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Service Desk Onboarding Training Environment

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Abstract

Low qualification of employees newly hired to service desks contributes to the high turnover of service desk agents and consequently to low quality of services delivered. This paper proposes a conceptual artefact comprising two modules for tacit knowledge elicitation and knowledge transfer during the onboarding training process. The design of the artefact follows the design science methodology. Ex-ante evaluation methods are chosen to evaluate the importance of a problem domain and evaluate the artefact feasibility. Expert interviews and focus group discussions with experts from the field were performed to support the evaluation activities. The proposed framework uses eye-tracking technology to complement captured knowledge with tacit knowledge. Next, the proposed model incorporates a simulated environment for enhanced training experience and effective knowledge transfer from expert employees to novice ones. This paper and the proposed artefact aim to improve the training process of service desk employees and to contribute to wider use of tacit knowledge capture and elicitation techniques in IT service management.

Keywords

Service desk; Knowledge management; Training; Eye tracking; Skills management.

1   Introduction

Most companies have some sort of technical support department or office at their disposal. When employees encounter technical issues regarding their work environment, they may choose to contact tech support. In larger companies, where IT services must be managed in a more organized and complex way, it may be convenient to establish a so-called service desk. This department acts as a central point of contact in matters such as incident management, problem management, access management or facility management. Because of this, the service desk department plays a critical role in the company. It is customary that the operators are able to provide quality service regarding the incident and problem resolution.

According to data from 2018 (Rumburg, 2018), the average annual turnover of service desk agents was 40%. A service desk position with the highest level of employee turnover is the IT service desk operator, as they are in direct contact with the company's customers or other employees. In order to minimize this level of turnover, proper and quality training should be in place, as insufficient training is one of the reasons for this high turnover (Flynn and Philbin, 2014).

According to Flynn and Philbin (2014), the high fluctuation and low retention of tech support staff (service desk, help desk, etc.) are caused mainly by communication with users, who at times act rudely towards the staff, and the low qualification of new service desk hires. They often come from different work fields and do not possess enough knowledge and experience in technical support topics and areas. One of the possible solutions to this is effective and thorough training during the onboarding stage of the new employee while using modern technologies and knowledge management methods.

Onboarding is a set of processes activated after a new employee is hired. Onboarding is a vital part of the induction process to their new employment. During the process, the new staff members are integrated into the organization and create a set of expectations and goals. Onboarding is a crucial part of the worker's path to success in the new organization.

1.1   Problem and its Significance

Effective training and, therefore, effective knowledge transfer and knowledge sharing in IT services are essential. With high-quality knowledge available to the operators, they are able to perform their work more efficiently. The quality of the service increases and, as a result, it reduces the costs of the support (Yuan et al., 2017).

The quality of services delivered by service desk staff members is closely related to the knowledge they possess. Experienced staff members are more likely to provide qualified and quality services thanks to their experience in the service desk department. However, this may not be the case with novice employees. They may come from different fields and not possess the qualifications to perform according to the department or company standards. To enable these employees to gain the needed knowledge in a timely fashion, it is essential to provide them with good training, which is not always the case as the position of IT service desk operators is considered one with high retention (Rumburg, 2018) and companies do not focus on this part of the workforce. The problem that the proposed conceptual artefact is trying to solve is the low qualification and insufficient training of novice employees.

Without good quality training and an effective onboarding process, the company faces a high risk of a decrease in customer satisfaction and loyalty. Consequently, this will be reflected in the key performance indicators related to the service desk operations, and the management might lose trust in the department and decrease its funding. Without quality service desk operations, the company might lose its good reputation. It is therefore very important to incorporate effective training in the onboarding process, keeping knowledge management practices in mind.

1.2   State of the Art

According to Martin (2020), up to 83% of employees prefer video-based material for their training in new work-related tasks. This is, alongside with presentation recordings, screen recordings or quizzes, one of the classic approaches to staff training. However, academic literature discusses a number of additional approaches.

One effective approach to enhancing staff training is to introduce gamification elements to the process. An example of implementation of gamification techniques to existing software was presented by Yuan et al. (2017). They created a solution to motivate IT service desk employees to share their knowledge and improve their knowledge quality by revising the knowledge stored in the knowledge base. Gamification and persuasion were used as an incentive mechanism. In order to incorporate this mechanism, they integrated the techniques into to the Hewlett Packard Enterprise Service Manager software user interface. The service desk employees receive reputation points based on their activities regarding (1) submitting detailed ticket records, (2) creating knowledge articles and transferring knowledge, (3) enhancing the quality of knowledge articles, and (4) getting positive feedback from customers about usefulness of their service. A similar approach with the introduction of gamification was presented by Miller et al. (2018); however, their solution aimed more at new staff members in training during their onboarding process. Unlike Yuan et al. (2017), they used additional elements of gamification in the form of leader boards, levelling up, bonus prizes or challenges. They did not incorporate their solution into existing ticket software, but they used a learning management system by Brightspace and complementary tools such as Camtasia Relay for screen capture and Microsoft Video app as a video hosting tool. Both solutions that use gamification elements show positive impact on staff members and consequently on customer satisfaction with staff performance.

While gamification focuses mainly on the motivational aspect of staff training, there are also approaches that can bring enhancement to the knowledge management aspect of the training. One of the approaches is the use of eye tracking as a tacit knowledge elicitation tool. Eye tracking is used in various fields and can prove its usefulness as a tacit knowledge transfer tool, as was evaluated in an explorative study by Eklund et al. (2020). They tried to identify whether eye-tracking technology is useful in supporting tacit knowledge transfer from expert to novice pilots, especially regarding visual expertise. Visual expertise and strategies are considered valuable knowledge and, as was presented by Sommer et al. (2017), eye-tracking technology can be a productive enhancement of staff learning activities. Marketing is a very prominent field where eye tracking is used. As was described in the work of Wedel and Pieters (2017), this technology is used in choice and search behaviour research, television commercials, web usability and advertising. Approaches used in marketing can also be applied to IT service management as strategies for gaining visual attention can be used to improve the learning and training process. A similar approach of detecting visual attention was used by Ahrens et al. (2019). They introduced an approach to record and transfer developers' attention during software maintenance using eye tracking. To visualize the recordings, they used heatmaps that helped with orientation in code and finding relevant parts.

