Bus Inf Syst Eng 58(2):135–149 (2016)
DOI 10.1007/s12599-015-0403-3

RESEARCH PAPER

Design Principles for High-Performance Blended Learning Services Delivery

The Case of Software Trainings in Germany

Philipp Bitzer · Matthias Söllner · Jan Marco Leimeister

Received: 14 July 2014 / Accepted: 21 May 2015 / Published online: 12 October 2015

Abstract The "perfect" orchestration of training participants, IT and process design is one of the ongoing challenges within blended learning service research and practice. Blended learning services (BLS) offer a great variety of options to design learning processes, overcoming many shortcomings of pure e-learning services and providing better scalability and more advantages for learners than pure face-to-face class teaching. Nevertheless, due to inconclusive results of blended learning design research in the literature, BLS designers can hardly find support for the systematic design of efficient and successful blended learning processes, which would enable a high degree of learning success with a balanced degree of delivery effort. Based on major determinants of BLS processes' quality, the authors identify, develop, and evaluate design principles for high performance BLS using an action design research approach. They first derive a set of initial design principles, based on insights from literature and own exploratory case studies as well as workshops with experts from the field. They then improve the design principles iteratively in expert workshops as well as apply the design principles in four software training sessions. Finally, they present seven evaluated design principles for BLS, which are the core of a nascent design theory and contribute to a time-efficient and successful BLS delivery. Furthermore, these principles enable practitioners to systematically apply the design knowledge formalized within the principles in order to improve BLS design and delivery.

Keywords Blended learning · Blended learning services · Efficiency · Learning success · Design principles · Learning service engineering

Accepted after two revisions by Prof. Dr. Becker.

Electronic supplementary material The online version of this article (doi:10.1007/s12599-015-0403-3) contains supplementary material, which is available to authorized users.

Dr. P. Bitzer (✉) · Dr. M. Söllner · Prof. Dr. J. M. Leimeister
Chair for Information Systems, Kassel University, Pfannkuchstr.1, 34121 Kassel, Germany
e-mail: bitzer@uni-kassel.de

Dr. M. Söllner
e-mail: soellner@uni-kassel.de

Prof. Dr. J. M. Leimeister
e-mail: leimeister@uni-kassel.de

Dr. M. Söllner · Prof. Dr. J. M. Leimeister
Institute of Information Management (IWI-HSG), University of St. Gallen, Unterer Graben 21, 9000 St. Gallen, Switzerland

1 Introduction

In 2010, more than 70 % of all German companies invested in vocational training. In fact, 94 % of all major companies (with more than 1000 employees) invested in vocational training (Vollmar 2013). This accounts for a market volume of more than 28 bn euros (Seyda and Werner 2012). These numbers show the major economic importance of such learning services, due to the need to constantly train employees in order to remain competitive and avoid the loss of knowledge to demographic change (Vollmar 2013). At the same time, Arthur et al. (2003) stated that vocational training is becoming increasingly technology-supported, referred to as blended learning services (BLS). Blended learning services combine face-to-face instruction with computer-mediated instruction (Graham 2006). They consist of processes where participants and trainers interact in e-learning and face-to-face learning scenarios (Graham 2006; Wu et al. 2010). Their goal is to integrate the

strengths of synchronous (face-to-face) and asynchronous (IT-based) learning activities (Garrison and Kanuka 2004). In this context, training courses for enterprise resource planning (ERP) software, which is the largest enterprise application market, has a significant share within vocational training (Gartner 2012b). Nevertheless, the delivery of ERP training varies widely in terms of training organization structures, applied IT tools and learning methods with varying yields of success (Gartner 2012a).

Thus, the design of successful BLS is a challenging matter due to the interplay between three critical aspects, i.e., (1) the service process design (Gupta and Bostrom 2009), (2) the use of technology to support the service process (Gupta et al. 2010), and (3) the integration of the external (human) factor into the service process (Parasuraman et al. 1988; Zeithaml et al. 1985). From a BLS provider perspective, all three aspects have to be enhanced simultaneously for two dimensions, i.e., time-efficient delivery and high learning success of the participants. More precisely, standardization and the systematic use of IT can help to minimize the time needed and to create economies of scale. At the same time it enables a high learning success for the training participants since customer satisfaction is a crucial element for successful services. Moreover, the use of IT enables providers to save time resources (Ray et al. 2005; Weiss et al. 2007) and to deliver a more interactive BLS with a higher learning success (Melville et al. 2004). Last, (3) the customer integration enables BLS providers to transfer delivery efforts with the customer, which again saves time–resources during the BLS and simultaneously enables BLS participants to learn in a more interactive, self-regulated and finally more successful way.

Nevertheless, current research results show an inconclusive database regarding the design of efficient, successful BLS. The latter, in turn, is essential to foster resource-saving aspects of BLS in correlation with potential learning success gains (Lehtinen et al. 1999; Gupta et al. 2010). This lack of transferable insights can be explained by the fact that many studies have focused on input–output research designs that ignore critical aspects of the learning process (Gupta and Bostrom 2009).

To sum up, we regard the current lack in the systematic BLS process design as a considerable shortcoming. The research presented here intends to address this shortcoming by studying blended learning services (BLS), the goal being to develop and collect productivity-oriented design knowledge from an efficiency and effectiveness perspective. On this account, design principles help to synthesize and formalize design knowledge (Lindgren et al. 2004).

In doing so, we are adding to the existing body of knowledge on BLS by developing a nascent design theory (Gregor and Hevner 2013) while answering the following research questions:

1. Which design principles foster successful BLS, i.e., improve BLS outcomes?
2. Which design principles foster time-efficient BLS, i.e., decrease BLS delivery efforts?

In order to achieve our desired goal, the remainder of this paper is structured as follows. First, we introduce findings from literature. In the following, we present the research methodology, which encompasses a literature review, a multiple case-study approach, and a two-folded evaluation embedded within a design research approach. Then, we present the seven final design principles. Thereafter, we present the evaluation, explaining the evaluation approach and presenting the core results of the evaluation. The paper closes with a summary which includes areas of future research.

2 Blended Learning Service Research

Services are perishable, intangible experiences rendered for a recipient who does double duty as both customer and co-producer (Fitzsimmons and Fitzsimmons 2011; Leimeister 2012, 2015), implying that customers influence the process and the result of a service. Hence, in contrast to the productivity of manufacturing industries where the tangible assets can be identified and counted easily, qualitative aspects have to be considered within the design of BLS. Therefore, economical process measures – such as delivery time – as well as success measures – such as learning success – have to be considered.

2.1 Ensuring High Learning Success for Blended Learning Services

The field of learning analytics offers a wide variety of findings on factors influencing learning success (e.g., Greller and Drachsler 2012). Therefore, it is important to carve out precisely the focus of this research. In accordance with Grönroos and Ojasalo (2004), we are focusing on capacity efficiency, creating insights into the measurement of service delivery process quality as well as into the design of a productive service delivery process, i.e., a design which is efficient (time efficient) and effective (high quality).

