TOWARDS A HOLISTIC UNDERSTANDING OF TECHNOLOGY MEDIATED LEARNING SERVICES – A STATE-OF-THE-ART ANALYSIS

Complete Research

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Abstract

The evaluation of Technology-Mediated Learning Services (TMLS) has been a major topic for both researchers and practitioners. Nevertheless, inconsistent research results can be observed within TMLS research, leading to the question which determinants and output variables should be used for TMLS evaluation. Therefore, this study examined 85 articles published in peer-reviewed outlets on determinants on learning success and satisfaction within TMLS scenarios. The research was collected from various disciplines, such as IS, psychology, education and business. Thereby, this study systematically examines variables from perspectives such as learner, TMLS provider, process and result. The current state of research in the field of TMLS is presented, focusing on TMLS specific variables which have been researched for (1) at least three times, classified as experimental variables providing research potentials, and (2) at least five times, classified as variables which have been constantly examined. We identified a set of 31 determinants which have a significant or strong significant effect on satisfaction and learning success as well as 34 variables which showed inconsistent effects or provide research potentials. By this means, we identified a significant foundation for TMLS evaluation, as well as inconsistent or not yet extensively examined research results, i.e. future research potentials.

Keywords: Technology-mediated learning services, blended learning, e-learning, evaluation, holistic

1   Introduction

Arthur et al. (2003) identified the influence of technology in all learning scenarios as a major trend in education. They are referred to as technology-mediated learning services (TMLS). The aim of TMLS is to integrate the strengths of synchronous (face-to-face) and asynchronous (IT-based) learning activities (Garrison and Kanuka, 2004). TMLS is the most important form of vocational training, and will continue to gain more importance through more individual and resource-preserving ways of learning, e.g., computer-based learning from home, or IT-support within the classroom (Michel, 2011). Furthermore, TMLS will further the development of innovative, more individual, more resource-preserving ways of learning, e.g., micro-learning at the workplace, or location-independent cloud-based learning (MBB, 2011, Leimeister, 2012). According to Wainhouse Research (2007), the global market value of TMLS increased from $802.8 million in 2007 to $1.5 billion in 2011 for a compounded annual growth rate of 13%.

TMLS have many variations, and often consist of 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). Despite its many advantages, such as reduced dropout rates (López-Pérez *et al.*, 2011), or improved student achievements (Alonso *et al.*, 2011, López-Pérez *et al.*, 2011), TMLS pose several fundamental challenges. First and foremost, it still remains challenging for TMLS researchers to fully understand the effects of synchronous and asynchronous learning elements in specific TMLS learning scenarios and on participants (Gupta and Bostrom, 2009, Gupta *et al.*, 2010). The variety and heterogeneity of research results lead to an inconclusive database regarding a systematic, effective, and efficient TMLS delivery, which fosters resource-saving aspects of IT-use with potential learning success gains (Lehtinen *et al.*, 1999, Gupta *et al.*, 2010, Bitzer *et al.*, 2013b). Consequently, without a holistic perspective on TMLS which considers relevant aspects of various dimensions, TMLS research provides little support for researchers and practitioners to face the increasing use of technology in TMLS, and still is not sufficient for dynamic development in practice (Alavi and Leidner, 2001, Sasidharan and Santhanam, 2006). A comprehensive view on TMLS which includes not only selected elements and its effects on the learning success, but also its relative meaning, can help to understand, and design TMLS.

To sum up, a research gap exists in terms of a comprehensive explanation causal relationships within TMLS scenarios, and for the derivation of general, transferable advice for the systematic design of TMLS scenarios (Alavi and Leidner, 2001).

In order to achieve an understanding of the formation of various dimensions of TMLS within various TMLS scenarios, TMLS research has to complete a major task; it must investigate how a comprehensive TMLS model can be conceptualized (Gupta and Bostrom, 2009).

As a result, the objective of the study is to collect constituent parts of TMLS identified within a systematic literature review. In particular, we aim to answer the following research questions:

- o Which constructs and components have to be included in a comprehensive TMLS evaluation?
- o How strong is the empirical evidence of the different factors of TMLS quality?