Transfer of knowledge during onboarding training can be supported and enhanced by the use of simulations, which are no longer used only for ticket workload estimation (Bartsch et al., 2010). This type of solution supporting staff training was presented by Sukmana et al. (2021), who created a service desk simulation application to "increase trainees' understanding of the process of incident and request fulfilment management". The training system is built on web technologies like PHP, MySQL database and Apache web server and, like the system by Martin et al. (2018), it uses gamification techniques. A similar approach was chosen earlier by Schmidtmann (2010), who presented a system based on business process modelling software to be used in simulations during training. The training was structured as follows: (1) general presentation of the training project, (2) introduction to the ITIL framework, (3) instructions on how to work with the modelling tool, and (4) simulation runs.

Based on the preceding paragraphs, it is evident that there are several approaches to staff training enhancement. However, from the knowledge management point of view, eye-tracking technology and simulations can be regarded as the most suitable and helpful. Eye-tracking technology can be used to enhance tacit knowledge elicitation and simulations allow effective knowledge transfer. These two technologies and their underlying theories were therefore selected as a kernel theories for the proposed artefact.

1.3   Knowledge and Social Context

As was stated in the previous subsection, the conceptual artefact presented in this paper uses two kernel theories as a base for the artefact design. Those theories are eye tracking as a tacit knowledge elicitation tool and simulation as a tool for knowledge transfer. Tacit knowledge elicitation through eye tracking was already tested in environments such as armed forces (Eklund et al., 2020), marketing (Wedel and Pieters, 2017) or software maintenance (Ahrens et al., 2019). The theory behind tacit knowledge elicitation through eye tracking makes for an effective tool for implementing knowledge management practices into the onboarding process. It enables efficient transfer of experts' important knowledge to novice employees.

Simulations in the form of business simulations can work as a knowledge transfer tool because the trained employees "live" through real-life scenarios and learn from these experiences (Lefebvre, 2011). They develop a set of skills and gain knowledge on how to correctly and most effectively respond to given simulated situations.

The theories mentioned above are incorporated into a solution covering the broader topics of knowledge management, service desk and onboarding. All of these topics are relevant to each other, and they are part of the knowledge context of the design artefact.

Service Desk Institute (2015) listed a number of types of training that are available for service desk workers: online training, practical workshops, induction, buddying, self-paced e-learning, webinars, public training courses, shadowing, and coaching/mentoring. In relation to these types of training, the present paper combines online training, self-paced e-learning and shadowing in the proposed solution. According to Morger (2015), one of the approaches in staff training is the use of presentation recordings, screen recordings or quizzes. This is also supported by Martin (2020), stating that 83% of employees prefer video-based training material to learn new work-related tasks.

According to Bayes (2017), a quality onboarding should take about three months for it to be effective and allow the employees to reach their potential. The same goes for the training process, which should be organized with utmost importance. Without proper training, the department may waste time and resources on an employee, who will soon contribute to the high turnover rate.

Harpelund et al. (2019) define onboarding as enabling the new employee's integration into the organization and as a personal process creating directions and expectations for the new hire. For the onboarding process to be effective, it should have four main attributes (Krasman, 2015): (1) strategic, (2) comprehensive, (3) consistent, and (4) measured. Krasman (2015) also states that the critical elements of a successful and effective onboarding process are the centralization of valuable information, a time plan for the whole onboarding process, and the introduction of the new employee beforehand. When current employees are informed about the new employee's arrival, they can correctly set up their working environment (access to company information systems and other facilities).

To prepare for an effective onboarding process, it is important to have quality training material, which should be prepared with knowledge management in mind. An effective approach must be applied for knowledge transfer and, consequently, knowledge elicitation to prepare comprehensive training material. Both explicit and implicit knowledge is relatively easy to capture and transfer; however, tacit knowledge is considered the most difficult to capture and transfer (Cairó Battistutti and Bork, 2017). Several

technologies, techniques and methodologies are used to elicit and transfer tacit knowledge, such as creating scenarios or concept mapping backed up by soft system methodology (Hanafizadeh and Ghamkhari, 2019), interviews, questionnaires, storytelling, observation or role-plays (Gavrilova and Andreeva, 2012).

Efficient training and onboarding of employees also relate to skills management. In order to keep track of what skills the department staff members have and, therefore, what skills could be taught to others, some skills management methods should be incorporated. The current body of literature does not explicitly describe an implementation of this in the area of interest of this paper – the service desk. However, some exciting approaches could be adapted to the needs of a service desk department. For example, Benjamins et al. (2002) described a knowledge market where the objects of interest are skills. There is a place for employees to "sell" their skills and projects, and departments and profiles to "buy" those skills.

The social context of this conceptual artefact concerns stakeholders, who may be affected by the artefact. The first group of stakeholders are its users (new staff members, experts or the knowledge base manager – the roles and responsibilities regarding the proposed artefact are presented later in this paper).

The next important stakeholder is the management of the service desk department and higher management as well. Their goal is to have a high-quality functioning service desk department with knowledgeable and experienced operators who can solve incidents and problems promptly and correctly. The human resources department is also considered a stakeholder. They are tightly connected to the onboarding process that is in place in the given organization.

Current solutions to new employee training are not satisfactory in that they do not take into account knowledge management sufficiently – mainly knowledge elicitation and the following knowledge transfer, which is an important part of effective learning. The job of a service desk worker is quite knowledge-intensive and requires proper management of the knowledge, especially during the onboarding. Current training practices comprise documents, presentations or videos. These tools can be used to transfer explicit knowledge. However, the training material should also comprise tacit knowledge. This can be achieved by introducing expert tacit knowledge elicitation via eye tracking followed by knowledge transfer via simulated scenarios (stories). Therefore, the aim of this article is to propose a framework for an onboarding training environment that uses previously mentioned technologies to improve the training experience for new service desk staff members and to contribute to wider use of tacit knowledge capture and elicitation techniques in IT service management.

