Future Digital Workplace - Developing a Tool for the Hardware-Selection of Knowledge Workers

Emergent Research Forum Paper

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Abstract

In the recent past, researchers have conducted investigations with different implications for the design of the future digital workplace. Several researchers advocate user autonomy regarding the selection of the workplace hardware. Other scholars advise enterprises to keep governance in terms of knowledge workers hardware selection. Because of that, companies are in a conflict: On the one hand they want to allow their knowledge workers more independence and autonomy regarding the selection and deployment of hardware. On the other hand they want to keep a minimum of governance within the hardware selection process. In our ongoing research project we are following the Design Science Research Methodology in order to develop and design a need-based configurator prototype for the selection of knowledge worker's workplace hardware. The configurator shall serve as a solution for the conflict described above and consider the interests of employees and employers.

Keywords

Digital workplace, future workplace, need-based configurator, design science research, IT-workplace

Motivation and Research Method

While the *Digital Workplace* is widely acknowledged as an important organizational asset for the optimization of knowledge worker's productivity, the design of the *Future Digital Workplace* is difficult to grasp for researchers and practitioners. However, scholars as well as practitioners have recently made efforts regarding the shaping of the future digital workplace. One aspect in the discourse of the future digital workplace is that today's knowledge workers have higher requirements concerning modern workplace hardware. In that context, several researchers are calling for more user autonomy in terms of the hardware selection. In contrast, other scholars advise enterprises to keep governance in terms of knowledge worker's hardware selection process. Because of that companies are in a conflict: On the one hand they want to allow their knowledge workers more independence and autonomy regarding the selection and deployment of hardware. On the other hand they want to keep a minimum of governance because of compliance, controllability and security issues. Even though researchers are calling for an individual workplace design, not every individual preference regarding hardware fits to a certain job role (Köffer 2015; Köffer and Urbach 2016; Urbach and Ahlemann 2015). Due to the novelty of the research topic, there is no suitable holistic solution in the field of information system (IS) to solve this organizational problem described above.

In our ongoing research project we are following the *Design Science Research Methodology* (DSRM) proposed by Peffers et al. (2007) in order to develop and design an appropriate prototype for the selection of knowledge worker's workplace hardware. Design Science in IS focuses on the creation and evaluation of IT artifacts in order to solve identified organizational problems (Hevner et al. 2004). The DSRM can be divided into a process of six phases: problem identification and motivation (1), definition of objectives of a

solution (2), design and development of the solution (3), demonstration of the solution (4), evaluation of the solution (5) and communication (6) of the research results (Peffers et al. 2007).

With respect to the first phase of the DSRM, the problem and motivation of our research were already described in the explanations above. Under consideration of these, we defined the following objectives in the second phase: The tool shall integrate both: The interest of the knowledge worker as well as the interest of the company. The knowledge worker's interest is to have the opportunity to select hardware according to his or her preferences. The company's interest is to offer a proper hardware-equipment suitable to the knowledge workers' preferences but as well to their job role and without losing the control of hardware allocation within the company. As an appropriate solution we suggest the use of a need-based hardware configurator. By considering job roles and the opportunity to choose by preferences, the configurator is integrating the interest of both parties. Furthermore the tool has to enable the employer to evaluate whether hardware trends, which are currently not available in the company's hardware portfolio, fit to the knowledge worker's job roles. In the case of a match, the company is able to offer their employees attractive hardware. As an additional target, the user oriented hardware selection shall generate a satisfaction benefit for the company's employees and fulfill their requirement for an attractive hardware-equipment. Currently we are located in the development and design phase of the DSRM. Figure 1 illustrates the three steps within this phase:

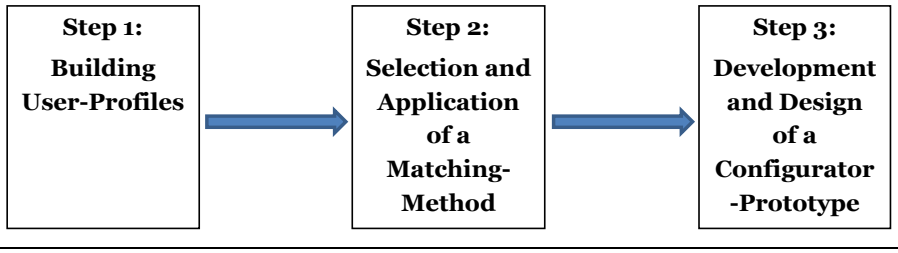

Figure 1. Steps in the Development and Design Phase of our DSRM

In a first step we build user-profiles according to the knowledge worker's job roles. Step two contains the selection and application of an appropriate method for the matching and the fit of user profiles with suitable hardware technology properties. The last step three deals with the development of the configurator-prototype for the selection of knowledge worker's hardware. In the following sections these steps will be described more detailed.