To achieve our desired aim, the remainder of this paper is structured as follows. First, we present a theoretical framework in order to identify relevant determinants of our dependent variables, i.e., learning success and satisfaction. Afterwards, we explain our selected research method, i.e., by means of a literature review. Subsequently, we present our results by presenting the identified indicators, our dependent variables and the relationships between them. Next, we elaborate our contribution to theory, the state of existing limitations, and the future research agenda, before, finally, coming to our conclusion.

2   Theoretical Background

Technology mediated learning services have been in the focus of research for decades. Thereby, a great variety of results were created, coming from disciplines such as psychology, education, business or information systems (Gupta *et al.*, 2010). Nevertheless, the results remain unclear and partly conflicting (Gupta *et al.*, 2010, Bitzer *et al.*, 2012, Bitzer *et al.*, 2013a). First and foremost, no dominating theory can be identified which provides a standardized, commonly accepted approach to evaluate TMLS. Evaluation approaches mostly rely on the specific focus of a particular discipline on the evaluation subject (Bitzer *et al.*, 2012).

Nevertheless, multi-dimensional perspectives on services are well-known throughout the literature. Thereby, three perspectives are commonly known to evaluate services, even in the case of TMLS evaluation: structure (Donabedian, 1980a, Broderick and Vachirapornpuk, 2002, Bitzer *et al.*, 2013a), process (Donabedian, 1980b, Grönroos, 1984, Broderick and Vachirapornpuk, 2002), and outcome (Donabedian, 1980a, Grönroos, 1984, Broderick and Vachirapornpuk, 2002). These dimensions describe the potentials a service provider provides (structure), the process, which is determined by the interaction between service participant and service provider (process), and the service results from a

customer's perspective (outcome). As mentioned before, during the service process, the integration of the customer into service delivery, and the consideration of the simultaneous production and consumption of services (uno-actu-principle) is necessary (Fitzsimmons and Fitzsimmons, 2006). Hence, the service characteristics and service results are significantly determined by the learners' structural potential, i.e., the learners' predisposition (in addition to the structural potential of the service provider), and his actions in the process. These individual differences in learners' predispositions play an especially important role for complex, person-oriented services (McLaughlin and Coffey, 1990, Menschner *et al.*, 2011). Therefore, a multi-dimensional evaluation approach is required to evaluate these services while taking the following dimensions into account (Donabedian, 1980a, Broderick and Vachirapornpuk, 2002, Fitzsimmons and Fitzsimmons, 2006, Bitzer *et al.*, 2013a).

Structural Perspective	Learner
	TMLS Provider

Process Perspective	Elements created by interaction between Learner and Provider

Results Perspective	Effects induced by the TMLS

Figure 1.   Research Framework for TMLS

These three dimensions (cp fig. 1) served as research framework for the classification of our results, providing a structure for the identification of existing findings from a holistic perspective in accordance with Gupta and Bostrom (2009).

3   Methodology

In order to review the current literature, our methodology follows the approach of Jeyaraj *et al.* (2006), which comprises the steps of finding, coding, validating, and analysing the quantitative empirical literature of TMLS.

3.1   Identification of literature

The identification of relevant research papers for our review follows the search process by vom Brocke *et al.* (2009), which includes the consideration of databases, keywords, backward and forward search, but also an on-going evaluation of the identified sources. Owing to the scope of the review, the disciplines considered in the review process were education, information systems (use of technology), psychology (acquisition and implementation of knowledge), and management (contribution to turnover by educational services). In consequence, the following five databases were used to cover the specific research disciplines, and provide access to peer-reviewed journals (Rowley and Slack, 2004), and renowned conferences (Webster and Watson, 2002): Ebsco, ScienceDirect, IEEE Xplore, AIS Digital Library, ERIC and ISI.

We researched contributions published between 2000 and 2013 (see Figure 2), considering both IS- and non-IS outlets in order to adequately address the blended character of TMLS (mixture between traditional and e-learning), and to collect results and research approaches from other disciplines, such as education, psychology and business. The following keywords were employed for searches:

• efficiency OR effectiveness OR evaluation OR controlling OR measure AND

• learning OR teaching OR training OR education AND

• success OR achievement

Additionally, we used NOT operators depending on the nature of the database. Terms like "medical," "public," "military," and "school" were excluded. On whole, we identified 3004 research papers as relevant for the analysis.