The remainder of this paper is structured as follows. The Methods section describes the chosen research strategy as well as the evaluation and validation strategies of the proposed conceptual artefact. Then, in the Artefact section, the description of the artefact with its stakeholders, goals and requirements is laid out. The Discussion section describes the limitations and implications for both theory and practice. The last section of this paper is the Conclusion. The paper also includes two appendices. Appendix A contains a summary of an unstructured interview and Appendix B describes the progress of a focus group discussion.

2   Method

This paper follows the design science methodology to propose a conceptual artefact. First, a problem is investigated and described, then an artefact is designed to treat the problem, and that treatment is validated. After the validation, the artefact is implemented and later evaluated. This is, however, not part of this research paper as the proposed artefact design is yet to be implemented. Approaches to validation and ex-ante evaluation are combined from works of Gonzalez and Henk (2012) as well as Sonnenberg and vom Brocke (2012).

Two activities aimed at evaluation are performed: (1) to evaluate whether the design problem is important for practice, and (2) to evaluate whether the proposed conceptual artefact design can act as a solution to the described problem. The results of both evaluation activities are described in section 3.6.

2.1   Unstructured Interview

To evaluate whether the design problem is important for practice, an unstructured interview was performed. There were three participants: (1) the interviewer (the author of this paper), (2) an expert working at the service desk in an automotive company, and (3) an expert working in a smaller IT company. The interview was held online through a Google Meet video call. At the beginning of the interview, the experts were informed about the purpose of the interview. The questions were placed according to the flow of the conversation, as this was an unstructured interview. The participants were asked questions stemming from their previous answers. The initial question was aimed at weak elements in the service desk department of the company they work in. A summary of the interview can be found in Appendix A. Based on the results of this interview, it can be stated that the chosen problem is relevant for practice.

2.2   Focus group Discussion

The second evaluation activity was performed via a focus group discussion with experts from service desks and academics specializing in knowledge management. This artificial evaluation method was chosen due to the fact that the artefact had not yet been constructed.

The participants from service desks were chosen based on their affiliation to a service desk department. The academics were chosen based on their expertise in knowledge management. For this ex-ante evaluation through a focus group, a group of five service desk experts and two academic experts were invited to a discussion regarding the proposed design artefact.

Due to the participants' location and limited time availability, the discussion was held online through a Google Meet video call. At the start of the online focus group session, the artefact design was described thoroughly to the participants. The participants were then asked to imagine their current service desk work environment and to apply the artefact to their conditions mentally. A series of questions regarding the (1) understandability, (2) possible usability and (3) overall feasibility of the proposed artefact were asked. Details of the focus group discussion can be found in Appendix B.

Theoretical validation of the conceptual artefact – the Service Desk Onboarding Training Environment – is sought using kernel theories and expert opinions gained through the focus group discussion. The kernel theory acting as the "hard core" of the proposed artefact comprises the theory of tacit knowledge elicitation using eye-tracking technology and the theory of knowledge transfer with simulation. As this artefact still awaits its implementation and, therefore, ex-post validation, the formative validity (Gonzalez and Henk, 2012) of the proposed artefact can be assumed as the kernel theories are valid and have been previously implemented in different areas of research. By gaining expert opinions through the focus group discussion, an elementary validation is made under the conditions of practice, as the members of the focus group have practical experience as well as thorough practical knowledge of the problem context.

3   Artefact

This paper proposes a conceptual artefact in the form of a model of an application to enhance and support onboarding training processes. The model consists of two main modules (as shown in Figure 1): (1) the tacit knowledge elicitation module (see section 3.3) and (2) the training module (see section 0). These modules contribute to the overall efficiency improvement in the knowledge transfer process between expert employees and new staff members. In the following subchapters, the two modules are described in detail.
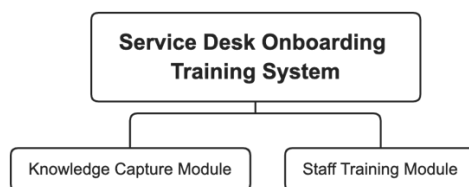
Figure 1. Modules of the proposed framework.

This section is divided into a number of subsections. The first subsection 3.1 describes the stakeholders of the proposed conceptual artefact. In the next subsection 3.2 the reader will find information about the roles and responsibilities assumed for the framework. Section 3.3 describes the first module of the proposed application – the knowledge capture module. The following section 0 is concerned with the second module – the staff training module. In the last subsection 3.6 the reader will find information about the artefact evaluation.

3.1   Stakeholders

Basic behaviour and functionality stem from the requirements of the framework. Those requirements were developed based on the stakeholders of this design and their goals. Therefore, the stakeholders are described first.

Stakeholders who interact with the artefact are (1) the knowledge base manager, (2) expert employees, and (3) new staff members in training. The knowledge base manager's goal is to prepare comprehensive training material in cooperation with expert employees from the department.

The expert employees use the corresponding module to record knowledge from actions performed in an information system during various training scenarios. Their goal in using the design artefact and participating in creating training material is to save time by not having to teach the new employees. They can therefore focus on their important work activities.

New staff members use the training material to gain the much-needed knowledge for work in the service desk department. Their goal is to train the activities in an easily accessible and comprehensive way. They need to be trained so they can perform their job correctly.

Stakeholders who are in the immediate environment of the artefact are mainly managers of service desk departments. They are interested in the overall functionality and prosperity of the service desk environment. Therefore, they benefit from well-trained employees. The wider environment of the artefact consists of top managers or shareholders who benefit from a prospering organization or company.

3.2   Roles and Responsibilities

Before the proposed model of the onboarding training environment is presented, the roles and responsibilities accounted for in the model are described. The proposed model works with three primary user roles:

- knowledge base manager,
- expert employee, and
- novice employee.

