultant for the Solution Integration	2 years
Client organization 1	Trainer of the IT Department	10 years
Client organization 2	Personnel Officer	18 years
Client organization 3	Trainer	27 years
	Trainer	3 months
Client organization 4	Training Coordinator	13 years

Following Yin's (2018) recommendations, we triangulated the interviews with archival sources, including project documentation, organization documents (wiki boards, management presentations, communication plans, and emails). The archival documents were used in two ways. First, emails and management presentations were used to formulate and refine interview questions and second, reports were used to validate interview reports. Phase 1 of the coding process consisted in creating a list of categories based on the definitions of the ten identified affordances during the literature review. In Phase 2, the interview transcripts were introduced into a database, read carefully and relevant portions highlighted. The highlighted portions were then keyed into the database into a field called "evidence" as chunks of rich text.

All the transcripts, starting with the first interview, were coded using the preliminary set of codes. The development of the coding scheme was an on-going

process throughout the transcription of each of the interviews. The goal of the coding was to identify patterns. Usually a pattern, in collected interview data, "at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon" (Boyatzis, 1998, p.4). In our case, we were looking for chunks of text that would relate to any affordance that has been defined in section VAs Affordances. Patterns may be generated inductively from raw interview data or generated deductively from theory or prior research (Patton 2002). We chose the latter approach. We followed Patton's (2002) two-stage analytic induction: first, we selected and coded pieces of texts (mostly from the transcripts of interviews and archival documents) and then we analyzed the resulting data to determine whether the findings support our five research propositions. The analysis of the three data sources yielded 616 patterns to one or more of the 10 affordances.

FINDINGS

Proposition 1: Increase Efficiency and Productivity

The first research proposition is based on the affordances **Increase Efficiency** and **Increase Productivity**. It is the second most referenced research proposition with 188 distinct patterns referencing it. The first affordance, Increase Efficiency, is referenced 69 times either directly or indirectly during the interviews.

"Firstly, you don't need a person to answer your questions and secondly, you have an answer immediately, and you have it at any time" (HR systems consultant, DigiSol); "From a business point of view, the organization could save millions of euros from now on. Firstly, because knowledge is not lost and secondly, because the search is concentrated at one point, and I don't have to run around a thousand times to gather my information." (Personnel officer, Client organization 2).

The second affordance mentioned in the first research proposition is Increase Productivity. There were 72 patterns referring to it in the DigiSol interviews, 19 in the archival documentation, and 28 in the client interviews.

"It is able to remind the trainee, for example, that he/she has to maintain the report book, that he/she has to go to vocational school tomorrow, that his/her certificate is still missing, and it needs to be uploaded." (Consultant for the Solution Integration, DigiSol); "Definitely higher productivity. There are time advantages when a VA is optimally introduced and used." (Trainer, Client organization 3)

The analyses of all three data sources show that both Increase Productivity and Increase Efficiency affordances are supported by the data. While the Increase Efficiency affordance is the third most referred to affordance, the Increase Productivity affordance is the second most referred in every data source. Hence, the data provide some evidence to support the relevance of Proposition 1.

Proposition 2: Reduce Workload and Resources

The second research proposition is based on the affordances **Reduce Workload** and **Reduce Needed Resources**. Both affordances together are referenced by 69 distinct patterns. Data analysis identified 42 patterns in the DigiSol interviews. Across all data sources affordance Reduce Workload is supported and it is the sixth-most frequently referenced one (38 patterns).

"This is a key aspect in addition to reducing organizational hurdles during the onboarding process. With the VA, the trainee has someone on his side to support him. The VA could therefore ensure that time and money can be saved in the background." (Head of Development, DigiSol); "From a business point of view, the organization could save millions of euros. Firstly, because knowledge is not lost and secondly, because the search is concentrated at one point, and I don't have to run around to gather my information." (Trainer, Client organization 3)

While the affordance Reduce Needed Resources is mentioned in 25 patterns in the interviews with the DigiSol employees, only 5 patterns in the archival documentation and 1 pattern in the client interviews were found. We believe that this lack of patterns in the client related data is due to the similarity between the two affordances in terms of practical results. Notwithstanding this, we consider that overall, the patterns found in the three data sources provide some evidence to support the relevance of Proposition 2.

Proposition 3: Enhance Working Atmosphere and Communication

The third research proposition is based on the **Enhance Working Atmosphere** and the **Increase Communication** affordances. We found 93 distinct patterns that refer to this research proposition, with 52 of these patterns being identified in the DigiSol interviews. As mentioned earlier, Enhance Working Atmosphere affordance covers everything that makes employees enjoy their work more, makes them feel more welcome, or allows them to feel more appreciated. DigiSol interviews showed great support for the Enhance Working Atmosphere affordance (the fifth most frequently

identified pattern), and no pattern could be identified that would state that the working atmosphere would deteriorate if the VAs were used. Additionally, the analysis of the other two data sources has shown that this affordance is supported by the evidence.