Building User Profiles

Within a company there are different types of job roles and therefore various requirements regarding IT (Köffer 2015). A manager will for instance need a tablet PC and a phone for his or her job whereas a secretary who works stationary needs a desktop PC, a monitor, a mouse and a keyboard. Therefore, the building of knowledge worker profiles seems to be the right first step in the third phase in our DSRM. As an example for knowledge worker segmentation by job roles van Heck et al. (2012) developed seven personas with different digital work styles like a deskbound employee, a concentrative analyst, a traditional engineer or a highly mobile manager (van Heck et al. 2012). Personas are abstractions of groups of real individuals who share common characteristics and requirements. A persona is therefore a fictional individual representing a group of real individuals (Pruitt and Adlin 2006; Turner and Turner 2010). In general, there are more possible approaches in the process of building personas (Friess 2012). Several researchers advocate a data driven approach by conducting empirical field work using methods like interviews or focus groups (Adlin and Pruitt 2010; Goodwin 2009). In our research we are following a qualitative research approach (Goodwin 2009) to get a deep insight into knowledge worker's requirements and characteristics regarding hardware. In order to build personas we conduct interviews as well as group discussions with IT specialists. These specialists have expert knowledge about knowledge worker's requirements and characteristics (e.g. knowledge about tasks, working situations or working behavior).

Because of the objective to enable the company to prove whether attractive hardware, currently not being part of the company's hardware portfolio, fits to the knowledge worker's job roles, the requirements and

characteristics of personas have to be described in a formal manner (Bowman and Hodges 1999). For that purpose and in the sense of the DSRM (Hevner et al. 2004) we are using and combining existing taxonomies from the research field of IS in order to derive a formal description for the specification of personas (e.g. interaction tasks). This formal description shall as well serve as a guide in the empirical field studies. Furthermore the derived description is not a closed construct but open in order to complement the description by our own research results (Gregor and Hevner 2013). The purpose of building user profiles by means of personas is to avoid a random hardware selection based on personal preferences. If a hardware configurator only would work by preferences, the knowledge worker could select any hardware he or she wants. A secretary could for instance choose a smart watch without checking if the device fits to her job profile. Therefore, personas are serving as a hardware preselection mechanism and help the company to keep governance concerning the hardware allocation.

Determination of an appropriate Matching-Method

For the matching of knowledge worker's requirements and characteristics with proper hardware the method of *Quality Function Deployment* (QFD) (Akao 1990) seems to be a suitable technique. The method has been applied to numerous areas like product development, concept evaluation and service design. The QFD is characterized by linking customer requirements to technology attributes via a matrix (House of Quality). The approach strives to communicate and quantify the fit of technology attributes to customer requirements. By successfully applying the approach, the matrix illustrates relationships among the customer requirements and technology attributes as well as correlations between the technology attributes themselves (Chang and Wu 2002; Gerards et al. 2011; Wang and Chen 2012). Figure 2 illustrates a simplified House of Quality. With the help of the House of Quality one can evaluate the relationships between the respective customer requirements and technology attributes and thus as well the compatibility between requirements and technology properties. Furthermore the method allows one to validate how good or bad a possible technology solution fits to the user's requirements. This is indicated in Figure 2 by pluses and minuses. If a technology attribute has strong positive relationships towards a special requirement, like for instance attribute six regarding requirement two, five, six and eight, the method is indicating a high level of fit. For example, a manager with the requirements of a fast data input and retrieval, visual output, high portability and high convenience could get a tablet PC. In addition to that, one can prove if the technology attribute corresponds with other attributes or not (correlation). In our case an expert group with knowledge about employees' requirements and technical attributes will conduct the matching described above.