The learner is the main influencing factor of learning services. Several characteristics could be identified within the literature which have a major impact on learning services in general and blended learning services in particular. Blended learning services are considered effective when service quality meets the expectations of the participants and customers in terms of input, process, and results quality (Lewis and Booms 1983; Bitzer et al. 2013). Plenty of research can be found regarding input quality, i.e., trainer

characteristics (e.g., Arbaugh 2001; Kim et al. 2011; Bitzer et al. 2011), participant characteristics (e.g., Pintrich and De Groot 1990; Colquitt et al. 2000; Greller and Drachsler 2012), learning materials (e.g., Ozkan and Koseler 2009; Rasch and Schnotz 2009) and IT -characteristics (Lin 2007; Delone 2003; Greller and Drachsler 2012). Nevertheless, the interplay between these characteristics with the dimensions of the process has not yet been fully examined (Gupta et al. 2010; Gupta and Bostrom 2009). Solely focusing on single determinants rather than developing a holistic perspective, e.g., focusing only on learning materials (Rasch and Schnotz 2009), cannot provide generalizable results since we do not know the BLS process design and the according interplay of learning materials with other determinants, such as trainer competence. Therefore, the service dominant logic stresses the importance of the service process for the customers' value generation, implicating that BLS design requires the explicit consideration of learning process characteristics, (e.g., Grönroos and Voima 2013; Hilton et al. 2012; Kleinaltenkamp 2013). In addition, educational research stresses the importance of the interplay in the learning process which determines the quality of the collaboration between training participant and providers and finally determines learning success (Gupta and Bostrom 2009). Consequently, facets driving BLS process quality constitutes a valuable starting point for the derivation of design principles that help to increase the quality of learning processes. A widely studied process-related antecedent is interaction. Prior research has studied different kinds of interaction, such as participant–participant interaction, recipient–lecturer interaction and recipient–IT interaction (Smith and Woody 2000; Evans and Gibbons 2007; Sims 2003; Thurmond and Wambach 2004), and identified their impact on BLS process quality. Recently, further factors such as IT-process support, the characteristics of a learning group in terms of the homogeneity of their knowledge, expectations and mutual support, as well as the helpfulness, didactical appropriateness and understandability of exercises were highlighted as important antecedents of BLS process quality. Additionally, the importance of transparency about the learning goals, course procedures and the current progress was pointed out (Bitzer et al. 2013; Gupta and Bostrom 2009). Furthermore, in accordance with prior research on the performance-to-expectations gap in service settings (Zeithaml et al. 1988; Frost and Kumar 2000), the fit between the course design and the recipients' expectations and characteristics needs to be considered.

2.2 Designing Efficient Blended Learning Services

As mentioned before, the service dominant logic requires a stronger consideration of the service process within BLS design than it has enjoyed so far. Therefore, in accordance with Fließ and Kleinaltenkamp (2004), processes also have to be designed in an efficient manner. From a service productivity perspective, the identification of tangible, efficiency-related input factors of BLS seems to be comparatively unproblematic. Efficiency can usually be increased in terms of time- and resource-savings during the provision of a service (Grönroos and Ojasalo 2004), resulting in money savings. Consequently, design principles for the efficient delivery of a certain class of services can be adapted to fit the specifics of another class of services – in our case BLS. Well-established ways to enhance the efficiency of services are: standardization, segmentation, and automation (Fließ and Kleinaltenkamp 2004). By breaking down the delivery process into single segments, sub-activities that can be automated or standardized may be identified. In turn, by standardizing several segments of the service, e.g., the way feedback from the recipients is gathered, the homogeneity of the input for the subsequent process steps can be enhanced, also leading to time savings. The automation of process segments, e.g., signing in for a course, may lead to both time and resource savings (Wegener et al. 2012). Nevertheless, the adaptation of existing insights concerning the efficient delivery of services is still challenging, since BLS contain a high degree of customer-induced activities, e.g., learning activities (McLaughlin and Coffey 1990).

3 Methodology

Our project started in October of 2011, and for about two and a half years we collaborated with three major German software training providers. The goal of the project was to develop design principles for successful and scalable BLS provision. For developing our design principles, we relied on the action design research (ADR) method (Sein et al. 2011). This decision was based on the fact that ADR combines the strengths of design research, developing in essence innovative and useful solutions for classes of problems which are relevant to practice (Hevner et al. 2004; Gregor and Jones 2007). Additionally, the ADR approach recognizes the importance of collaborating directly and closely with practitioners to ensure the possibility to learn from the intervention in an organizational context in order to iteratively improve the resulting IT artifacts (Sein et al. 2011). Furthermore, ADR supports van Aken's (van Aken 2004) argument that domain-specific insights – in his words "tested and grounded technological rules" (p. 8) – should be developed and evaluated in the target domain, in our case the BLS provision. As a result, we follow Sein et al.'s (2011) conceptualization of the IT artifact as an ensemble artifact meaning that the artifact incorporates dimensions beyond the technological aspect.

Furthermore, we chose to apply a circular organizational design (Sein et al. 2011; Romme and Endenburg 2006) in order to iteratively evaluate (for further information on the evaluation see Appendix D; available online via http://link.springer.com) and improve the design principles. Consequently, ADR is the most suitable method to achieve our intended goals, since we aim to develop design principles which support BLS providers in providing better services. The ADR method consists of four stages, and each stage is guided by one to three principles. The next paragraphs contain methodological details related to these four stages. At the end of our paper, we summarize our ADR process in Table 8 and address the seven guiding principles of ADR.

3.1 Problem Formulation

In the problem formulation stage, we created an ADR team consisting of two researchers and six experts from the software training providers (two from each provider, experience range from 3 to 27 years). After this, we conducted case studies with our partners to obtain deeper insights into their problems with BLS delivery. The case studies included focus group discussions, participant observation, technology review, workshop sessions, and 15 semi-structured interviews (with the six experts from the ADR team and three additional experts from each collaborating provider). Based on the case studies, we identified three problems the providers were facing in the context of providing their software training. Table 1 provides an overview of the methods used and the output generated in the problem formulation stage.

3.2 Building, Intervention, and Evaluation (BIE)

Since the problems were more related to organizational structures and processes as a whole than to a specific IT artifact, we followed (Sein et al. 2011) an organization-dominant BIE. Figure 1 shows a graphical illustration of the BIE in the project with the software training providers.

During our two and a half year ADR project we applied a plethora of different research methods in the BIE stage. We initially examined the existing literature on the three identified problems, using search strings such as "Learner integration", "Blended Learning efficient use of IT" or "Blended learning success" in order to identify the initial design principles. More precisely, we collected design recommendations which were categorized by the ADR-team and thereby identified five design principles. Furthermore, we relied on qualitative methods for evaluating and refining the different version of our design principles, since we wanted to generate rich insights into the strengths and weaknesses for the experts' points of view. This allowed us to specifically generated insights not only into the current quality of the principles (measured, e.g., by perceived quality on a Likert scale), but we were able to generate solution information which allowed us to refine our principles to ensure a high quality of the final set of design principles. To enhance the understandability of the research process, Table 2 provides details of the applied methods including inputs and outputs. The numbers displayed in Fig. 1 relate to the numbers presented in the first column in Table 2. Further details of the single stages, e.g., the alterations of our design principles during the ADR project, will be presented in Sect. 4.