We analysed the preliminary findings of the review, in order to only obtain research papers that correspond to the goal of our study. This process included the consecutive examination of keywords, abstracts and full texts. Moreover, we conducted a backward (examination of references) and forward (examination of citations by using the "cited by" feature provided within several databases) search. Within this process, we eliminated all conceptual papers, papers not related to the topic of TMLS, and duplicate findings. After finishing, we studied all remaining research papers in search of authentic output factors of TMLS, and the key factors that influence TMLS. This resulted in a body of works, including 85 research papers which were (1) peer-reviewed in renowned research outlets (journals and academic conferences, see for detailed information the references section), (2) exclusively concerned with adult education, and (3) whose aim was the measurement of the aim attainment of corporate educational services. The included research papers of the literature review are listed in the reference section, and marked with an asterisk.
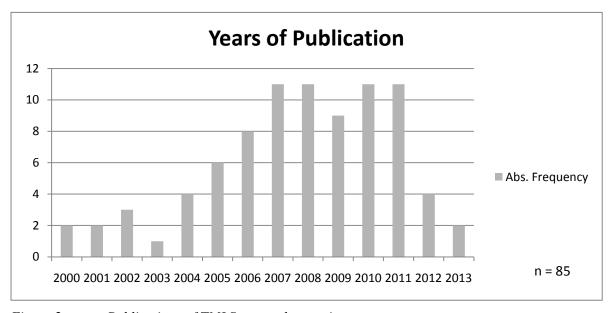

Figure 2.   Publications of TMLS research over time

3.2 Coding and Validation of the Literature Review Results

We aggregated the findings of all identified research papers by developing a list of master codes and definitions that describe the master codes. For this purpose, we identified 8 dependent variables and 245 independent variables. We examined this initial set of variables, and used them as the starting point for our list of master codes. In an iterative process, the variables of the papers were coded

multiple times to eliminate the redundancy of variables that differed among the identified research papers. Therefore, the first author coded the set of identified papers to identify the master codes. In a subsequent step, the second author checked the results of the master codes by examining both master codes and their respective definition, and, if necessary, added additional master codes. This procedure was repeated until the final set of master codes was established. Finally, the results were checked by the second author with respect to the consistency of the coding. This helped us to accumulate similar, and, therefore, redundant variables from different research papers that used different variable names for the same constructs.

3.3   Analysis of Findings and Codification

In order to synthesize the findings of the identified empirical research papers in a concise, meaningful and helpful manner, we counted the numbers of times relationships between independent and dependent variables were studied and, more importantly, the number of times these specific relationships were found to be significant. Both positive and negative relationships were considered, meaning also the number times a relationship was found to be insignificant. Using this information, we created three models that take determinants of (1) learning success and (2) learning satisfaction into account, as well as a (3) model that considers factors that influence the whole TMLS process, including learner and provider characteristics.

The codification scheme used for this process included three possible values for each analysed relationship: '+1', '0' and '-1'. In this process, we coded each significant positive relationship between an independent variable with a dependent variable. Vice versa, each negative relationship was coded with '-1'. The threshold for considering a significant relationship was $p < .05$. If a relationship was found to be insignificant, we assigned '0' as a value. Owing to the fact that we only examined quantitative studies, we had no tolerance while coding the different relationships. The first author coded all 422 relationships involving the two dependent (learning satisfaction and learning success) and 37 independent variables (Table 1). Afterwards, the second author reviewed all of the identified relationships. In a last step, we used our results of the codification to extract the influencing factors for two TMLS models. In order to be a considered influencing factor in these models, the factor must have already been well-utilized in research, and, therefore, had to have been tested several times. In accordance with Jeyaraj *et al.* (2006), we only took independent variables into account that were empirically tested 5 or more times in TMLS literature. In addition, only variables with consistent results were considered. This means that in at least 60 percent of the cases in which a specific relationship was studied the findings had to be consistent. In turn, variables with inconsistent findings were disregarded. However, experimental variables (considered less than 5 times and more than two times) and variables with inconsistent results (less than 60% of the evidence is positive and significant) were not completely disregarded. We included them to provide directions for future research.

