TOWARDS A PRODUCTIVITY MEASUREMENT MODEL FOR TECHNOLOGY- MEDIATED LEARNING SERVICES

Bitzer, Philipp, Kassel University, Pfannkuchstr.1, 34121 Kassel, Germany, bitzer@uni-kassel.de

Söllner, Michael, Kassel University, Pfannkuchstr.1, 34121 Kassel, Germany, soellner@uni-kassel.de

Abstract

Technology-mediated Learning Services (TMLS) increasingly play an important role in the vocational training service industry. However, TMLS success is assessed inconsistently within literature. To assess TMLS success, this study focuses on a TMLS productivity perspective, i.e. a systematic inspection of the input, process and output perspective. Consequently, we will develop a TMLS productivity measurement model to assess TMLS from a holistic perspective. In this paper, we present the recent status, comprising TMLS constructs from an input-, throughput and output perspective. They were derived and developed from (1) literature, from an (2) expert workshop and from a (3) q-sort-pre-test. To bridge the existing research gap in TMLS assessment, we thereby develop a productivity measurement model that seeks to measure TMLS productivity from a holistic perspective. It contains tangible as well as intangible TMLS factors, both from a customer and a service provider perspective. We propose to evaluate the model by means of a factor analysis to enrich TMLS research in terms of systematic evaluation and assessment. Furthermore, we provide practitioners with a tool to measure the productivity of their TMLS using both tangible and intangible indicators.

Keywords: Technology-mediated learning services, training success, service productivity

1 Introduction

The majority of German companies, more than 90%, use technology mediated learning services (TMLS) (MBB, 2011), which lead to more effective, more individual, cheaper ways of learning (Arthur et al., 2003, Gupta et al., 2008). TMLS have many variations and are often a combination of the following learning modes: web-based or computer-based, asynchronous or synchronous, instructor led or self-paced, individual-based or team-based (Gupta and Bostrom, 2009). The goal of TMLS is to integrate the strengths of synchronous (face-to-face) and asynchronous (IT-based) learning activities (Garrison and Kanuka, 2004).

In spite of their importance, TMLS providers incite fundamental challenges. The use of IT-support in learning scenarios leads to a higher management complexity for training providers and trainers, which results in an inconclusive database for TMLS provision efforts and learning outcomes (Alavi and Leidner, 2001, Gupta et al., 2008, Gupta and Bostrom, 2009). Many trainers question the learning outcomes, because TMLS require more self-discipline on the part of students (Allen and Seaman, 2006). Although it does not require “same-time, same-place” learning, it might not effectively facilitate “deep learning” due to the decreasing influence of the trainer, particularly when students lack intrinsic motivation to acquire knowledge (Martens et al., 2007). From a service perspective, the participants’ success and satisfaction is especially important for TMLS providers since it influences loyalty and the willingness to recommend the provider (Zeithaml, 1996). Summing up, training providers face the challenge of a “TMLS black box”, not knowing how to design their TMLS in a way ensuring the effective and efficient provision.

A first step towards solving the challenge to design effective and efficient TMLS is being able to measure TMLS productivity. Current research lacks of reliable insights on this issue, since many studies used input-output research designs that ignore critical aspects of the learning method and process (Gupta and Bostrom, 2009). Although, e.g.; the ServQual approach (Parasuraman et al., 1985) is suitable when it comes to the quality evaluation of services, it is inadequate in terms of the consideration of the evaluation of input- process and output elements, especially ignoring requirements in the evaluation of TMLS (Gupta and Bostrom, 2009). Consequently, the research done so far is limited in terms of supporting TMLS providers to manage the use of technology in TMLS and to systematically design productive TMLS (Bitzer et al., 2013, Alavi and Leidner, 2001).

Hence, the objective of the study is to develop a productivity measurement model that enables training providers to assess TMLS productivity and derive measures to increase their productivity.

Addressing the above mentioned limitations of the extant research, the research question framing this paper is:

- What are relevant input, throughput and output dimensions for measuring TMLS from a productivity perspective?

To achieve our desired goal, the remainder of this paper is structured as follows. We present the related work regarding research on service productivity and TMLS productivity. Afterwards, we explain our research method and present our results. This research-in-progress paper closes with expected implications and the next steps.