3.3 Reflection and Learning

During the whole 2.5 year project and especially after the single BIE parts, we always reflected on the generated results and incorporated additional insights from practice and from the literature to ensure that our design principles resemble a solution not only for the problem of our partners, but for a broader class of problems, in our case, the delivery of effective and efficient BLS. We think that our project setting helped to achieve this goal, since we did not collaborate with only a single but three different BLS providers.

3.4 Formalization of Learning

To ensure that the results of our project are ready to use for both practitioners and researchers, we formulated a total set of seven design principles following a predefined scheme including the addressed challenge(s), the goal, the necessary input, a short description, and the output of each principle (see Sect. 4.4).

Table 1 Problem formulation

Methods used	Output
Case studies (including focus group discussions, participant observation, technology review, workshops sessions, and 15 semi-structured interviews)	Three problems of the providers (see Table 3 in "Problem Formulation: Blended Learning Service Design as a Class of Problems" for further details)

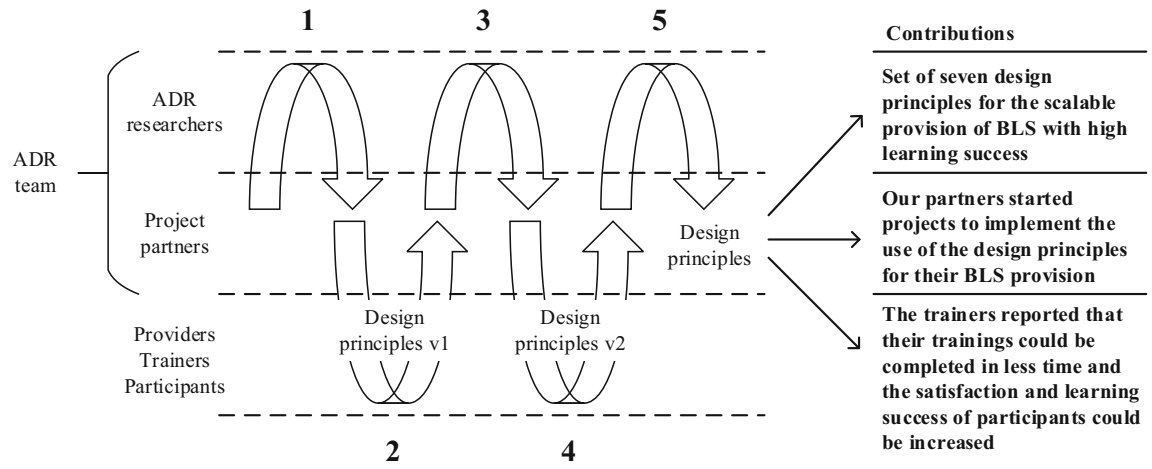

Fig. 1 Action design research process (Sein et al. 2011)

Table 2 BIE process including inputs, methods used, and outputs

BIE part	Input(s)	Method(s) used	Output(s)
1	Three problems from problem formulation stage	Review of literature on service provision and blended learning services	Initial set of five design principles
	Initial set of five design principles addressing efficient and successful delivery	Workshop with the six practitioners from the ADR team	Set of seven design principles (Design principles v1)
2	Set of seven design principles (Design principles v1)	13 semi-structured interviews with experts from the providers	Feedback especially focusing on the scope, completeness and understandability of the design principles
3	Feedback especially focusing on the scope, completeness and understandability of the design principles	Iterative refinement of the design principles within the ADR team using workshop settings	Set of seven design principles (Design principles v2) one of v1 was dropped one was split into two distinct principles
4	Set of seven design principles (Design principles v2)	Workshops with four trainers Application of design principles 1, 2 and 3 Identification of intervention points in the BLS provision process suitable for applying design principles 4, 5, 6 and 7	Intervention points for applying design principles 4, 5, 6 and 7
	Intervention points for applying design principles 4, 5, 6 and 7	Redesign of four software training courses, including the development of, e.g., a learning management tool (Fig. 1)	3 Interventions in software trainings resembling the application of design principles 4, 5,6 and 7
	Three Interventions in software trainings resembling the application of design principles 4, 5, 6 and 7	13 semi-structured interviews with trainers (4) and participants (9) regarding the effect of the intervention	Feedback especially focusing on understandability, helpfulness, and acceptance
5	Feedback especially focusing on understandability, helpfulness, and acceptance	Iterative refinement of the design principles within the ADR team using workshop settings	Final set of seven design principles

4 Development of the Design Principles

4.1 Problem Formulation: Blended Learning Service Design as a Class of Problems

The design principles are an important theoretical contribution because they incorporate design knowledge of blended learning services, which can be considered as a mandatory contribution for the body of knowledge and an underlying goal of action design research in general (Sein et al. 2011; Gregor and Hevner 2013). In order to ensure the validity and helpfulness of the design principles, the ADR team first identified the most important challenges within BLS delivery. In the problem formulation stage, we extended the beforehand mentioned challenges within BLS design with help of the literature and specified more precisely three major challenges for BLS training providers in the course of the three case studies (Table 3).

These problems constituted the starting point for the development of the design principles within our action design research project. Based on focus group discussions, participant observation, technology review, workshop sessions, and semi-structured interviews our initial study traced a wide variety of customers, contents, and IT tools existing within BLS scenarios. In this context, we identified the interplay between process standardization efforts, systematic use of IT and the systematic integration of participants as the main challenge within an efficient and a simultaneously successful BLS delivery. We observed participant acceptance problems in various courses, especially with respect to IT-use and respective learning results.

We concluded from literature that service science and results on standardization, automation and customer integration have to be extended due to the specific characteristics of complex learning services (McLaughlin and Coffey 1990). Because of the need for a parallel consideration of economic process efficiency and learning success, the ADR team decided that the existing knowledge on efficient and successful service design needed to be expanded.

4.2 Building, Intervention, and Evaluation

Based on the results of the problem formulation stage, we decided to identify design principles for both an efficient BLS delivery and high learning success. In this context, the ADR team derived an initial set of five design principles in order to solve the problems of process delivery effort, systematic use of IT, and BLS customer integration (Table 3). The fundament of efficient BLS processes is the identification of standardization potentials (Fließ and Kleinaltenkamp 2004). Therefore, the ADR team derived the principle of "BLS segmentation", which supports a common understanding and the classification of the BLS process steps. Moreover, we collected potential parameters for a systematic standardization of BLS within the initial design principle "Standardizing BLS processes". In addition, we collected design information on the systematic use of IT within BLS scenarios. With regard to the problem of misinformed BLS design due to varying customer characteristics, the ADR team derived the principle of systematic BLS value identification in order to increase customer and participant acceptance of BLS. Last, a design principle for the systematic BLS evaluation was derived, aiming at the missing information about participant characteristics, standardization potentials, and systematic use of IT.