The *knowledge base manager* is responsible for managing the service desk knowledge base containing everything related to tasks and works in the service desk department. They are employees of higher seniority and are familiar with the work environment from a knowledge management perspective. They are also responsible for selecting topic domains and scenarios for which the novice employee should train.

Expert employees are employees with a certain degree of seniority in the department, meaning they have sufficient knowledge and experience that could and should be passed on to new employees. Their responsibility is to make time in their schedule to attend a training material recording session. They are invited to do that by the knowledge base manager.

Novice employees are the new staff members starting their onboarding process with training. It is assumed that they have no prior experience with the systems used by the service desk department and the whole company. Their responsibility is to learn to use the company systems to facilitate good customer care – either for company employees or customers.

The proposed model of the onboarding training framework has six phases that are characterized as follows:

1. The knowledge base manager at service desk curates the KB (knowledge base) and selects the processes knowledge of which will be captured based on screening.

2. A knowledge capture plan is developed, and service desk workers (expert employees) are invited to knowledge capture sessions.

3. The knowledge is captured during the sessions, when the expert employee (according to a scenario) performs specific tasks and their actions are recorded in four layers (screen recording, audio voice-over, eye tracking, key logging).

4. The knowledge base manager processes the captured material and, in cooperation with a service desk worker, edits the material and applies it in the simulated software environment. The material is divided into specific steps while timestamps are created.

5. A new service desk employee is introduced to the department and gains compulsory knowledge about basic company systems.

6. Service desk training mode – the novice employee trains for specific scenarios and user stories based on topic domains chosen by the knowledge base manager.

3.3 Knowledge Capture Module

The first module used in the proposed model aims to effectively capture the knowledge of senior service desk members, considering them experts in the given field or problem domain. They possess knowledge created and formed through years of experience. Some of this knowledge can be externalized and turned into service manuals and physical documents. However, this is just one part of their body of knowledge, and to complete it, an elicitation of tacit knowledge needs to be performed. In this case, the tacit knowledge of these expert employees is very valuable, and it can complement the training material very well.

The environment where the proposed framework should be implemented works mainly with computer screens; therefore, a visual form of captured knowledge makes the most sense. When an expert employee works on a specific task, what knowledge can be extracted from their activity? For a common employee who wants to learn how to do specific tasks and is being taught by an employee with more seniority, they see

- what window or application they opened,
- which button they clicked,
- and which checkbox they checked.

The learning employee should also make notes and catch everything the teaching employee did during this time. It is already widely established that this is not an efficient way of training. There are far more advanced and functional approaches to training new employees using many modern technologies. To enable such technologies and, therefore, effective training processes, it is necessary to have quality materials prepared for new employees.
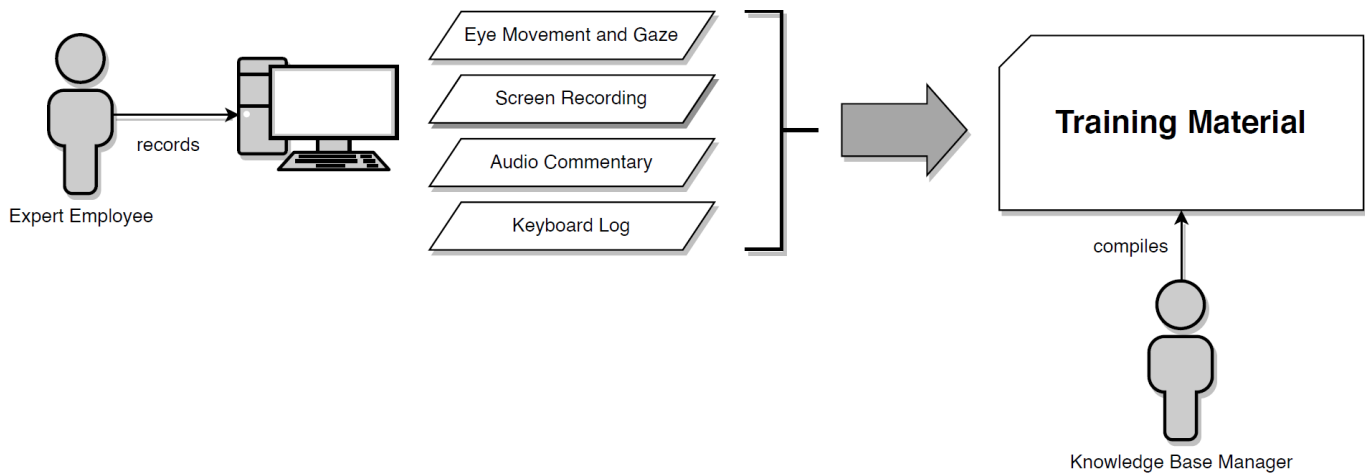

***Figure 2.** Expert knowledge capture.*

In the proposed model, a combination of four key elements of effective training material is presented. Modern training material uses screen recordings, preferably with added audio commentary or voice-over. To record which keys were pressed, a keylogger is used. However, to utilize all available knowledge in the proposed model, an eye-tracking solution is used to provide a powerful utility to capture tacit knowledge in the form of eye gaze and places on the screen where the expert users aim their attention at any given moment while solving an issue or fulfilling a user request.

By combining the four elements:

- screen recording,
- voice-over notes,
- eye-tracking heatmap, and
- keyboard logs,

it is possible to create a comprehensive and complex training material that utilizes all system inputs of the expert employee (see Figure 2).

3.3.1 Stories

In order for the knowledge elicitation to be effective, it is imperative that the right tasks and work scenarios are selected for recording. The knowledge base manager decides what tasks and scenarios will be selected for recording (as mentioned in section 3.1). They create training plans for specific staff positions in the service desk department. This plan is divided into topic domains such as hardware, software, access management, user management, etc. Each topic domain has several "user stories" replicating real-life scenarios with which the novice employees might come into contact. Every user story has its target state, and specific steps describe the path to achieving this goal (e.g., "Open module XY inside the YZ information system").

These stories are prepared by the knowledge base manager and are directly connected to one of the expert employees. This employee is invited for a training material recording session, during which the act of working towards the story goal is recorded, as mentioned earlier.