2 Conceptualization of Service Productivity in TMLS

2.1 Service Productivity

The term productivity is a well-known expression in business research. It is defined as the ratio between outputs and inputs (Prokopenko, 1992). In other words, productivity is a concept that reflects the degree of effectiveness of processes in the course of which input resources are transformed into economic results for the producing firm and value for its customers. This formula has to be modified for services as they have various characteristics which distinguish them from classical products (Harmon et al., 2006). Services are time-perishable, intangible experiences rendered for a recipient, who pulls double duty as both customer and co-producer (Fitzsimmons and Fitzsimmons, 2011). Hence, customers usually influence the process and the result of a service. As their individual perception affects the process and the success of services, a qualitative perspective on services is necessary.

Consequently, productivity measurement procedures of manufacturing industries are inadequate for service companies (McLaughlin and Coffey, 1990). Moreover, the use of single productivity ratios for a productivity assessment is not sufficient for complex services since ratios only indicate for a limited aspect of a service without having the flexibility which is necessary for complex services (McLaughlin and Coffey, 1990). Therefore, existing productivity measurement approaches are not sufficient for the TMLS productivity evaluation, e.g. DEA.

The challenge of the evaluation of service productivity is to identify the relevant input, process, and output factors to evaluate efficiency and effectiveness (Grönroos and Ojasalo, 2004).

To increase visibility of TMLS success and productivity, a productivity measurement model helps to identify relevant input, process and output variables which have to be considered for the TMLS assessment. In general, the productivity evaluation of services requires the consideration of various special characteristics:

- Services have a tangible as well as an intangible component which makes the consideration of both components necessary (Zeithaml et al., 1985, Leimeister, 2012).
- Equal measuring units must be compared to obtain a productivity assessment. Depending on the chosen indicators, different ways of productivity assessment can be conducted. Additionally, the productivity has to be compared to previous periods or benchmarks (Johnston and Jones, 2004).
- Furthermore, if a service is provided in interaction with service provider and customer, like TMLS, (called customer encounter), service provider inputs as well as customer inputs have to be considered (Grönroos and Ojasalo, 2004)
- From a TMLS perspective, the customer perspective can be divided into learner (TMLS participant) and into the learners company (TMLS client) (Bitzer et al., 2010)

To sum up, the identification of indicators addressing the different facets of service productivity is essential. From a service productivity perspective, the identification of tangible input factors of TMLS seems to be unproblematic. Labor costs, time, technology, systems and information can be considered as classical input factors (Grönroos and Ojasalo, 2004), which can be easily accounted for. Moreover, the consideration of intangible, qualitative indicators for these and additional input and output factors from a TMLS perspective is necessary, to evaluate productivity for various dimensions.

Thereby, the consideration of the provider and customers has to be ensured, both with tangible and intangible inputs and outputs.

2.2 TMLS Productivity

Regarding TMLS productivity, a number of relevant factors can be identified in the literature. One of the main influencing factors on TMLS success is the lecturer's performance e.g. (Wang et al., 2007, Arbaugh, 2001). Another frequently examined input is the learners' characteristics. Frequently mentioned learner characteristics are for example cognition (Johnson et al., 2009), motivation (Bolliger et al., 2010) and other individual influencing factors, such as gender, age or education (Friday et al., 2006).

Moreover, the process perspective was taken into consideration. Gupta and Bostrom (2009) highlight the importance of understanding and investigating TMLS process. Most research designs focused on input- and output factors but neglected critical aspects of the learning method and the learning process (Gupta and Bostrom, 2009).

From a process perspective interaction was a major topic in the studies (interaction among learners and between learners and lecturers as well as between learners and IT) as an object of influence in the learning process, e.g. (Hansen, 2008).

Currently, the main focus is on service quality and learner characteristics like motivation, cognition and interaction as investigated objects in the learning process. From a productivity point of view this is surprising since time is highly relevant from a productivity perspective (Sampson and Froehle, 2006). Considering the output factors of educational services the main focus is placed on the learning outcome and less on reaction (achievement of desired learning success) or behaviour (application of knowledge).