"I believe that one of the benefits will be that the trainees are better informed, because I believe that at some point when a trainee has had many questions, he no longer dares to ask a question and then thinks: 'Somehow, I'll be fine by'. And then the trainee may not be as well informed as if he could simply ask five times without anyone noticing." (Head of HR, DigiSol); "The fact that I can ask the VA questions is of course convenient, that I don't have to put myself in the position of asking the trainer the same question five times during the training session." (Trainer IT department, Client organization 1)

The other affordance, the Increase Communication may overlap with the Enhance Working Atmosphere affordance because a better communication can also result in an enhanced working atmosphere. Overall, 33 patterns refer to this affordance, with 20 of them being extracted from the DigiSol interviews, 4 from the archival documentation, and the rest from the client data.

"VA can be used to create a platform on which the trainees can exchange information. They can virtually meet and exchange ideas. An advantage would be that the VA could be configured to moderate the platform. From time to time, it could send notifications to the users that they should exchange more information with each other." (Customer support consultant, DigiSol); The trainees often have the problem that they don't know whether they have read everything about a certain topic and a VA would be a great help here. For example, considering a specific topic, the VA would notify you 'communicate with this or that employee, because he or she is dealing with the same topic'." (Trainer IT department, Client organization 1)

The analyses of all three data sources show that both Increase Communication and Enhance Working Atmosphere affordances are supported by the data. Thus, the data seem to also provide some evidence to support the relevance of Proposition 3.

Proposition 4: Increase Information Sharing and Availability

The fourth research proposition is based on two affordances: **Increase Information Availability** and **Increase Information Sharing**. With 224 distinct patterns (133 from the DigiSol interviews, 67 from the client interviews, and 24 from the archival documentation), it was the most frequently referred to research proposition. The analysis of the DigiSol interviews yielded 100 patterns referring to the Increase

Information Availability affordance. It is the most referred to affordance over all data sources.

"One aspect about VAs is exciting: the availability of information. The HR employee goes down the stairs to interview, let's say, Jan a potential new employee. The VA can instantly give him the information about the school the candidate finished, what kind of teacher and grades he had" (VA Software Developer, DigiSol); "For the instructor, it is good that he could say 'Give me an overview of the trainee', so that he can intervene in time if grades are not right and not wait until he can't make up for the gap anymore" (Trainer, Client organization 3)

While somehow similar to the Increase Information Availability affordance, the Increase Information Sharing affordance is focused on functions that proactively provide information to the trainee.

"VA would ensure the procurement and sharing of information. For example, one could tell the VA that an appraisal should be arranged for specific trainees in the third year of the apprenticeship and the VA would send it out immediately." (Head of the HR, DigiSol); "I think it is very difficult to follow the conversations during the training sessions because of data protection. By tracking conversations, then filtering and sharing the information, the VAs would be great tools." (Training coordinator, Client organization 4)

Since both affordances were identified in patterns of data in all data sources, the relevance of Proposition 4 seems supported.

Proposition 5: Generate and Maintain Knowledge

The fifth and final research is based on the **Generate Knowledge** and the **Maintain Knowledge** affordances. With 42 distinct patterns referring to this research proposition, it is the least frequently referred to research proposition. The overall support for the Generate Knowledge affordance is low compared to the other affordances. Five of the nine DigiSol interviews do not contain any pattern that supports this affordance, but all have at least one pattern that does not support it. As more than half of the DigiSol and client interviews and the archival documentation do not support this affordance, the Generate Knowledge affordance is categorized as not supported by the data.

"When it comes to generating knowledge, it definitely depends on the amount of data that the VA has available. If the VA has dealt with a quiz or a question 80 times, he

has a lot of data available and may also be able to draw conclusions about similar problems, but at least for the moment, it will not be able to generate new knowledge." (Head of Development, DigiSol); "VA can help a trainer collect knowledge and avoid having to do it several times. However, the human must have a kind of control whether the knowledge is useful." (Personnel Officer, Client organization 2)

The last affordance that was analyzed was Maintain Knowledge. We identified 21 patterns in the DigiSol interviews, 2 in the archival documents, and 8 in the client interviews that refer to this affordance.