4   Findings

We divided the body of empirical TMLS literature into three sections for reviewing. First, we focus on the findings of the dependent variables that reflect the results perspective of our proposed research framework. Second, we display the findings of independent variables that constitute TMLS quality, reflecting the structural and process perspective. Third, we create two comprehensive models, considering our proposed research framework, and the identified dependent and independent variables, in order to gain a holistic understanding of TMLS.

4.1 Findings on Dependent Variables and Independent Variables

The two major dependent variables that evolved from our review are learning satisfaction and learning success as output factors of TMLS. Therefore, they constitute the results perspective in our TMLS research framework. We define learning satisfaction as the perception of an individual of being able to achieve learning success and positive feelings about achieved learning outcomes in a TMLS setting (Keller, 1983). The learning success, or the learning outcomes achieved in TMLS are also connected to this definition. We subsequently define this as the knowledge gain a learner achieves in a TMLS (Bitzer *et al.*, 2013a).

In contrast to the above introduced dependent variables, we are now introducing the independent variables that constitute the structural and process perspective of TMLS. We found 245 independent variables in our TMLS literature review. By eliminating redundancies and experimental variables (cf. sections 3.1 and 3.2) we were able to reduce this number to 21 variables that are well researched, and an additional 16 experimental variables which represent areas for future research. The following table shows the remaining independent variables considered in our literature review, and their subsequent examination as key influencing factors of TMLS embedded in the structural and process dimension of our TMLS research framework.

4.2 Findings on Relationships Between Independent and Dependent Variables

In this section, we summarize major findings concerning the relationships we coded between independent and dependent variables (cf. section 3.3). These relationships were coded between the two dependent variables learning success and learning satisfaction and the 37 independent variables. In order to provide a comprehensive overview of the results regarding TMLS quality we encapsulated the results, and moved them to a higher unit of analysis. We did this by reporting specific determinants that are grouped into three broad categories with various sub-categories for each dependent variable. Although we might lose some precision regarding the specific determinants of TMLS quality, we gain a better understanding of how TMLS quality is achieved in practice.

Perspective	Category	Sub-Category	
Structural Perspective	Learners' Characteristics	-	Prior Experience with TMLS; Attitude towards TMLS; Computer Experience; Self-Efficacy; Learning Styles Learning Motivation; *Prior Knowledge* *Learning Orientation; Metacognition; Learning Engagement*
	Provider Input	Trainer Characteristics	Responsiveness; Fairness; Knowledge; Prior Experience; Trainer Characteristics; *Control Over Technology; Service Quality; Effective Facilitation*
		Information Quality	Information Quality; *Course Content; Structure; Up-to-date*
		System Quality	E-Learning Technology; System Quality; Perceived Ease of Use; Perceived Usefulness; Support; Availability; Reliability; *Course Design; Course and Program Flexibility; Media Variety*
Process Perspective	-	-	Interaction and Interactivity; Support, *Focus on Interaction; Ease of Interaction; Activity Design; Social Presence*

Table 1.   List of independent variables
*   Note: Variables highlighted in italics are experimental*

To facilitate the subsequent discussion after presenting our findings of our literature review, we created two models which comprised our two dependent variables for the holistic evaluation of TMLS quality: satisfaction and success. By extracting the best evidence from the identified independent variables we relied only on variables that were examined by researchers at least five times in order to

avoid relying on exploratory research (Jeyaraj *et al.*, 2006). However, we included these variables for the sake of completeness, but we do not discuss them in detail and focus on non-exploratory findings.

Furthermore, as previously stated we only considered independent variables in our analysis that exhibited consistent empirical evidence. We therefore relied on a threshold of at least 60 percent to ensure that the majority of evidence is consistent. However, we created a tiered legend, and indicated in our subsequent analysis how consistent the empirical evidence is. Therefore, we used a '(+)' if the evidence was consistent in 60 to 80 percent of the reviewed relationships. If a relationship provided more robust results, i.e., more than 80 percent of the empirical evidence was consistent, we used a '(++)' to indicate this particular relationship. If a relationship did not meet these thresholds we indicated this with a (0). For example, if a relationship was studied 6 times, and in just one case the relationship was not found to be significant, and the remaining evidence showed a significant positive relationship, we categorized this example relationship with a '(++)'.