To sum up, variables like time or costs have hardly received attention in most studies in that research area. Especially transfer efficiency, in terms of a faster and efficient way of working, and effects on retention seems to be highly relevant for measuring the productivity of TMLS. User satisfaction, even with use of IT systems and system usability, is a pivotal factor for the IS success (Wang et al., 2007); but the discussion in recent relevant literature is rare and not substantial enough for the measurement of TMLS productivity.

3 Research Methodology

We choose a research design based on group interviews, an approach which is recommended, e.g., by Kitzinger and Barbour (1999) to explore a specific set of issues such as people's views and knowledge. The qualitative research results are the exploratory groundwork to add up on literature findings (Bitzer et al., 2012) for the quantitative evaluation and improvement (Miles and Huberman, 1994). This results were additionally pre-tested by means of the q-sort-method (Nahm et al., 2002).

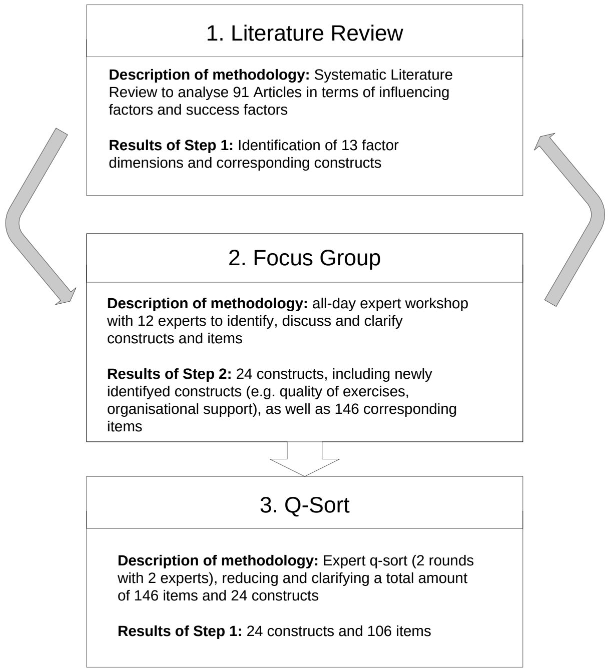

Figure 1: Visualisation of the research approach

First, we had a subject-matter expert focus group with twelve subject-matter experts. The participants were employees of vocational education service providers with a minimum of eight years of working experience. Following the focus-group design approach by Frey and Fontana (1991) we designed the focus group taking into account data-related design requirements, interviewer, and group characteristics. Falling back on the results of the literature review presented before, a conceptual productivity measurement model was derived, including a set of possible items and categories.

Subsequently, we applied the Q-sort-method to ensure reliability and construct validity of the questionnaire items (Nahm et al., 2002). Thereby, four judges with more than 4 years of experience in TMLS were asked to sort every item to the identified categories, in order to improve the items and categories comprehensibility and clearness. This procedure was applied since Cohen's Kappa, a measure of agreement, exceeded 0.76, representing an excellent degree of agreement beyond chance (Landis and Koch, 1977) and the total hit ratio was used to identify potential problem construct areas (Moore and Benbasat, 1991).

4 The TMLS Productivity Measurement Model

Based on the literature review, the expert workshop and the q-sort-pre-test the following productivity measurement model was developed (see Figure 2).