The initial set of design principles (Table 4) served as a starting point for the further development of design principles with regard to the specific characteristics of BLS. Therefore, we conducted an expert workshop to discuss and amend the design principles with regard to BLS delivery. Furthermore, we identified two further design principles (design principle 7 and 8). Additionally, in the course of the evaluation design principle 6 was identified [please find further information omit in this evaluation section (Table 5)].

Table 3 Challenges within existing BLS

No.	Challenge	Description
1.	Participant integration	Complexity of the learning process leads to increased participants' demands in terms of service quality
		Complexity of the learning process leads to increased participants' demands in terms of interactivity
2.	Missing use of IT-potentials within BLS scenarios	Missing knowledge of IT potentials which foster learning success
		Missing knowledge of IT potentials which foster provider time-savings
3.	Efficiency-challenges due to time-intensive BLS delivery	BLS complexity hinders a standardized, time-efficient delivery of BLS
		Missing knowledge of parameters identifying standardization potentials

Table 4 Set of initial design principle (source in theory)

No.	Initial design principles	Description
1	Segmentation of BLS processes (Fließ and Kleinaltenkamp 2004)	Supports various stakeholder groups around BLS in understanding BLS design and identifying improvement potentials regarding standardization and automation
		Facilitates a common understanding and the documentation of best practices
2	Standardizing the BLS delivery process (Fließ and Kleinaltenkamp 2004; Menschner et al. 2011)	Supports an economical BLS delivery by delivering selected elements in an identical manner across different BLS scenarios
		Requires the identification of recurring events which are not in need of a complex provider-customer interaction
3	Systematic IT-support during the BLS process delivery (Fließ and Kleinaltenkamp 2004; Gupta and Bostrom 2009)	Systematic use of IT within BLS scenarios in order to improve the economic efficiency of BLS
4[a]	Systematic BLS value communication (Petter et al. 2012)	Helps to cure one of the major problems of BLS design, namely the poor participant and customer acceptance
		Enables a systematic business value identification process in order to show the value of certain training items to the company and the employees
5	Establishing a Continuous Learning Process for BLS (Gupta and Bostrom 2009; Bitzer et al. 2013)	Integrates a continuous improvement process within BLS companies which goes beyond usual qualitative evaluation approaches

[a] Design Principle 4 was dropped in the course of the development process

Table 5 Additionally identified design principles

No.	Additional design principle	Description
6	Systematic interaction support	Systematic use of IT within BLS scenarios in order to improve the learning success of the participants
7	Identification of participant expectations and characteristics	Collection of mandatory information on participant characteristics and attitudes
		Information about stakeholders and respective data dimensions
8	Learning goal management	Systematic identification of participants‘ learning goals
		Transparent tracking of learning success of BLS participants during the training

We collected, structured, and refined all information gathered within the case study setting. Furthermore, we presented between one and four principles to the experts and evaluated them using semi-structured interview techniques. In accordance with Patton (2005), the interview guideline contained open questions as well as closed ones, giving the experts the possibility to add their views and opinions on the principles in addition to the existing results. We chose the experts upon recommendation by the previous experts interviewed during the case studies.

In the course of the interviews, we split the initial version of the design principle on automation into Design Principle 3 – Automation and Design Principle 6 – Systematic Interaction Support, taking into account that the use of IT potentially affects efficiency aspects (design principle 3) as well as effectiveness aspects (design principle 6). One of the interviewees stated:

> *"Using IT for simple activities such as a questionnaire is very easy. Nevertheless, when it comes to e-learning, a large number of determinants have to be taken into consideration."*

When discussing the effectiveness principles, the interviewees' stressed the potential improvement through these principles in comparison to the status-quo, demanding their stronger integration into software training and training in general. One interviewee stated:

> *"So far, we are not able to systematically manage learning goals and, even worse, we are not able to prove that our trainings made a difference in the end."*

In general, the experts agreed upon the design principles. To strengthen the findings, the training participants were questioned after the training delivery. They stressed the increase of transparency due to the formalization of learning goals and the additional feature of instant feedback. One participant stated:

> *"Since this topic is completely new to me, it helped a lot to see what is expected of me and to communicate learning deficiencies immediately, not only to the trainer but also to myself"*

Minor changes were conducted in terms of wording, additional descriptions, and added content, especially for design principles 3 and 6. The experts stated that it is crucial to differentiate between highly suited learners and less suited learners. For this reason, a definition of the main aspects of learner appropriation was defined for e-learning use, and iteratively evaluated by the experts. One expert stated:

> *"One can do almost anything with e-learning. The only, but strongest limiting factor is the learner. Only if he is willing, capable and structured enough, we have a chance to effectively apply e-learning."*

Therefore, in accordance with BLS research and interview results, we differentiated between learners' self-regulatory learning capabilities, motivation and technology readiness (see, e.g., design principle 6). These design principles served as a foundation for the intervention and reconstruction in the real-world setting.

In order to evaluate the formerly derived artifacts, the ADR team applied the design principles in the course of a real-word software-training course. First, the course was visualized (design principle 1) in an expert workshop (Fig. 2).

The visualization enabled the workshop participants to discuss possible intervention points and reasonable activities (Fig. 1) in order to optimize the learning success by applying learning success related design principles (design principles 4–7). As a result, an extended process could be derived (extensions marked orange), including intervention points and service design requirements. More precisely, the newly designed software-training comprised a systematic requirements elicitation (design principle 4), a systematic learning management (design principle 5), a systematic interaction support (design principle 6), and an evaluation of the course process (design principle 7). Second, we applied design principles 2 and 3 in order to gain efficiency potentials for the whole process.

Thus, standardization and automation potentials were identified, and process improvements as well as requirements for a supporting IT-tool were derived.

Based on these requirements, the ADR team developed a learning support platform (Fig. 3) in order to facilitate the systematic requirements elicitation, the process evaluation, as well as the learning goal management.

The learning platform provided e-learning material and enabled the BLS provider to collect requirements according to participant characteristics before and during the training. Moreover, a constant process evaluation was integrated, allowing an easy monitoring of shortcomings for every training day, which enabled the instructor to react to learning problems or unsatisfied participants.