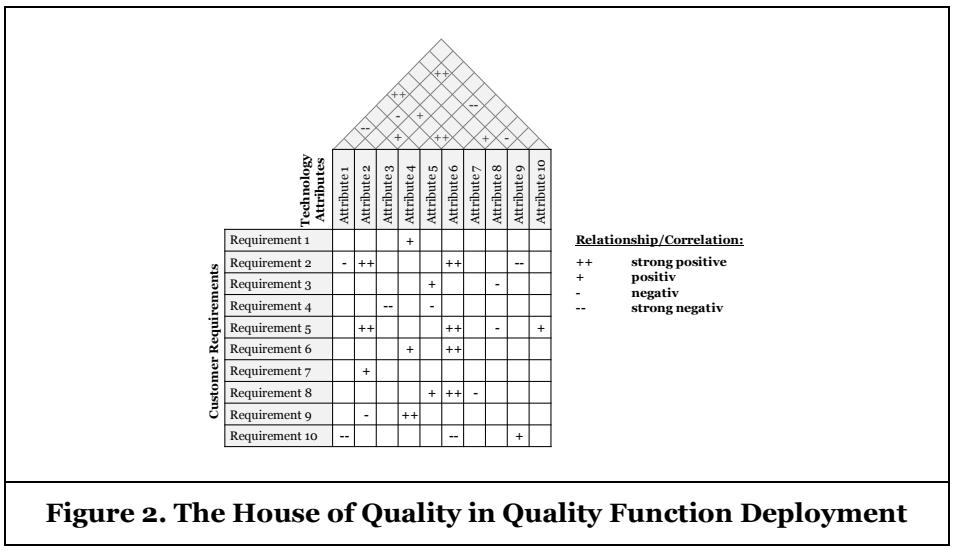

Figure 2. The House of Quality in Quality Function Deployment

By doing the research about how to match customer requirements with hardware/technology attributes in the best way, we are currently facing different challenges: How to prioritize the respective hardware systematically if there are more possible solutions for the fulfillment of knowledge worker's requirements? How to create sets of suitable hardware-equipment as a basis for a selection by preferences? In order to get answers to these questions we are currently researching in the field of operations research and

evaluating multi criteria decision making methods like the analytical hierarchy process (Saaty 1980) or TOPSIS (Hwang and Yoon 1981).

Development and Design of a Hardware Configurator

The central idea of using a configurator for the selection and combination of knowledge worker's hardware equipment originates from the deployment of configuration systems in mass customization. As an interactive tool, our configurator intends to support and guide the customer in the process of eliciting a suitable combination of hardware devices (Piller 2004; Salvador et al. 2009; von Hippel 2001). In contrast to the existing single hardware configurators, our configurator aims to assemble the entire hardware equipment for a knowledge worker's workplace. There are two types of configuration tools: parameter-based and need-based configurators. A parameter-based configurator presents the costumer all possible components and variants of a product. The customer has to choose and decide on his own which options and components fit to his needs the best. A typical example for that kind of configurator are car configurators where users can select for instance different colors, motors, sound systems, or interiors. The need-based configurator asks the customer about his needs for usage and suggests him a configuration. A system automatically builds configurations by matching models of customer needs with characteristics of a set of possible solutions. In areas, where customer product knowledge is lacking, the usage of a parameter-based configurator can lead to wrong decisions and a wrong decision can endanger the customer satisfaction. A typical example for a situation where required user knowledge lacks often is the selection of hardware like computers or cameras (Franke et al. 2009; Gerards et al. 2011; Randall et al. 2007).

In order to avoid mistakes in the selection of hardware we are suggesting the application of a need-based configurator. The configurator shall offer the knowledge worker predefined sets of hardware, which are suitable to the knowledge worker's requirements and thus to his or her job roles (personas). With the preselection of hardware according to job roles and the opportunity to choose by preferences afterwards, our objective to integrate the interest of knowledge workers and the company would be achieved. From a technical point of view there are more possible solutions for the development and implementation of a hardware configurator. Currently we are examining expert systems as a proper basis for the configurator. An expert system is a knowledge based system which can apply and reproduce knowledge which was inserted in the knowledge base of the system. In our case the knowledge base can be seen as a store of knowledge worker requirements to hardware combinations which resulted by the matching process. Every time a knowledge worker is selecting hardware by using the configurator, the existing knowledge within the knowledge base is used to offer an appropriate solution (Gerards et al. 2011). Even though an expert system could be a possible solution for our configurator, we plan to evaluate other conceivable technology platforms.

Conclusion

Our aim in developing a configurator prototype for the selection of the workplace hardware is to integrate the knowledge workers' and the employers' interest. After building personas and conducting the matching of hardware with user requirements, we will continue with constructing and implementing the configuration tool. The subsequent step is the validation of our tool through field tests. During these, employees will use the configurator to select their hardware equipment. With pre- and post-tests we will evaluate the impact and fit of the selected hardware. Nevertheless we have to mention following limitations concerning the target group and a possible matching bias: As we will only focus on knowledge workers, the outcome of this project cannot take into account production workers and workers with special needs like people with disabilities. Furthermore the matching process is based on a subjective assessment of experts. In a worst case, the configuration could lead to a misfit. However, by conducting next steps it is our target to create a contribution for managing the digital workplace of the future.

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