4.2.1 Determinants of Learning Satisfaction

As stated in section 3.3, we created a model for each dependent variable and their relationships with several independent variables. The model for the dependent variable learning satisfaction is depicted in Figure 3. This figure is a model of the major determinants, and captures the independent variables that produced consistent results in our literature review and in addition experimental variables as well as variables with non-consistent results to facilitate the discussion of future TMLS research. The independent variables are organized in broader categories of independent variables. The categories are learner characteristics, process variables and provider input. The latter is also divided into the sub-categories system quality, information quality, and provider input. All categories are described in detail below regarding their influence on learning satisfaction in TMLS.
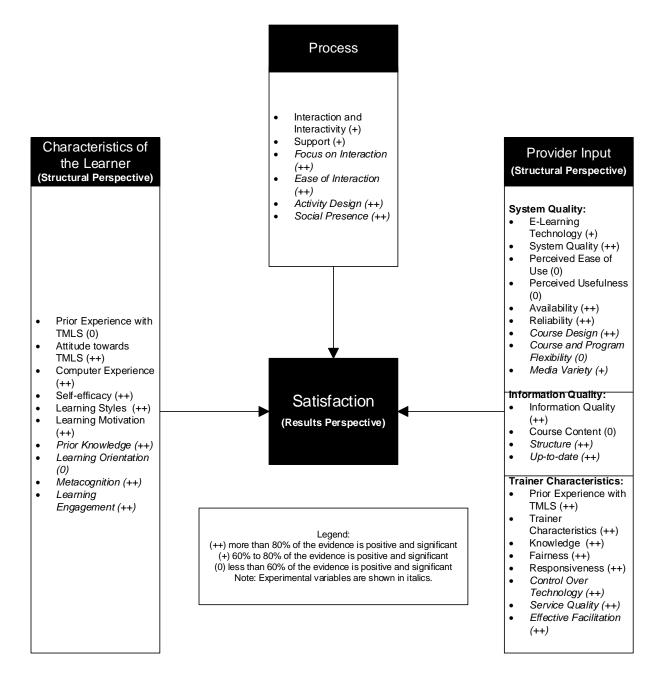
Figure 3.   *Determinants of Learning Satisfaction*

Influence of the Structural Perspective

The structural perspective comprises the input of the learner, and, in addition, the potentials a service provider provides. This category was extensively researched, since 57 relationships were available in this category. In the category learners' characteristics, six independent variables and their relation to satisfaction were studied. These variables include self-efficacy, prior experience with TMLS, attitude towards TMLS, computer experience, learning style and learning motivation. All studies produced nearly consistent and significant results in this group.

Self-efficacy was the most frequently studied independent variable in this category. It was studied six times, and produced nearly consistent results. It was marked five times in a positive connection, and was found to be without any significant causal relationship to satisfaction only once. In contrast, the

connection between prior experience and satisfaction was studied four times. However, there were mixed results, and only 50 percent of the results were consistent (with a positive relationship). The other results showed either a significantly negative relationship, or showed no sign of a significant relationship. Attitude was studied three times, and produced consistent results. Attitude is significant for satisfaction, because of its positive relation between both variables. Regarding computer experience, which was studied three times, the result is also significant for satisfaction. Here, a positive connection concerning the variables was also identified. Within the broad category of learner's characteristics, learning style was only studied twice. However, the result is significant, and affects satisfaction positively. Learning motivation as a characteristic of the learner was studied three times, and the influence concerning satisfaction proved to be consistent and positively related.

The second broad category of the structural perspective is the provider input. This category is divided into the subcategories trainer characteristics, information quality, and system quality. In the category of trainer characteristics, the relations between five independent variables and satisfaction were studied. Responsiveness, fairness, knowledge, prior experience and trainer characteristics belong to these independent variables. All results of this sub-category are positively significant, and show consistent results.

Considering information quality, the results are mixed. The quality of the information itself, e.g., correctness, shows consistent results. However, this is not the case with the course content, which exhibits mixed results. System quality, the last sub-category of provider input, was examined using seven independent variables. The independent variables encompass e-learning technology, system quality, perceived ease of use, perceived usefulness, support, availability, reliability. In at least four cases, the results are consistent, and positively connected with satisfaction. E-learning technology was extensively studied (7 times), and shows quite consistent findings regarding satisfaction. This holds true for system quality (studied 5 times) owing to strong empirical evidence. However, the technology acceptance model (TAM) variables perceived ease of use and perceived usefulness both showed inconsistent, insignificant results. In contrast, availability and reliability were not extensively studied, yet, they all show consistent results for satisfaction.