3.3.2 Recording Sessions

It is proposed that the expert employee be required to take part in the training material recording session as part of their employment contract. It is important to nurture the importance of knowledge management and knowledge sharing in the company ecosystem.

After the expert employee agrees to participate in the recording session, they set a specific date and time for this event. An expert employee is invited to a special studio room with the required equipment. The equipment consists of

- a computer with the required software,
- any type of camera (e.g., webcam), and
- a microphone.

The computer needs to be equipped with all the software used in the company and with which the service desk department staff work. There should also be special hardware equipment used for specific cases – card reader, security access token, etc. An eye-tracking software must be installed on the system to facilitate eye tracking. This system is set to work via the camera. Today's eye-tracking systems are advanced enough to be able to record the eye movements and the gaze of the user via a decent webcam. A keylogger program must be installed to make use of the information about what keys were pressed during the session. Unlike malicious keyloggers, which try to steal sensitive information from the user, this keylogger is only employed during the recording. Its output is made of timestamps with a list of keys pressed on the keyboard. The camera should also have sufficient resolution to facilitate good and precise eye tracking. The microphone can be a standalone device, or it can be a part of a headset.

At the time of the recording, the expert employee is told the goal of the task they are about to perform with the system available to them. While the expert employee is doing the task, they are encouraged to add voice commentary on what they are currently doing. The screen is recorded as well as the mouse clicks and key presses. Expert employees' eye gaze and movements are recorded to create a real-time heat map of the important points on the screen at the given moment. Thanks to this, novice employees will have enough material to train and learn from.

After the recording is finished, the expert employee is asked to check the recorded material for correctness and, in case of an error, to redo only the wrong part of the recording. The knowledge base manager's task is to compile all recorded outputs into training material representing one story. As the story comprises steps, the manager needs to cut the recorded material into parts and add specific timestamps related to the four layers. An example is shown in Table 1. This is important for ease of use of the training environment and compliance with the system functioning. When the material is walked through during the training process, the training module looks at the timestamps of each layer to play it at the right time for the learning experience to be complete.

Table 1. Example of step timestamps for step 1: open a new ticket.

Layer	Timestamp
Screen recording	1:05 to 1:40
Voice-over recording	1:05 to 1:20
Eye-tracking heatmap recording	1:10 to 1:20
Keylogger output	1:05, 1:08, 1:15, 1:30

3.4 Training Module

The training module of the proposed framework is a vital part of an effective onboarding process in the service desk environment. The training module and its environment is accessible from every employee's computer. As it is a web application, it is available on every workstation so that every employee can use it. The knowledge base manager enables access to the application. As the recent pandemic situation showed, it is also important to enable this access remotely while considering the security measures to prevent leakage of valuable company know-how.

When the novice employee completes the basic set of onboarding requirements, they are welcomed to their new department, in our case, the service desk department. As is good practice, the internal part of the onboarding process has the preparation of accounts and all required accesses embedded, so that the new staff member can start using the workstation they are assigned to. The training module of the onboarding training environment comprises the specific stories and learning material from the domain of the basic company systems that the employee should be familiar with to fit into the work environment. This means that the first things the novice employees learn are the basic systems (as shown in Figure 3).
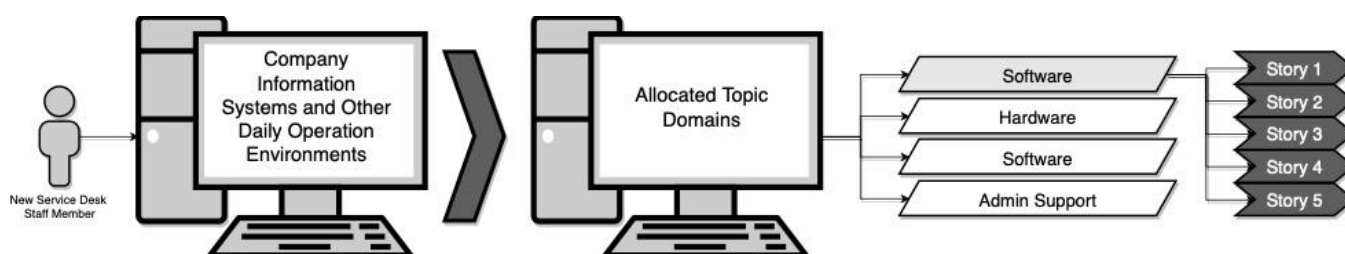

***Figure 3.** Training module.*

Once they are familiar with the basic systems, they can advance to specific user stories and start the specific training for their current position. The knowledge base manager selects what topic domains they should be trained in prior to their arrival. The employee in training then has a list of topics and work tasks available. The list is ordered hierarchically according to the difficulty level of the stories.
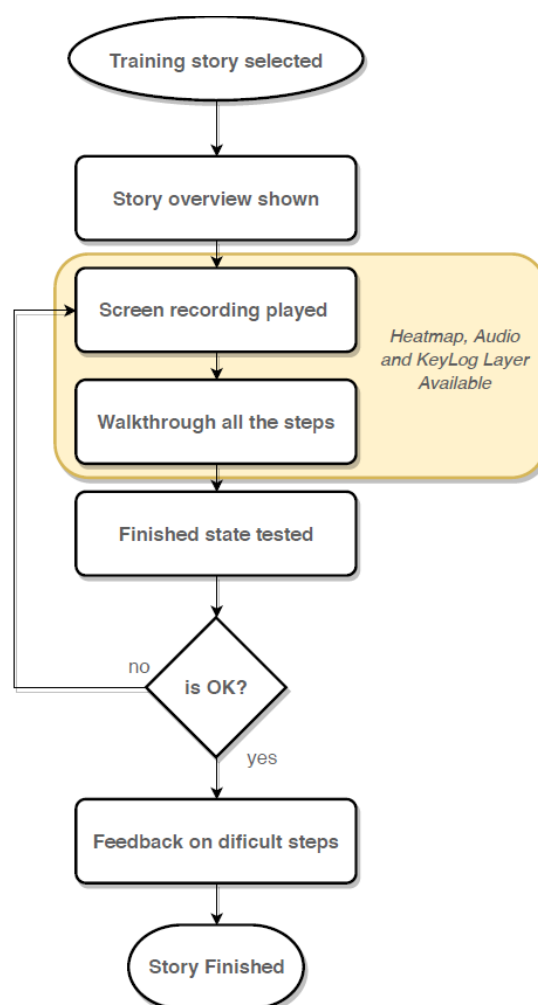
When a story is selected, the employee is first acquainted with the story's goal. Then they are shown the whole screen recording to get a gist of the story and see what the target state looks like. After that, they can switch to the training section, where they have access to a simulation environment. The diagram in Figure 4 demonstrates this whole process.