"The VA will be able to check the quality of the answer [from a trainee] by using a feedback function if the trainer has searched or asked for something. While the VA is not yet able to generate new knowledge, it can check the existing knowledge for quality." (VA Software Developer, DigiSol); I think that the VA could be used as an evaluation system, for example, I think it's a very good thing that the VA would evaluate if any of the answers [from a trainee] are not helpful and provided feedback on how to improve them." (Trainer, Client organization 3)

Overall, all three data sources indicate support for the Maintain Knowledge affordance. However, as Generate Knowledge affordance was not supported by the data, Proposition 5 is categorized as partially supported by the data.

DISCUSSION

Our research is based on the view that technology artifacts, in an organizational setting, are understood and appropriated in the context of specific practices (Orlikowski, 2007). Likewise, this study views VAs not only as a sum of their material functionalities but also in terms of the affordances they offer their users (Faraj & Azad, 2012). A technology affordance represents the "potential for action that emerges out of the interrelationships among the technical features of a system, people's ability and predisposition to use these features in certain ways, and the organizational context within which this takes place" (Gal et al., 2014, p. 1372). Thus, affordances are neither an objective property of the technologies, in our case the VAs, nor a subjective trait of the people who use them (Leonardi, 2013).

First, our analysis reveals that in the case of the DigiSol interviewees, VAs affordances become associated with different functionalities and meanings based mostly on the individual's background and previous experiences in the HR management software field. The analysis of this data source shows the emergence of a cognitive interpretation of the constraints and affordances of the VA technology.

Second, the data analysis of the client interviews reveals that clients' perceptions about the technology are closely interwoven with their perceptions about the nature of the HR tasks. Hence, during the test sessions they developed representations about the VA technology that were influenced by their backgrounds and previous experiences accumulated during traditional training session.

Clients' perceptions of potential affordances might have also been influenced by what Carter et al. (2020) call it a strong IT identity. IT identity represents a set of significances an individual confers to the self in relation to IT and emerges as a product of individuals' personal histories of interacting with IT (Carter & Grover, 2015). From this viewpoint, a strong IT identity can be described as "positive self-identification - use of the target IT is integral to my sense of self (who I am)" (Carter et al., 2020, p. 1315). All 5 interviewees from the client organizations were trainers therefore, we surmise that these individuals were influenced in their perceptions of technology affordances by their past experiences as training professionals.

Our analysis has shown that the first four research propositions seem to be supported, whereas the last one seems partially supported by the data. Our research propositions are based on the affordances enacted by the VA's functions as resulted from the literature review. As four research propositions are fully supported by the data, we can answer to our first research question positively. Thus, it can be suggested that there are several ways a VA can be used in a trainee management software.

We will try to answer the second research question, how can a VA be used in a trainee management software, by discussing our findings with respect to the four key HR tasks identified earlier: 1. Supporting employees in daily HR tasks (Self-Service); 2. Onboarding; 3. Training; and 4. Managing knowledge.

Concerning the Self-Service task, our analysis suggests that VAs may enable affordances that yield the following outcomes: identify and provide information proactively, offer an overview of unstructured information, provide file access, and point out contact persons. In terms of the HR task of Onboarding of trainees, our data analysis shows a strong perception of several practical affordances of a VA when the technology is used to support the onboarding of newly hired employees. However, some client organization interviewees thought that some in-person communication will be lost if a VA is included into the onboarding process despite its advantages, such as automatic welcome messages, the capacity to start the onboarding process at any time, spread information about new employees.

All interviewees perceived that the task of Training can be fully supported by a VA. This is due to its perceived affordance to act as a personalized teacher (in the specific context of the German dual vocational education apprenticeship system), who can talk to the trainee on daily basis, answer to any of the questions a trainee may ask and offer feedback. The interviewees also perceived the VA as being able to also challenge the trainee by providing tips to improve trainee's performance.

Finally, regarding the fourth task, Managing Knowledge, our analysis shows limited support for the research proposition that suggests VA can be used to efficiently manage knowledge. Mixed results show that interviewees' perceptions of a VA implemented with currently available technologies is not useable to generate new knowledge automatically in the context of trainee management. Generating knowledge can be divided into two parts: first, the manual data collection part that comes with the implementation of a VA and second, the automated part where a VA tries to generate knowledge. Interviewees' perception is that organization internal databases can be used to generate knowledge but only for the manual data collection process. Moreover, based on interviewees' current understanding and interpretation of VAs, it is not possible to access and analyze these information sources automatically. Moreover, the knowledge that is required to support the trainees is, in most cases, too specific to be generated automatically. Another function that the literature suggests is that the VA can ask employees to provide information about new topics in the organization. However, our data analysis suggests it would be too much work for the HR employees to ensure the quality of the knowledge, and thus, the interviewees see this as a constraint of the VA technology.