4.3 Reflecting and Learning

We were able to identify a total amount of nine improvement measures regarding the efficiency of BLS and the parallel learning success. The experts stated that the visualization of the process helped to create a common understanding of the process and made it possible to identify improvement potentials. One workshop participant stated:

> *"Now it is easy to see the internal process logic in respect to the learning goals, giving everyone the chance to understand our training approach as well as our support processes".*

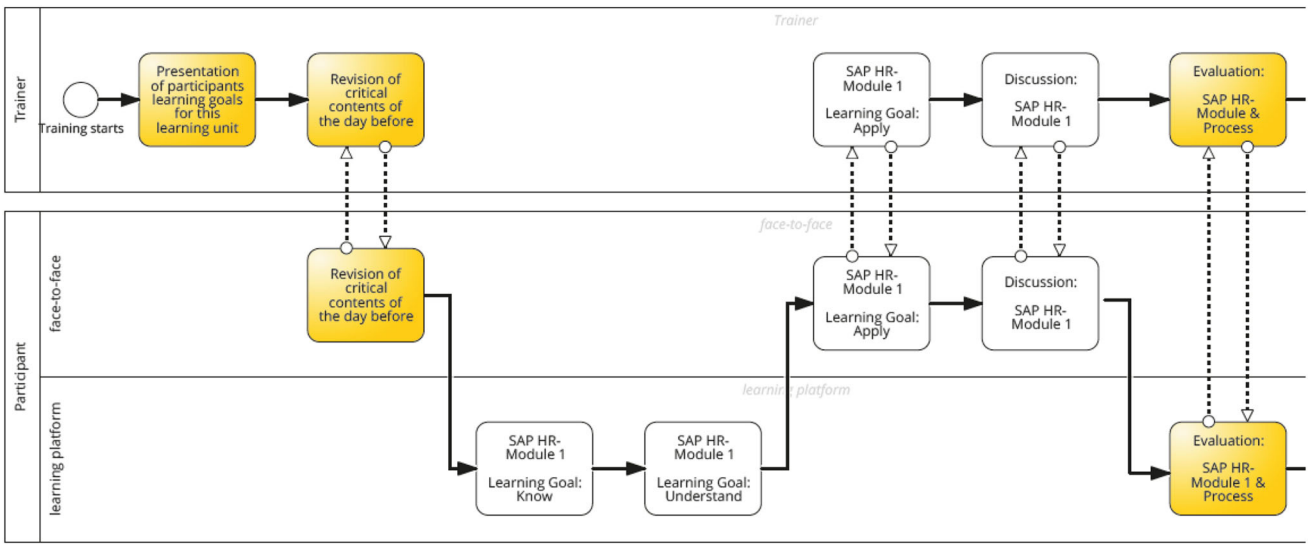

Fig. 2 Example excerpt of process visualization

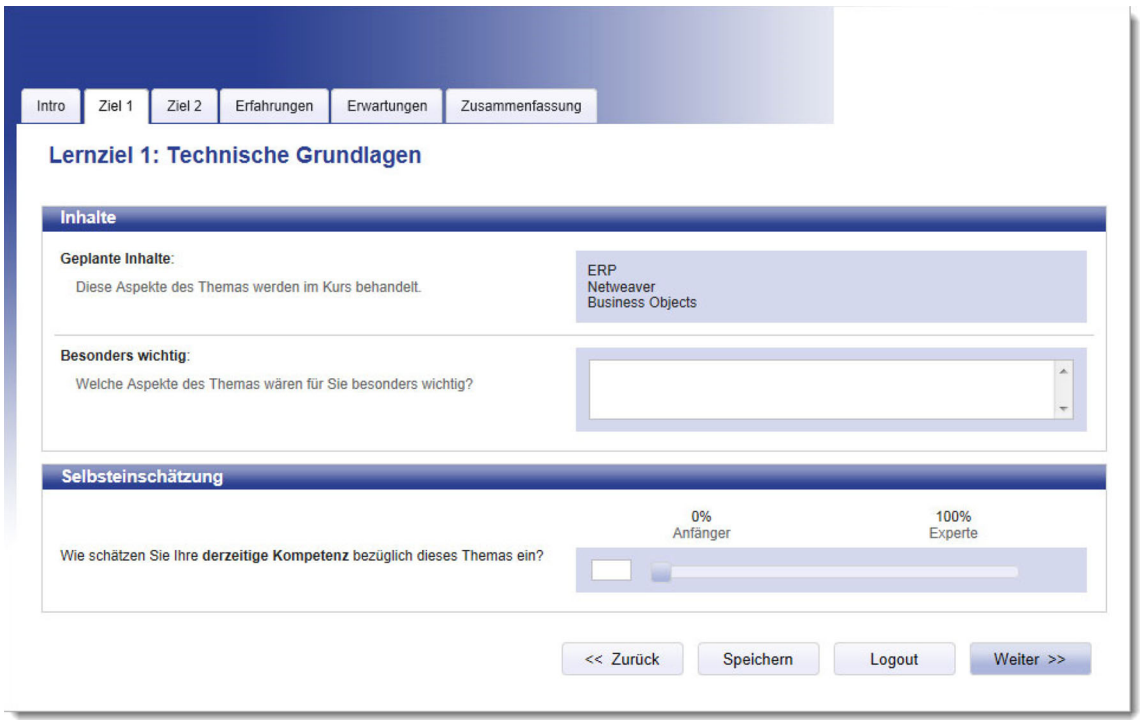

Fig. 3 Screenshot of the learning platform, developed on the basis of the design principles (German)

Another participant added:

"It [the visualization] is a helpful tool to discuss a certain process. Nevertheless it appears to be quite complex to create it. Therefore I rather consider it a tool for complex and costly trainings".

In contrast, the specific analysis allowed a detailed discussion of intervention points as well as improvement potentials of the status quo. Based on the visualized process, one design principle after another was discussed and collaboratively visualized within the process. Thus, correct points for the implementation of the systematic requirements elicitation (DP4) as well as of the intervention points learning management (DP5), interaction needs (DP6), and the continuous improvement process (DP7) were identified. All experts emphasized that it is an important success factor to keep the participant's efforts as low as possible, and that it is highly important to stress the actions'actual value for the participants. One participant stated:

"I see the necessity of your principles; nevertheless the main barrier is the participants' acceptance. Most training providers will be very cautious in their application, fearing a negative impact on customer satisfaction".

Therefore, we derived the requirement of very short interventions which last up to a maximum of 5 minutes. Since the training participants were rated as highly suited learners, additional interaction support was introduced by means of a web forum to support the exercises aiming at the learning goal "apply". Regarding lower learning goals, i.e., "know" and "understand", we identified exercises which were suitable for homework after the actual training.

In addition, we decided to integrate the learning management and the evaluation in one IT tool, giving the participants an incentive to communicate and trace their learning success. As a consequence, participants were induced to accept short evaluation snippets. By applying the efficiency design principles, we could identify standardization and automation potentials, especially in combination with design principle 6 (systematic interaction support), to move several exercises into the customer-independent area. This holds also true for the systematic requirements elicitation before the beginning of the training.

After the courses were conducted, we spoke to four trainers and nine participants of the course about the interventions. The participants stated that the effort was acceptable; nevertheless, not everybody managed to use the tools for their personal benefit. Therefore, we introduced a short tool introduction at the beginning of the course held by the trainer. One of the trainers stated:

"I think we definitely achieved a better learning outcome, especially due to the learning management tool and the additional interaction support. For me, it

meant less effort since some of the exercises were conducted by the participants alone".

Furthermore, one participant stated:

"I liked the very interactive approach, which helped a lot, especially in potentially critical situations. In addition, the learning goals helped me to structure myself-learning activities in order to master the huge amount of content we had to prepare".

4.4 Formalization of Learning: Design Principles for Blended Learning Services

In the course of this action design research approach, seven design principles for BLS ensuring high learning success and time-efficient delivery could be identified. Tables 6 and 7 provide an overview of the identified design principles and their BLS specific characteristics in comparison to already existing service design knowledge. A full elaboration of the design principles including a description of design principles for a time-efficient BLS delivery and design principles for BLS with high learning success, e.g., for interested practitioners, can be found in Appendix A.