After the employee in training selects the story, the training module shows them an overview of the story, including information about the target state they are after and information about any prerequisite abilities needed for completion of the task (story). Next, they can see the list of steps that the story includes and through which they will need to go (see Table 2).

After the overview, they can watch a screen recording of the whole process they are about to train for. It is important to see the target state, so it is not just something written on the screen. The employees in training also create expectations for themselves regarding the difficulty or complexity of the task. They can then adjust their efforts to understand the topic and the related tasks.

Table 2. Training story example.

Training story: an employee requests access to a directory on a company network drive	
Goal	Fulfil employee's service request by altering their access rights to the requested directory.
Prerequisites	Ability to work with service desk ticketing system
Steps	Perform: 1. Open a new ticket. 2. Access user management system. 3. Search for user XY. 4. Check the level of privacy of the requested directory. 5. Examine the employee's authorization to access data in the requested directory. 6. Edit access rights to the requested directory. 7. Send information to the employee about request resolution. Close the service ticket.
Attachments	Screen recording with audio commentary, eye-tracking heatmap, keylogger output
Metrics	FCR (first contact/call resolution), resolution satisfaction feedback

Figure 4. Flowchart of training process after a training story is selected.

The employees can then enter the practice simulation environment, where they complete the steps of the story. Each step has its description and additional material such as a heatmap (output of the eye tracking, enabling the employee to see where it is important to look at any given moment in the context of the current step), audio commentary (recorded by the expert) and an infographic of the keys pressed on the keyboard at any given time of the step.

After they go through all of the steps, the simulation environment is tested for successful completion of the goal of the story. If it is satisfactory, the employee is asked for feedback on what were the most difficult parts. Based on this feedback, the knowledge base manager can identify what to focus on more during the training material creation and improve the process.

If the result is not satisfactory, the employee is asked to return to the screen recording video. They can decide if they want to see the recording again or if they just want to go through the steps one more time to finish the steps correctly and reach the set goal. After successfully completing the story, the employee can "level up" to another story, and the process is repeated.

3.5   Simulation Environment

One of the biggest advantages of the proposed framework is the simulation environment, where novice employees train. Because it is simulated and virtual, it does not affect the real production systems. This way, the employees in training can make mistakes, and the state of the virtual environment can be reset back to the original state. Employees can therefore train the specific user story as many times as they want.

Thanks to simulated events that mimic real-life situations, such as fake incoming calls or messages with real service requests and incident reports, they are able to experience "real" situations. These service requests and incident reports should be from archived tickets, as they have been correctly resolved, and thus the target state of the training stories can be accurately measured. The system can also compare the key indicators (duration, time of resolution, error rate, etc.) with the training employees' performance.

3.6   Artefact Evaluation

The first evaluation activity used the unstructured interview method. The aim of the interview was to evaluate the importance of the problem context. Questions asked during the interview aimed to gather knowledge about onboarding processes, training and overall knowledge management practices at service desks (details can be found in Appendix A). The experts' answers confirmed that training is a very important aspect of new staff onboarding and the low qualification of the new hires poses a problem that should be solved and acted upon. However, it is important to note that there might be a slight difference in the perception and overall conception of the training processes within a large automotive company with an extensive knowledge base and a small IT company with fewer knowledge domains. Overall, as a result of those interviews, it can be assumed that the problem context is chosen correctly and relevant to practice.

The second evaluation activity used the focus group discussion method with the aim of evaluating the proposed design artefact. During the discussion, the participants were asked about the understandability, usability and feasibility of the proposed solution. Thanks to the focus group discussion, a few ideas for the model improvement were generated (e.g., a motivation system for expert employees to share their knowledge for training purposes of newly hired staff members). Based on the focus group discussion (its progress can be found in Appendix B), it was collectively agreed that the conceptual artefact presented to the participants might be an effective approach to improve the training of new service desk hires during the onboarding process.

The kernel theories that the presented artefact is built upon were evaluated by implementation by Eklund et al. (2020), Sommer et al. (2017), Sukmana et al. (2021) or Schmidtmann (2010), and the participants of

the focus group discussion agreed that the proposed artefact may serve as a solution to the presented problem. Therefore, the formative validity of the proposed artefact is assumed. This elementary evaluation is done under the conditions of practice as the majority of the focus group participants have practical knowledge of the problem context.

4 Discussion and Future Work

Compared to the work of Yuan et al. (2017), our presented solution brings more flexibility by not having to comply with a proprietary ticketing system as the solution is proposed to be a standalone web application and can be built around existing software depending on the needs and requirements of the company's service desk department.

The solution presented by Miller et al. (2018) is one of the few service desk training solutions described in the academic literature; it takes into account knowledge management; however, they only focus on transfer and gamification. Also, they use static and non-interactive methods of training and training material. In comparison, the presented artefact uses interactive material types to create comprehensive training material. The proposed solution also takes into account the tacit knowledge elicitation technique to contribute to the overall quality and effectiveness of the training material.

In comparison to the solution of knowledge transfer by eye tracking presented by Eklund et al. (2020), our solution is more beneficial in that it uses simpler visual data (screen recordings) that can be easier to work with. The possible user experience may therefore be better. This is also supported by the use of webcams instead of dedicated eye-tracking hardware in the form of headsets. As stated by Eklund et al. (2020), those may cause discomfort during use and may pose a burden for users that have to wear glasses while also wearing the headset for eye tracking. From this point of view and with regards to the topic subject of the eye-tracking recordings, the proposed artefact is more appropriate.