CONCLUSIONS AND FUTURE RESEARCH

The goal of our article was to show whether a VA can be used to support trainee management software, and if it can be supported, how it can be supported by identifying several technology affordances. To our best knowledge, we did not find other empirical studies to analyze this topic. Thus, a literature review was conducted to identify the HR tasks that can be supported by a VA. The identified tasks were Self-Service, Onboarding, Training, and Managing Knowledge. Each area was then checked for functions that may also be used in trainee management software. To analyze if and how VAs can be used to support this type of software, we adopted the Technology Affordances and Constraints theory, as suggested by Nambisan et al. (2017). Based on the technology affordances identified in the current literature, five research propositions were advanced that were tested for relevance on the data collected from a single case study (Huberman and Miles, 2002; Yin, 2018).

The main contribution of this article is to the literature on Virtual Assistants and HR management. By proposing five research propositions, this study provides a more in-depth explanation of a relatively unexplored field, which improves our understanding of how AI-based VA technology might be used in the context of HR management in a post-pandemic global digital economy. By using the Technology Affordances and Constraints theory it was found that VA technology, in an organizational setting, is understood and appropriated in the context of the specific

practices of HR. For practitioners, this study also provides insights on what could influence VAs adoption, use, and ultimately success in the context of HR training. To a certain extent, it doesn't really matter what functionality the technology offers, but how the users perceive its affordances.

Our work has two limitations. The main limitation of this study is that it provides generalizability of the conclusions from empirical statements issued from the case study to theoretical statements (Lee and Baskerville, 2003). To offer statistical generalizability (Yin, 2018), our findings need to be validated against a variety of organizations in process of implementing VA technology in an HR context. The second one is related to the lack of consideration of the data security aspect when the functions of the VA were analyzed. Because the data protection laws in Europe are strict, some of the presented affordances may be useable in theory but not when the data protection laws are taken into consideration.

The results of our research offer potential for several future research avenues in trainee management and VAs in the context of an increased utilization of AI-based tools for digital transformation. Technology artifacts such as AI-based VAs can be described as information systems (IS) agentic tools that can assume responsibility for tasks with ambiguous requirements (Hill et al., 2015). There is a need for better understanding of the relationships between humans and agentic IS artifacts (Baskerville et al., 2019). A first future avenue for research would be the application of the IS delegation theoretical framework (Baird and Maruping, 2021) in the context of HR VAs to identify and analyze different decision models of how to delegate human-VAs tasks. The framework stresses the importance of the IS agentic tool "attributes relevant to delegation (endowments, preferences, and roles) as well as foundational mechanisms of delegation (appraisal, distribution, and coordination)" (Baird and Maruping, 2021, p. 315).

The results of the data analysis suggest that trainers and trainees must complete different tasks that only exist in the training management. While the data collection has revealed some functions, it was focused on analyzing how VA functions of other HR-related areas can result in technology affordances in trainee management. Thus, a second avenue for future research would be to identify if there can be more tasks specific to the trainee management process that a VA can support and eventually generate specific affordances. Finally, the interviewees perceived that a VA cannot be used to generate knowledge automatically as today's VA technology is not yet able to extract complex information from different data sources, but some interviewees also expressed that in case it would be possible, automating the process would be a great addition to the VA's functionality. Hence, the third proposal for further research would be to study the possibility of automating the process of extracting information from different data sources to generate new knowledge for the organization.

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ADDITIONAL READING

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KEY TERMS AND DEFINITIONS

Artificial Intelligence (AI): It is the technology that allows machines to interact with humans, data, and the whole business ecosystem. It has the capacity to feel, think, act, and learn. It also can see, hear, speak, understand gestures, recognize sounds, and process images using inputs from sensors such as cameras and microphones. Moreover, it has the ability to understand and analyze information to make logical decisions.

Chatbot: It is a computer program designed to simulate conversation with human users.

Digital Innovation: Represents a strategic initiative organized and realized within the IT services function in an organization.

Human Resource Management: It is a strategic approach to manage employees effectively and efficiently in an organization in a way that they help their organization to gain and maintain a competitive advantage.

Technology Affordances: Are provided through complex interaction of technology materiality, human agency, and the contextual procedures within an organizational environment.

Trainee Management Software: Represents a streamlined version of what an employee already does daily. It is designed to organize and optimize the delivery of the training activity.

Virtual Assistant: Represents a more advanced version (AI-based) of a regular chatbot that can engage with a customer in a manner that mimics a human.

ENDNOTE

[1] A detailed account of the literature review methodology is available upon request.