Influence of the Process Perspective
Interaction and interactivity were examined six times. The results show mainly consistent, significantly positive results. However, it should been noted that there is evidence that contradicts these results. Support was in addition studied one time and found to be with significant impact on learning satisfaction.

4.2.2   Determinants of Learning Success

As was the case for learning satisfaction, we created a model of the major determinants of TML success. The model learning success is shown in Figure 4. This model captures the 35 independent variables that showed consistent results. The variables are organized in the already introduced broader categories of independent variables as well, and are described in detail below with respect to their influence on learning success in TMLS.
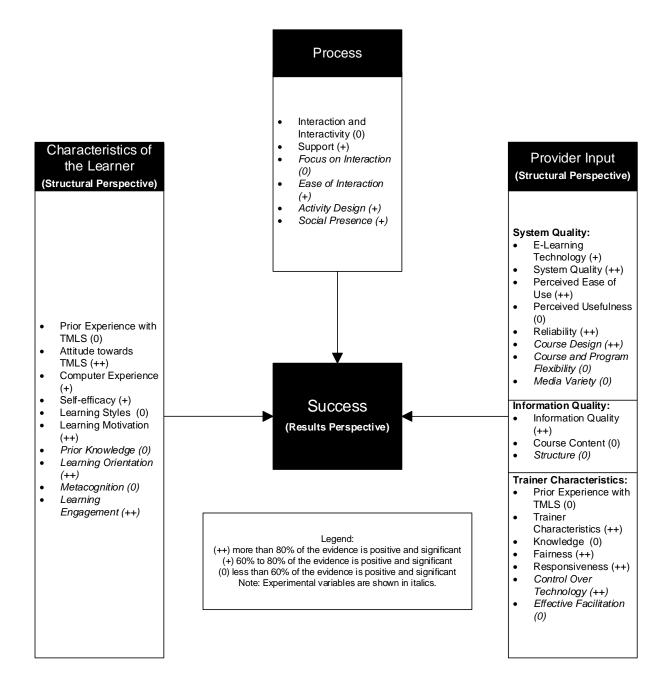
Process

- Interaction and Interactivity (0)
- Support (+)
- *Focus on Interaction (0)*
- *Ease of Interaction (+)*
- *Activity Design (+)*
- *Social Presence (+)*

Characteristics of the Learner
(Structural Perspective)

- Prior Experience with TMLS (0)
- Attitude towards TMLS (++)
- Computer Experience (+)
- Self-efficacy (+)
- Learning Styles (0)
- Learning Motivation (++)
- *Prior Knowledge (0)*
- *Learning Orientation (++)*
- *Metacognition (0)*
- *Learning Engagement (++)*

Success
(Results Perspective)

Provider Input
(Structural Perspective)

System Quality:
- E-Learning Technology (+)
- System Quality (++)
- Perceived Ease of Use (++)
- Perceived Usefulness (0)
- Reliability (++)
- *Course Design (++)*
- *Course and Program Flexibility (0)*
- *Media Variety (0)*

Information Quality:
- Information Quality (++)
- Course Content (0)
- *Structure (0)*

Trainer Characteristics:
- Prior Experience with TMLS (0)
- Trainer Characteristics (++)
- Knowledge (0)
- Fairness (++)
- Responsiveness (++)
- *Control Over Technology (++)*
- *Effective Facilitation (0)*

Legend:
(++) more than 80% of the evidence is positive and significant
(+) 60% to 80% of the evidence is positive and significant
(0) less than 60% of the evidence is positive and significant
Note: Experimental variables are shown in italics.

Figure 4.   Determinants of Learning Success

Influence of the Structural Perspective

We now turn to the findings concerning the influence of the structural perspective on learning success. Again, we consider the learner and provider inputs as constituting factors for learning success. The relationships were studied a total of 40 times. Considering learner characteristics, the already mentioned six independent variables were also studied in relation to the success of the learner. The correlation between prior experience and success was studied six times. Therefore, it represents the most frequently studied set of independent variables in this category. However, the results are mixed, and, therefore, we cannot conclude that this variable has a major influence on success.