Work presented by Wedel and Pieters (2017) is related to the present design artefact mainly through visual attention research. Visual attention is important in uncovering where, according to the expert employee, the new hire in training should be looking at any given moment during the specific process of the training scenario. The capture and analysis of visual attention is an important aspect of the proposed solution and brings the advantage of the possibility of creating comprehensive and effective training material.

Interesting results of a visual attention study were presented by Ahrens et al. (2019). The results showed that eye-tracking data visualized on top of the source code were more helpful for beginning employees. More experienced employees stated that the heatmaps increased their visual effort, and for them, reduced the code clarity. This corresponds with the intention of the presented design artefact as it is meant for new employees to improve their onboarding training activities.

The system for service desk simulations by Sukmana et al. (2021) is meant to improve understanding of service desk operations by implementing simulations with gamification elements. Compared to our proposed system, their work focuses on improving SLA quality and compatibility. Our proposed solution focuses on the overall improvement of the onboarding training process inside the service desk.

Another approach of using simulations to train service desk employees was presented by Schmidtmann (2010); however, his solution used process modelling software as a base. Our solution adds elements of interactivity by using video, audio, screen recordings and eye-tracking heatmaps to create a complete training experience and quality training material.

It is also important to compare the presented solution to onboarding training with conventional methods of training that are commonly used in service desk departments. With online training, it mainly depends on the form of materials available to the new employee. If it uses only textual or graphical elements, then compared to the proposed artefact it is unsatisfactory. The solution presented in this paper brings

interactivity in the form of multiple types of materials and training scenarios in a simulated environment. It would also be possible to transform this solution into an online training environment to enable remote work by introducing remote connection techniques to company systems. That would, of course, have many cybersecurity implications. Online training is closely related to self-paced e-learning; however, it faces the same limitations regarding the form of the training material.

Practical workshops are often held in person, time-limited, and often time-consuming in their preparation. Compared to that, the presented artefact and its solution to onboarding training practices enable new staff members to train in their own time and at their own pace. They are able to repeat every scenario and are not limited by the resources available to them (lecture computer room).

Shadowing practices can be seen in the concept of screen recordings, audio notes and eye-tracking heatmaps. The new hire is following the steps of the expert employee. The actions performed are, however, executed in a sandbox environment that can be reset to its former state. Therefore, the new employee cannot damage the company's production systems.

The proposed artefact brings novelty in combining specific knowledge management methods to improve onboarding training of new service desk hires. The specific methods are eye-tracking and simulated training environments. Eye-tracking technologies are used for tacit knowledge elicitation, and are documented in the academic literature. They are used in a number of fields such as aviation or automotive studies (Mao et al., 2021), marketing (Wedel and Pieters, 2017) or software development (Ahrens et al., 2019). However, there are no mentions of tacit knowledge elicitation via eye tracking in a service desk environment in the existing literature.

Training of service desk employees is also not much discussed in the academic literature. The artefact uses a simulated environment and comprehensive training material consisting of screen recordings, voice-overs, keyboard logs and eye-tracking heatmaps. This approach brings together well-known technologies and creates an effective knowledge transfer and training environment. The literature also does not mention use of simulations to train new service desk employees. Therefore, it can be asserted that this artefact design brings a novel view on this matter.

The proposed conceptual model of a framework for onboarding training of new service desk staff members brings possible practical implications for service desk practitioners. By optimizing the training process during onboarding, the qualification of new service desk employees improves, and therefore, the retention of those employees rises. In the end, well-trained employees deliver quality service, and the department and the organization have good grounds to be prosperous and profitable.

This paper also contributes to the broader usage of tacit knowledge capture and elicitation techniques and methodologies by service desk practitioners in organizations to enhance the onboarding process and knowledge management activities. As the system is yet to be implemented, our future research will aim to study the implementation and perform ex-post evaluation of the artefact design.

5 Conclusion

This paper proposed an artefact – a model of an enhanced onboarding training framework to improve the training of new service desk employees. It aims to help decrease high service desk agent turnover rates and increase staff retention rates by applying practical and comprehensive training to the onboarding process. We proposed to use eye-tracking technology as one of the tacit knowledge elicitation techniques to complement the training material that is created in cooperation with expert employees. Next, we proposed to use simulation technology to provide comprehensive training material consisting of screen recordings, audio voice-overs, eye-tracking heatmaps and keylogger output. This paper contributes to the usage of knowledge elicitation techniques to create comprehensive materials and, therefore, an effective environment for new service desk hires to train in. If good training opportunities and corresponding

processes are in place, the overall quality of service desk services rises, resulting in happy employees and customers, and consequently, the high turnover can decrease.

Additional Information and Declarations

Conflict of Interests: The author declares no conflict of interest.

Author Contributions: The author confirms being the sole contributor of this work.

Data Availability: The data that support the findings of this study are available from the corresponding author.

Appendix A – Unstructured Interview

General information

This is a transcript of the unstructured interview performed in order to evaluate the importance of selected design problem for practice.

Participants:

(1)   the author of the present paper (interviewer),

(2)   Expert A, staff member of a service desk in an automotive company,

(3)   Expert B, staff member of a smaller IT company.

Note: This interview transcript has been translated into English. The interview was held in the Czech language.

Interview progress

The participants were welcomed and informed about the interview procedure.

I (Interviewer): In your opinion, what are the weakest elements in your service desk department – as regards effectivity?

A (Expert A): Our service desk deals with a lot of incidents and request on a daily basis. There are a lot of tasks that could be automated to ease the workload of the operators. Also, in our company there are no clear guidelines for working with knowledge. The operators are closing tickets with little or no description of what was done to resolve the incident.

B (Expert B): I second to that, there are also no thorough knowledge management practices incorporated in the request resolution process in our company.