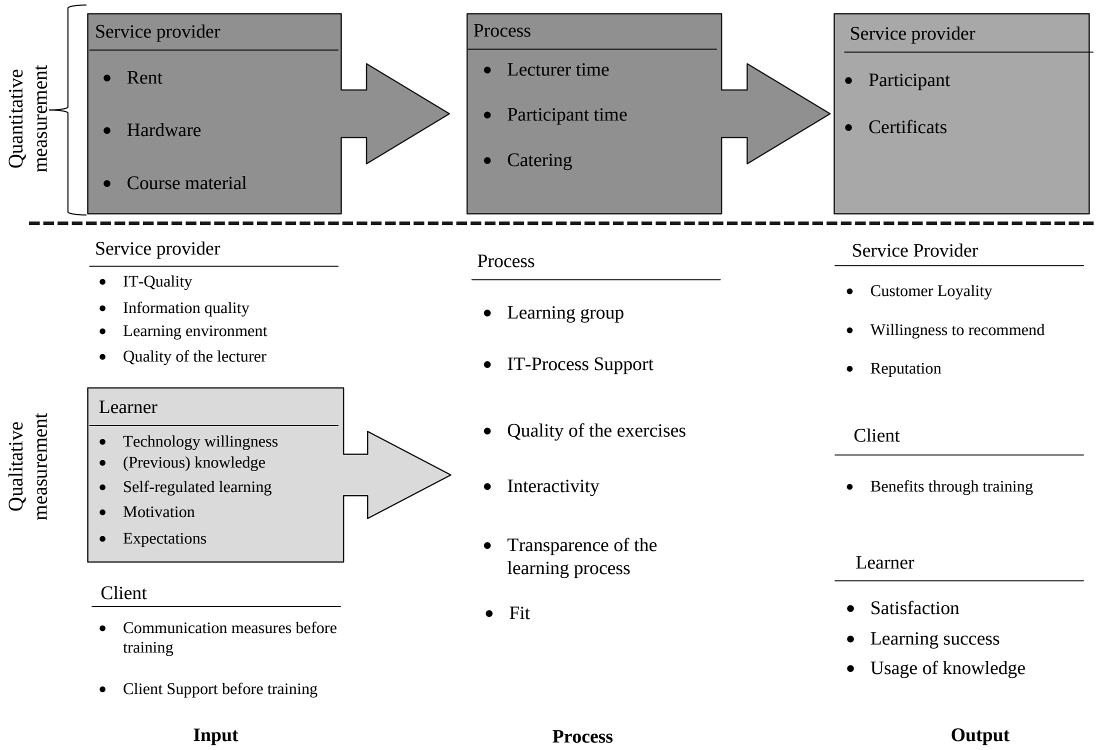

Figure 2. Productivity Measurement Model for TMLS

The pre-tested productivity measurement model consists of quantitative and qualitative parts. The quantitative parts, e.g. rent, lecturer time or certificats, are measured as key performance indicators which were identified during the workshop. The qualitative parts are measured by means of the questionnaire.Moreover it is seperated between service provider and customer perspective in terms of input and output. Additionally, process is considered as the assessment of the interaction between service provider and customer.

The service provider inputs comprise the trainer quality, comprising aspects such as commitment, his interpersonal skills, his professional competence and his didactical competence. Moreover, the learning enivorenment is considered, comprising aspects such as the quality of the room and the clothing of the employees. The quality of the IT-infrastructure and the quality of the provided information, i.e. learning materials offline and online were added.

On the customer side learner characteristics are considered. The learners company, referred to as client, is assessed in terms of communication measures before training about the internal importance of the training and the clients support before the training in terms of voluntariness and financial support.

The process perspective comprises six dimensions. (1) Characteristics of the learning group, i.e. the quality of the groups' personal and didactical fit. Furthermore, (2) the IT-process-support is considered, assessing the communication support and the process structuring through IT. Additionally, (3) quality of the exercise is included as well as (4) tranparence of the training process, i.e. the traceability of the course procedure and corresponding learning goals. Another construct dimension is (5) interactivity which is considered from the lecturer and the learner perspective. Last, (6) the overall fit of the course design for the participants characteristics and expectations is considered.

Finally, the output is seperated between service provider and customer. For the service provider, a successful training results in revenues and profit margin. Moreover, he receives intangible benefits, such as customer loyalty, customer willingness to recommend and reputation gains. On the customer side, the learners' output can be assessed in terms of his satisfaction, the learning success and the application of his knowledge within the company. This leads to clients financial results, i.e. the participation costs for the learners and the financial effects through the new knowledge of the learners' and the application of the knowledge, e.g. faster order procedure.

5 Next Steps and Expected Implications

Next, in accordance with Straub (Straub, 1989) the productivity measurement model is tested by means of a factor analysis for the productivity evaluation of TMLS in the field of software trainings.

Thereby, we aim to address TMLS productivity from a holistic vantage point by uniting the various perspectives on TMLS. By combining research conducted in IS, psychology, pedagogy and business, we developed a TMLS productivity measurement model. Consequently, existing shortcomings in the evaluation of TMLS could be remedied by the consideration of the learning process and a systematic evaluation of TMLS productivity (Gupta and Bostrom, 2009).

Finally, a productivity measurement model will be developed, which will contribute to theory by providing a validated model, which helps to systematically examin causalties within TMLS.

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