Attitude was examined four times and produced consistent results and therefore influences success positively. The relation between computer experience and success was studied three times. The result is positive, because it is positively related to success in two cases, and once there is any relation to success at all. Self-efficacy was studied five times. It was proven to be positively related to success three times, and twice no significant relationship to success was found.Learning style was studied three times, and did not produce a consistent result. Only once is it positively related to success. Yet, in two cases, the relationship to success was recorded as insignificant. In all four studies regarding the relation between learning motivation and success, the motivation to learn affects success positively.

First, the provider input was examined in regards of the broad sub-category of trainer characteristics. Five independent variables denoted as trainer characteristics and their influence to success had been studied. At least three times a positive and consistent result was obtained. Responsiveness was studied once, and it is positively related to success. Fairness was also studied once, and the result is also positively connected with success. Knowledge was only studied once. According to the result of the study, a relation between knowledge and success does not exist as far as trainer characteristics are concerned. Prior experience was studied three times, and produced mixed results regarding success. Therefore, it cannot be considered as a reliable factor.

Trainer characteristics were studied three times. In all cases a significant and positive connection to success exists. Considering the sub-category of information quality in connection with success, the results are quite similar to those obtained for satisfaction. Information quality itself produces consistent results, whereas course content shows mixed results, and cannot be considered as an important variable. System quality, the last sub-category of provider input, was studied 14 times. Results regarding e-learning technology (studied in total 10 times) are relatively consistent, because this variable proved to be positively related to success six out of ten times. System quality was studied twice as an independent variable, and scored consistent results, which verify a positive relation to success. The TAM variables produced mixed results. Perceived ease of use has been studied once, it can be marked that the perceived ease of use has a positive effect on success. The result of perceived usefulness is not consistent at all. Only once it is positively related to success, and twice no significant relationship is identifiable. Reliability was studied two times, and it is evident that there is a definitely positive relation to success.

Influence of the Process Perspective

Concerning the four studies of interaction and interactivity there is no real result. Twice it is positive related to success, once negative and again twice not found to be significant. Support was studied three times, and the result is almost consistent, because in two cases out of three a positive correlation to success was detected.

5 Discussion

Our paper makes several contributions to the existing body of literature. When answering our first research questions, we successfully identify a set of constructs and components which represent the current state of the art in the evaluation of TMLS. Thereby, we contribute to service science research and TMLS research in particular by providing recent findings and shortcomings in the existing body of literature.

More precisely, we identified a set of factors which were elaborately examined in the literature, and which showed a consistently positive impact on satisfaction and learning success in the case of TMLS such as attitudes towards E-learning, self-efficacy, computer experience or learning motivation. In doing so, we provided information about reliable determinants of learning success and satisfaction which should be included into a holistic evaluation approach. Moreover, we presented further constructs which showed inconsistent results, e.g., learning style, learning orientation or prior knowledge, which, in sum, indicates a changing effect that depends on other influences. Furthermore,

we presented additional constructs which were examined less than five and more than two times, showing further areas with research potential in order to create a deeper understanding of TMLS.

From a provider perspective, we were able to identify a whole set of consistently positive effects on learning success and satisfaction, such as responsiveness, fairness and trainer characteristics Nevertheless, trainer characteristics such as prior experience with e-learning, and knowledge about e-learning did not prove to have a consistent effect on learning success, indicating that the use of e-learning must only partly be supported by the trainer. This raises the question which are independent e-learning modules and which have to be supported by the trainer. Again, hardly examined factors could be identified, showing potential for further research, such as effective facilitation and service quality.

Furthermore, from a process perspective, only interaction was identified as a component of the process perspective which determines the results for satisfaction (+), and finding inconsistent effects on learning success (0). Apparently, interaction is not of similar importance within every learning scenario. A possible explanation for this is the complexity of contents, which requires a different degree of interaction (Anderson *et al.*, 2005). Furthermore, individual preferences could be a plausible explanation, implying that indicators are needed to design an optimal TMLS scenario, instead of only focussing on a maximum degree of interaction. From the process perspective, another promising construct is activity design, which showed first evidence that this should be most definitely included within a holistic TMLS model.