I: Thank you for your answers. So, you both agree that knowledge management practices should be part of the service desk practice? Can you please describe what knowledge management practices your departments use?

A: We use our ticketing software as a knowledge base. As I have mentioned, our operators – mainly the ones on the first level of support, do not correctly create knowledge base entries in the form of ticket resolution information. The staff members on the higher levels of our tech support service are better at

working with the knowledge base. As regards the knowledge shared in our department, I should also mention we create tutorials for employees as a form of self-service.

I: Now that you mention tutorials, how does your department deal with new staff members, specifically new operators as regards their training? Do they already possess the required knowledge, or do they need training even in the elementary concepts?

A: Well, our department has no stable amount of service desk workers as there are times when we need more operators as seasonal company activities require more IT support. During these times we hire a lot of operators; however, like you mention, they often do not have knowledge of the company systems, so they require training. Our training methods are based on them watching some of the more skilled workers and then slowly transitioning into their own tasks and tickets. The results are not stunning, the new hires make a lot of mistakes and are not confident in their work. This of course has a negative impact on quality of our operations.

B: As our service desk is smaller compared to my colleague here, we have quite a stable number of employees. When we hire new staff members, they are required to read our company materials and tutorials written by our senior colleagues. They are not trained in any coordinated fashion; they mostly learn on the job.

I: Based on your answers, do you consider training of new employees an important part of their onboarding process?

A: Yes, definitely. It could also be added to the list of weaknesses in our department, as their qualification is not sufficient most of the time.

B: I agree that it is a very important part of the new hire's journey to be a good staff member of our department. The qualification problems mentioned by my colleague here are not as noticeable, but our department would definitely benefit from implementing more sophisticated training methods. So, my answer is yes, I consider the training to be important.

The interview was then aimed at the other weak points stated by both experts; however, this is not in the scope of this paper.

…

The participants were thanked for their time and their insights. The interview ended.

Results

It can be summarised that there are a number of elements in the service desk that need to be optimized in order to have efficient operations. As the interview confirmed, training of new service desk employees is very important. Also, low qualification of the new hires poses a threat in the form of a cause for service quality decrease.

Appendix B – Focus Group Discussion

Organization

The focus group discussion was held online through a Google Meet video conference. There were seven external participants and one moderator (the author of this paper). All of the participants were selected based on their expertise in the field of service desk and knowledge management. The resulting group

consisted of five experts from service desk departments and two academics focusing on knowledge management.

The aim of the focus group was to evaluate the proposed Service Desk Onboarding Training Environment solution as described in this paper.

Brief agenda of the focus group discussion:

- introduction,
- organizational tasks,
- proposed artefact presentation,
- main discussion,
- additional questions,
- conclusion.

Focus group discussion

After all the invited members of the focus group entered the Google Meet online videoconference, they were greeted and introduced to each other by the moderator. The participants were then informed about the organization of the focus group and its agenda.

After that, a presentation of the design artefact and the whole proposed solution followed. The participants were informed about the proposed system for training new service desk employees, including the use of eye tracking for training material preparation. They were informed about the kernel theories serving as the core of the proposed solution – eye tracking as a tacit knowledge elicitation tool and simulation as a knowledge transfer tool.

The main discussion was split into three sections where the following aspects were discussed: (1) understandability of the proposed model, (2) its usability and (3) overall feasibility. Before the main discussion, the participants were asked to imagine their current service desk reality and conditions. Then they were asked to mentally apply the proposed artefact to their work environment. The knowledge management experts were asked to also make a mental model of the system with a focus on the knowledge management aspects of the solution.

In the first part of the main discussion, the participants were asked if they fully understand the proposed design artefact and its goals, and they were encouraged to ask questions. One participant asked about interoperability of the system modules. The moderator responded with remarks about intended functionality and explained that the modules are meant to work independently. The next question concerned the hardware requirements for the software to run on. The moderator explained that the main hardware requirements are a webcam, a microphone and a personal computer station. This is one of the advantages of the proposed system because it does not need any special hardware for the eye-tracking activities. The remaining questions in this part of the discussion were concerned with minor misunderstandings that were promptly corrected.

In the second part of the discussion, the possible usability of the artefact was discussed. The moderator asked questions related to possible practical usage and its constraints. Some concerns were raised during this discussion (e.g., possible time duration of training material preparation or unwillingness to share knowledge). The most interesting point raised through the discussion was the possible unwillingness of expert employees to share their knowledge with new employees, as they might feel they would be replaced by them. The discussion around this topic resulted in collective agreement that this is a difficult subject; however, it is important to try to create an appropriate environment. In this work environment, knowledge sharing is not a threat but an opportunity to revise one's own knowledge and to gain new

knowledge from one's colleagues and therefore improve oneself. A few participants also proposed a motivation system in the form of employee benefits, with which all the focus group participants agreed.

The overall feasibility of the proposed solution was discussed in the last part of the main discussion. In this phase, the participants discussed possible ways to implement the artefact and the appropriate conditions. Based on the whole focus group discussion, it was collectively agreed by the participants that the presented artefact might be an effective approach to improving the training process for new service desk hires during the onboarding process.

There were a few additional questions regarding the future steps and tasks concerning the proposed conceptual artefact and its implementation. The participants were informed about the future research and development plans regarding this artefact. The participants were ensured that they would be invited to the next stage of evaluation – an ex-post evaluation.

The moderator thanked the participants for their time and constructive questions asked during the focus group discussion. The focus group was then dismissed.

Results

The main results of the focus group discussion are as follows:

1. In order to incorporate the presented solution into practice, it is important to establish an appropriate environment where knowledge sharing is beneficial for employees and does not pose a threat to them.

2. The focus group members collectively agreed that the presented solution in the form of a design artefact might be an effective approach to improve the training process and therefore solve the problem of low qualification of new hires and the consequences it brings to the quality of services provided.

3. As this was an artificial evaluation method, the implementation and subsequent ex-post evaluation and confrontation with reality will bring more insight on whether the proposed design artefact may be a solution to the presented problem.

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