Furthermore, four learning success related design principles were identified – more precisely, design principles which comprise design information for a BLS delivery which ensures a high learning success, exploiting the potentials of IT-support.

The presented design principles incorporate BLS specifics based on the three major challenges identified before:

1. Challenges of participant integration are targeted by the systematic inclusion of participant characteristics. Thereby, we incorporated the systematic integration of external factor in various dimensions: a common understanding of BLS processes including a participant dimension (design principle 1), a systematic identification of standardization potentials (design principle 2), a systematic identification of IT potentials (design principles 3 and 6), and a systematic process to identify customer expectations and characteristics (design principle 4). Furthermore, the systematic consideration of the individual learning goal of the participants was integrated, which represents a major determinant of an adequate and successful BLS delivery.
2. The challenge of identification of IT potentials was targeted from two perspectives. On the one hand, we addressed the use of IT in order to increase process efficiency of BLS by the consideration of a homogenous, learning-goal oriented interface design which aims at a homogenous, participant friendly IT-use (design principle 3). In addition, a systematic interaction support was identified as a major aspect in BLS design. In accordance with learner appropriation and learning goal complexity, interaction needs are derived to support a participant adequate BLS design (design principle 6).
3. The challenge of an efficient BLS delivery was targeted by a systematic identification of standardization potentials (design principle 2) and IT-use for adequate process activities (design principles 3 and 6). Finally, the continuous improvement process (design principle 7) aims to meet the challenge of efficient BLS delivery (2) as well as successful use of IT (3) in order to enable provider-specific learning and improvement of BLS design.

5 Discussion and Outlook

To outline the contribution of the paper at hand, let us describe it with respect to the three challenges which were identified at the beginning of the paper (Table 3).

Overall, the presented design principles incorporate specifications for the time-efficient and successful (in terms of learning success) design of blended learning services. First, we provided design guidance for systematic participant integration within BLS-scenarios by identifying and constantly evaluating the participants' learning goals in order to evaluate the learning progress and enable the trainer to react to challenges on short notice. Additionally, we provided design information on a systematic process evaluation during the BLS-process, again to enable the trainer to react to participants reactions on a short notice. Therefore, we addressed lacking design theory on systematic participant integration as mentioned, e.g., by Gupta and Bostrom (2009). Furthermore, we addressed the necessity of the use of efficiency challenges within BLS-scenarios by the provision of design theory for segmentation, standardization and systematic IT-support. The design theory incorporated the specific characteristics of BLS as requested in the literature. More precisely, we are the first to expand the knowledge based on a systematic BLS design by extending existing results to include efficient service process design which considers the specific characteristics of BLS as demanded in the literature (Fließ and Kleinaltenkamp 2004; Cuthbert 1996; Ladhari 2009; McLaughlin and Coffey 1990).

Last, we addressed the challenge of the lacking use of IT-potentials by providing design guidance as to the degree to which IT-potentials should be used, focusing on the newly identified parameter interaction needs of the participants (design principle 6). Thereby, we contributed to the literature in terms of the existing confusion on the use of IT within varying learning scenarios and varying

Table 6 Design principles for efficient blended learning service processes

No. and name	1. Segmentation of the BLS delivery process
Addressed challenge(s)	Participant integration, use of IT-potentials, efficiency challenges
Goal	This principle supports different stakeholders in obtaining a common understanding of BLS processes and improvement potentials
Input	Verbal description of existing or planned blended learning service processes
Description (short)	Supports various stakeholders within BLS in order to collaboratively design and deliver BLS. It incorporates BLS specific process dimensions for adequate visualization of BLS processes: 1. Process phases (pre-, during and post-training) 2. Learning channel (e-learning vs. traditional learning) 3. Actors (learner, learner's company, trainer, and training provider) 4. Activities (support vs. learning activities)
Output	BPMN-based representation of BLS processes divided into learning and support activities, with respect to various actors, learning channels, and process phases (e.g., Fig. 2)
No. and name	**2. Standardizing the BLS delivery process**
Addressed challenge(s)	Efficiency challenges
Goal	This principle aims at the time-efficient delivery of BLS by identifying standardization potentials in order to reduce BLS providers' course and support time
Input	Visualized representation of BLS processes, divided into activities, actors, and process phases
Description (short)	Learning and support activities are classified with respect to their standardization potential, i.e.: 1. Recurring events 2. Homogenous inputs
Output	Identified activities with a high standardization potential in accordance with the standardization criteria
No. and name	**3. Systematic IT-support within the BLS process delivery**
Addressed challenge(s)	Efficiency challenges
Goal	This principle aims to identify potentials for a fully IT-based automation of activities to decrease provider effort, i.e., the amount of time needed for BLS delivery
Input	Visualized representation of BLS processes, divided into activities, actors and two delivery channels (traditional delivery and IT-based delivery)
Description (short)	In contrast to design principle 2, this design principle focuses on fully automated activities, which entirely exclude human interaction. Systematic IT-support within BLS requires a homogenous, learning-goal oriented interface design which provides to homogenous application of learning methods per learning goal, homogenous appearance within e-learning units regarding to a specific learning goal, homogenous interaction support, homogenous duration of e-learning units with regard to a specific learning goal in order to establish familiarity with the learning concept
Output	Identified activities which can be completely transferred into the IT-delivery channel with respect to the criteria provided by this principle

participant characteristics (Gupta and Bostrom 2009; Colquitt et al. 2000).

To sum up, we incorporated findings from theory and practice, in order to design BLS in a more time-efficient way and to increase its learning success.

In analogy to Hevner et al. (2004), the theoretical contribution comprises the representation of a real world problem, i.e., design principles for a productive BLS delivery in the context of software training, thereby enabling the exploration of the effects of design decisions and changes in the real world in order to efficiently deliver BLS. According to Gregor (2006), this is a theoretical contribution of the type "design and action". It contributes to the scientific body of knowledge by helping to overcome the challenges identified in the introduction by insights gained within several case studies which support claims