In addition, different effects of the same determinants could be observed, e.g., interaction and interactivity has a positive effect on satisfaction and at the same time a non-significant (0) effect on learning success. This stresses the meaning of a learning success oriented TMLS perspective, not only focussing on subjectively estimated learner's satisfaction and success but also on objectively investigated learning effects, e.g., test results.

Overall, a bias within the research results was visible, which comprised a strong overrepresentation of positive effects on satisfaction and learning success. This can either be explained by a strong focus on positive effects due to an exclusive perspective by the researchers, or by the resistance of researchers to report negative effects within TMLS scenarios, possibly bringing up unpopular results regarding TMLS quality within a specific scenario. In any case, future research could provide interesting insights as to constructs which influence learning success negatively. This, in turn, could help to gain an understanding of deficient learning success.

In sum, we provided a set of constructs from a holistic perspective, showing reliable constructs which should be included within the model. Thereby, we presented a foundation for a holistic model for the evaluation of TMLS scenarios, and helped to explain the inconsistent results discovered so far. Furthermore, we were able to show potential constructs of interest which have not been examined sufficiently yet, thus, providing research directions for future studies. Moreover, we were able to uncover a lack of research regarding the process perspective by presenting inconsistent results on interaction. Moreover, we did not find any other construct that had been thoroughly researched. Once again, we were able to point out potential areas of future research.

Furthermore, our results contribute to practice by providing consistently tested components and constructs which have to be included into a TMLS evaluation approach. In doing so, success factors for the delivery of TMLS successfully identified, and serve as a foundation for continuous improvement processes. Such improvement processes enable the development of measures for the identification and correction of weaknesses regarding the delivery of TMLS.

6   Limitations and Future Research

However, because our review only dealt with quantitative studies, we did and do not account for the insights of qualitative studies in this paper. Future research should acknowledge this gap by also examining qualitative research papers, in order to gain more in-depth knowledge as to how the productivity of TMLS is influenced. Furthermore, we are aware that our focus was on the identification of solid factors that influence TMLS. This means that there are opportunities for future research to investigate the size of effects of each relationship using meta-analytical approaches.

By means of examining the research papers in our literature review, we identified future directions for researching TMLS. First, none of the papers included in this study systematically studied the influence of culture on TMLS, although various scholars have suggested that culture has a significant impact on the perception of services (Sharma *et al.*, 2009, Sharma *et al.*, 2012) and IT (Leidner and Kayworth, 2006). More even, it is said to heavily influence outcomes of learning scenarios (Hofstede, 1986). By examining how the specific reference layers of culture, .e.g., national or organizational culture, influence the quality perceptions of TMLS, we might be able to gain an understanding how TMLS must be adapted for specific cultures in order to achieve higher TMLS outcomes in a more globalized setting (Janson *et al.*, 2014). Research possibilities include, for example, how the application of IT in TMLS has to be adjusted in a different culture, or how the trainer and the service process have to be redesigned to achieve better TMLS productivity. Second, as stated in the previous section, the results of the literature may bias our holistic model that build upon those research findings. Third, the process perspective is underrepresented in our model, which stresses the need for a systematic development of process variables.

7   Conclusion

The holistic evaluation of TMLS is crucial to uncover potentials that significantly influence learning success and learning satisfaction. For this purpose, we conducted a systematic literature review to study which variables have to be included in a holistic TMLS model. Therefore, in accordance with Donabedian (Donabedian, 1980a, Broderick and Vachirapornpuk, 2002) we took the structural perspective, comprising learner and provider input factors, the process perspective and results perspective into account. In accordance with Gupta *et al.* (2010) we conducted a systematic literature review to identify variables for a holistic, systematic TMLS evaluation approach.

We therefore analysed the 85 identified research papers and systematically identified existing knowledge as well as future research needs. By considering the two major outcome variables, learning satisfaction and learning success, we were able to identify a set of variables that take these two dependent variables into account. More precisely, we identified a set of in total 65 determinants that were examined in the context of TMLS evaluation. Thereby, we collected data for the systematic TMLS model development, providing a foundation as well as hints for the systematic identification of additional variables.

Acknowledgments

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