Table 7 Design principles for successful blended learning services

No. and name	4. Identification of participant expectations and characteristics
Addressed challenge(s)	Participant integration
Goal	The principle identifies the optimal fit between participant expectations and course design as well as an optimal learning group composition
Input	Participant and customer expectations and characteristics
Description (short)	The design principle specifies that information about the customer company and the learner should be recorded in a structured data collection process. Standardized and non-standardized information were identified to be of major importance for the BLS provision process. First, characteristics of the customer company have to be considered, i.e.: 1. Customer technology readiness 2. Corporate culture 3. Judicial requirements Second, the participants' characteristics and expectations have to be identified: 1. Participants' motivation 2. Technology readiness 3. Self-regulatory learning capabilities 4. Prior knowledge 5. Perceived company support 6. Participant expectation Based on this information, the BLS process has to be designed. Further information can be found in Appendix A and C
Output	Structured and systematized information about customer characteristics and participantś expectations and characteristics which determine the success of BLS
No. and name	**5. Learning goal management**
Addressed challenge(s)	Participant integration
Goal	This principle fosters transparency regarding learning goals and the degree of its attainment.
Input	The individual, work-specific learning goals of the participants
Description (short)	The principle specifies stakeholders, which should be integrated into the learning identification process: 1. Customer 2. Supervisor 3. Participant Moreover, a process comprising intervention points before, during and after the training is included in order to evaluate the degree of individual learning goal achievement. The visualized process can be found in Appendix B
Output	A participant-specific set of learning goals which is known (e.g., to trainer and BLS designers) before the training begins and is constantly evaluated during and after the training
No. and name	**6. Systematic interaction support within BLS scenarios**
Addressed Challenge(s)	Use of IT-potentials, efficiency challenges
Goal	This principle identifies IT-potentials within the learning process under consideration of interactive needs of the participants
Input	Participant characteristics and corresponding needs for interaction
Description (short)	Our research indicates that e-learning, i.e., fully automated learning, can be applied to a wide variety of learning scenarios. Nevertheless, the varying success observed in theory and practice indicates that certain determinants of BLS success should be considered in order to find an optimal degree of interaction within BLS scenarios. Interaction describes the degree of collaborative learning and feedback between learners as well as between learners and the trainer. We identified two major determinants: (1) learning goal complexity, and (2) learner appropriation. This principle differentiates between a low and a high learner appropriation (defining technology readiness, self-regulatory learning and motivation). Based on these characteristics, interaction needs are derived in accordance with learning goal complexity
Output	Intervention points for e-learning with respect to participant characteristics and corresponding interactions needs

Table 7 continued

No. and name	7. Establishing a continuous improvement process for BLS
Addressed Challenge(s)	Use of IT-potentials, participant integration
Goal	This design principle aims to find specific learning contents required by a company by implementing a systematic data collection process before, during and after BLS delivery
Input	A set of determinants and success factors of BLS process quality
Description (short)	In order to achieve a holistic process evaluation, our research results show that a model for the evaluation of BLS quality should be applied which comprises two input dimensions, namely learner predisposition and provider characteristics. Moreover, a BLS process perspective should be included in dimensions such as process transparency, learning group characteristics, interaction, IT process support, quality of exercises, and the overall fit between learner expectations and the actual BLS. Please find the model explained in detail in Appendix C
Output	A dataset for the evaluation and continuous improvement of BLS in a specific BLS setting for a specific target group

Table 8 Summary of the ADR process in the project

Stages and principles		Artifact
Stage 1: Problem formulation		
Principle 1: Practice-inspired research	Research was driven by the providers' need for guidance regarding BLS design ensuring high learning success and time-efficient delivery	Recognition: Providers suffer from a lack of guidance on how to design BLS ensuring high learning success and time-efficient delivery
Principle 2: Theory-ingrained artifact	We built on existing theory on service delivery in general and BLS provision in particular as well as antecedents of learning success	
Stage 2: BIE		
Principle 3: Reciprocal shaping	The fact that we had multiple organizational partners in the project was an ongoing problem, due to organization-specific needs. However, this circumstance also fostered the dialog between the organizations and fostered generalizability of the results from the beginning	Design principles v1: A first set of seven design principles addressing insights from theory as well as practitioners needs Design principles v2: Refined set of seven design principles also incorporating the expertise and experience of trainers as well as participants
Principle 4: Mutually influential roles	The ADR team included researchers and practitioners in order to include theoretical and practical perspectives. The team was led by the first author of the paper	
Principle 5: Authentic and concurrent evaluation	The design principles were evaluated multiple times including the ADR team, as well as trainers and participants	
Stage 3: Reflection and learning		
Principle 6: Guided emergence	The ensemble nature of the design principles was recognized. Based on the experience in the field, initial design principles had to be refined or even dropped	Emerged version and realization: Iterative improvement of the design principles
Stage 4: Formalization of learning		
Principle 7: Generalized outcomes	A set of design principles for BLS provision was developed, based on our collaboration with software training providers	Set of seven design principles for BLS ensuring high learning success and time-efficient delivery

that the developed design principles are effective. More precisely, our design principles make an "improvement" contribution, since they are new solutions for known problems. Furthermore, our design principles are a nascent design theory, since they provide generalizable insights that can be applied to various kinds of BLS (Gregor and Hevner 2013). Last but not least, we contribute to practice by the provision of knowledge which serves to systematically increase productivity within BLS, considering both efficiency- and effectiveness-related design principles.

To ensure the quality of our design principles, we followed Sein et al.'s (2011) principles of good action design research (Table 8).

Although we could ensure a high quality of our research approach, the article has its limitations, which at the same

time, reflect areas for future research. In the application phase, we conducted expert interviews, solely focusing on experts with experience in a specific BLS domain – namely software trainings. We are aware that according to the domain and the corresponding target group, different results and measures could have been derived. Therefore, future research should investigate whether our design principles are valid in other BLS domain or whether adaptations need to be made or even additional design principles need to be developed. Furthermore, we used qualitative research methods without defining and quantitatively showing the effectiveness of our principles. Consequently, future research should conduct a quantitative evaluation of the design principles in order to further enhance the internal validity of our results, and to further prove their effectiveness. Furthermore, it needs to be understood that this research can only be the beginning on derivation of a comprehensive theoretical foundation for a field which offers a variety of potential further research areas. E.g., the perspective on learning success could be extended in accordance with Kirkpatrick and Kirkpatrick (2005), therefore ensuring a high practical relevance for the field of vocational training. Furthermore, new technological potentials, e.g., virtual and augmented reality approaches require an extension and further examination of the derived design theory. Moreover, additional dimensions of design and evaluation should be considered, such as the inclusion of other stakeholders and more detailed outcome examination (e.g., Greller and Drachsler 2012).

References

Arbaugh JB (2001) How instructor immediacy behaviors affect student satisfaction and learning in web-based courses. Bus Comm Q 64(4):42–54. doi:10.1177/108056990106400405

Arthur WJ, Bennett WJ, Edens PS, Bell ST (2003) Effectiveness of training in organizations: a meta-analysis of design and evaluation features. J Appl Psychol 88(2):234

Bitzer S, Klein M, Schumann M (2011) Approaches to improve teachers' use of groupware. Knowl Manag E Learn 3(2):271–289

Bitzer P, Soellner M, Leimeister JM (2013) Evaluating the quality of technology-mediated learning services. In: International conference on information systems, Milano

Colquitt JA, LePine JA, Noe RA (2000) Toward an integrative theory of training motivation: a meta-analytic path analysis of 20 years of research. J Appl Psychol 85(5):678–707

Cuthbert PF (1996) Managing service quality in HE: is SERVQUAL the answer? Part 1. Manag Serv Qual Int J 6(2):11–16

Delone WH (2003) The DeLone and McLean model of information systems success: a ten-year update. J Manag Inf Syst 19(4):9–30

Evans C, Gibbons NJ (2007) The interactivity effect in multimedia learning. Comput Educ 49(4):1147–1160

Fitzsimmons JA, Fitzsimmons MJ (2011) Service management – operations, strategy, information technology, 7th edn. McGraw-Hill, New York

Fließ S, Kleinaltenkamp M (2004) Blueprinting the service company: managing service processes efficiently. J Bus Res 57(4):392–404

Frost FA, Kumar M (2000) INTSERVQUAL – An internal adaptation of the GAP model in a large service organisation. J Serv Mark 14(5):358–377

Garrison DR, Kanuka H (2004) Blended learning: uncovering its transformative potential in higher education. Internet High Educ 7(2):95–105

Gartner (2012a) ERP Training Best Practices. Worldwide

Gartner (2012b) Forecast: Enterprise software markets, worldwide, 2011–2016, 2q12 update

Graham CR (2006) Blended learning systems – Definition, current trends, and future directions. In: Bonk CJ, Graham CR (eds) The handbook of blended learning: global perspectives, local designs, Chapter 1.1. Pfeiffer, San Francisco

Gregor S (2006) The nature of theory in information systems. MIS Q 30(3):611–642

Gregor S, Hevner AR (2013) Positioning and presenting design science research for maximum impact. Manag Inf Syst Q 37(2):337–355

Gregor S, Jones D (2007) The anatomy of a design theory. J Assoc Inf Syst 8(5):312–335

Greller W, Drachsler H (2012) Translating learning into numbers: a generic framework for learning analytics. Educ Technol Soc 15(3):42–57

Grönroos C, Ojasalo K (2004) Service productivity: towards a conceptualization of the transformation of inputs into economic results in services. J Bus Res 57(4):414–423. doi:10.1016/s0148-2963(02)00275-8

Grönroos C, Voima P (2013) Critical service logic: making sense of value creation and co-creation. J Acad Market Sci 41(2):133–150

Gupta S, Bostrom RP (2009) Technology-mediated learning: a comprehensive theoretical model. J Assoc Inf Syst 10(9):686–714

Gupta S, Bostrom RP, Huber M (2010) End-user training methods: what we know, need to know. ACM SIGMIS Database 41(4):9–39

Hevner AR, March ST, Park J, Ram S (2004) Design science in information systems research. MIS Q 28(1):75–105

Hilton T, Hughes T, Chalcraft D (2012) Service co-creation and value realisation. J Market Manag 28(13–14):1504–1519

Kim J, Kwon Y, Cho D (2011) Investigating factors that influence social presence and learning outcomes in distance higher education. Comput Educ 57(2):1512–1520

Kirkpatrick D, Kirkpatrick J (2005) Transferring learning to behavior: using the four levels to improve performance. Berrett-Koehler, San Francisco

Kleinaltenkamp M (2013) Nutzungsprozesse – Die vernachlässigte Seite der Wertschöpfung. In: Schmitz G (ed) Theorie und Praxis des Dienstleistungsmarketing. Springer, Berlin, pp 1–25

Ladhari R (2009) A review of twenty years of SERVQUAL research. Int J Qual Serv Sci 1(2):172–198

Lehtinen E, Hakkarainen K, Lipponen L, Rahikainen M, Muukkonen H (1999) Computer supported collaborative learning: a review. The JHGI Giesbers reports on education 10

Leimeister JM (2012) Dienstleistungsengineering und -management. Springer Gabler, Berlin

Leimeister JM (2015) Einführung in die Wirtschaftsinformatik. Springer, Berlin

Lewis RC, Booms BH (1983) The marketing aspects of service quality. Emerg Perspect Servic Market 65(4):99–107

Lin HF (2007) Measuring online learning systems success: applying the updated DeLone and McLean model. CyberPsychol Behav 10(6):817–820

Lindgren R, Henfridsson O, Schultze U (2004) Design principles for competence management systems: a synthesis of an action research study. MIS Q 28(3):435–472

McLaughlin CP, Coffey S (1990) Measuring productivity in services. Int J Serv Ind Manag 1(1):46–64

Melville N, Kraemer K, Gurbaxani V (2004) Review: information technology and organizational performance: An integrative model of IT business value. MIS Q 28(2):283–322

Menschner P, Peters C, Leimeister JM (2011) Engineering knowledge-intense, person-oriented services – A state of the art analysis. In: 19th European conference on information systems, Helsinki

Ozkan S, Koseler R (2009) Multi-dimensional students' evaluation of e-learning systems in the higher education context: an empirical investigation. Comput Educ 53(4):1285–1296. doi:10.1016/j.compedu.2009.06.011

Parasuraman A, Zeithaml VA, Berry LL (1988) Servqual. J Retail 64(1):12–37

Patton MQ (2005) Qualitative research. Wiley, New York

Petter S, DeLone W, McLean ER (2012) The past, present, and future of "IS success". J Assoc Inf Syst 13(5):341–362

Pintrich PR, De Groot EV (1990) Motivational and self-regulated learning components of classroom academic performance. J Educ Psychol 82(1):33

Rasch T, Schnotz W (2009) Interactive and non-interactive pictures in multimedia learning environments: effects on learning outcomes and learning efficiency. Learn Instr 19(5):411–422

Ray G, Muhanna WA, Barney JB (2005) Information technology and the performance of the customer service process: a resource-based analysis. MIS Q 29(4):625–652. doi:10.2307/25148703

Romme AGL, Endenburg G (2006) Construction principles and design rules in the case of circular design. Organ Sci 17(2):287–297

Sein M, Henfridsson O, Purao S, Rossi M, Lindgren R (2011) Action design research. MIS Q 35(1):37–56

Seyda S, Werner D (2012) IW-Weiterbildungserhebung 2011. Vierteljahresschrift zur empirischen Wirtschaftsforschung, Köln

Sims R (2003) Promises of interactivity: aligning learner perceptions and expectations with strategies for flexible and online learning. Distance Educ 24(1):87–103

Smith SM, Woody PC (2000) Interactive effect of multimedia instruction and learning styles. Teach Psychol 27(3):220–223

Thurmond V, Wambach K (2004) Understanding interactions in distance education: a review of the literature. Int J Instr Technol Distance Learn 1(1)

van Aken JE (2004) Management research based on the paradigm of the design sciences: the quest for field-tested and grounded technological rules. J Manag Stud 41(2):219–246

Vollmar M (2013) Berufliche Weiterbildung in Unternehmen 2010. Wirtschaft und Statistik, H 4:276–287

Wegener R, Menschner P, Leimeister JM (2012) Design and evaluation of a didactical service blueprinting method for large scale lectures. In: International conference on information systems, Orlando

Weiss JW, Thorogood A, Clark KD (2007) Three IT-business alignment profiles: technical resource, business enabler, and strategic weapon. Comm Assoc Inf Syst 18(1):33

Wu J-H, Tennyson RD, Hsia T-L (2010) A study of student satisfaction in a blended e-learning system environment. Comput Educ 55(1):155–164

Zeithaml VA, Parasuraman A, Berry LL (1985) Problems and strategies in services marketing. J Mark 49(2):33–46

Zeithaml VA, Berry LL, Parasuraman A (1988) Communication and control processes in the delivery of service quality. J Mark 52(2):35–48