Analysis of the Persuasiveness of User Experience Feedback on a Virtual Learning Environment

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ABSTRACT
The main purpose of this paper is to evaluate a set of theory-grounded User Experience (UX)-related measures which are supposed to persuade course designers of particular UX-related problem areas based on a specific feedback format. Specifically, two online surveys on a university online course were conducted with the former focusing on the quantitative ratings and the latter on qualitative comments. The course designers were asked to assess the persuasiveness of the feedback with respect to eight dimensions. The results show that UX-related problem areas anchored in the DeLone and McLean's Information Systems (IS) Success Model (ISSM) had a consistently higher level of perceived persuasiveness than those anchored in the Technology Acceptance Model (TAM) 3. The discrepancy can be attributed to the nature of items: process- vs. trait-based). Implications for future research on fixing UX-related problems are discussed.

Keywords
Course Designer, Design Characteristic, Feedback Format, IS Success Model, Persuasiveness, TAM3, User Experience.

INTRODUCTION
At the present day rigorous, i.e. theory-grounded, and relevant, i.e. practice-oriented, approaches for the design and evaluation of Virtual Learning Environments (VLE) are needed to improve the understanding and communication of educational needs among all stakeholders, including researchers and practitioners [10]. In this paper VLE are understood as systems for the administrative and didactical support of learning processes in higher education and vocational training settings by means of formal online courses [22]. Hence, it is of great importance to investigate the drivers or determinants of VLE success to assist system and course designers in building, operating and sustaining systems and online courses as integral parts that are useful and accepted by the end-user (here: students). However, a specific theory of successful VLE is currently missing as existing approaches focus on information systems (IS) in general with the DeLone and McLean's ISSM [2, 3] being one of them. Contrary to the TAM, which does not propose concrete

system design guidelines [23, 32, 34, 36], the ISSM identifies and provides general qualities which are thought to enhance user satisfaction, the use of, and the net benefit(s) (NB) of using a VLE [2, 3]. However, the main disadvantage of the ISSM used as a general approach is that specific VLE-related success drivers cannot be directly derived from the model itself. Rather, the ISSM offers insights into the process of how general qualities, namely system- and information quality, influence the final success [2, 3]. Hence, the ISSM offers a general and "useful framework for organizing IS success measurements" [27] which can and should be adapted to the VLE context [3, 27]. Though, beside more general recommendations for the selection of success measures [29], there currently lacks a widely accepted set of measures relevant to VLE in particular.

However, some latest research attempts striving for a VLE-specific extension of the ISSM revealed a comprehensive and exhaustively validated set of system- and information-related design characteristics relevant to VLE in particular [22]. As some of these design characteristics, respectively their corresponding items can be adequate measures for UX as well, these UX-related design characteristics may support designers (here: course designers[1]) in their attempts to fix not only usability-related issues [25] but also UX-related problem areas (e.g. *image*, see Table 1). Thereby, UX-related problem areas anchored in the ISSM are compared against the ability of selected UX-related ones anchored in the TAM3 [32] in order to carve out differences in the persuasiveness of the feedback format for course designers. This construct is assumed to be dependent on a) the kind of theory applied (ISSM = product-oriented; TAM3 = state-/trait-oriented) and b) the information richness of the feedback format provided.

According to Nørgaard and Hornbæk [25], the underlying assumption is as follows: The richer the UX problem area-related contextual information contained in the feedback format, the higher persuasiveness of this feedback format is for course designers. Thus, in search for a rigorous and

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[1] In addition to research efforts solely focusing on system designers [e.g. 6, 7, 8, 4, 15, 16, 25].

persuasive UX-related feedback format[2], the following research questions (RQ) will be addressed in this paper:

RQ1: To what extent do students as end-users have more problems in specifying UX-related problem areas based on TAM3-related UX items than those based on their ISSM-related counterparts (see Table 1, *students' item rating statements*)?

RQ2: To what extent do course designers perceive UX-related problem areas (see Table 1: based on the *construct label*, *construct definition*, *item wording*, *item-UX-match*, *students' item rating* and *students' item rating statement*) originated in the ISSM to be more persuasive than their TAM3-related counterparts?

RQ3: Which of the UX-related problem areas (TAM3- vs. ISSM-anchored) do course designers perceive to be more persuasive in case *evaluators' suggestions* are provided in addition to the set of UX problem area-related contextual information illustrated in Table 1?

Based on these research questions, the main purpose of this paper is to identify and validate a set of theory-grounded, UX-related measures of which persuasiveness presumably varies with feedback format. In this context, we define *persuasiveness* in terms of convincing course designers about the problematicity of particular UX-related issues, which may entail specific resolutions.

In the paper we first explore the concept of UX as well as feedback formats as a means to persuade designers. Then we present the methodological framework regarding students' specification of UX-related problem areas as well as course designers' assessment of their persuasiveness of the feedback formats generated. Next, we describe the empirical results with regard to the overall persuasiveness of the feedback format (quantitative evaluation) and particular UX-related problem areas (qualitative evaluation) as perceived by the course designers. The aforementioned three research questions will be then discussed. Finally, implications for future research efforts and conclusion are drawn.

BACKGROUND
User Experience
As distinct from usability-centred evaluations which roughly focus on task-related issues such as efficiency and effectiveness [7], "[UX] proposes a more holistic view of the user's experience when using a product than is usually taken in the evaluation of usability" [12]. While pragmatic/do goals are associated with usability, hedonic/be goals address cognitive, socio-cognitive and affective aspects of users' experience in their interaction with artifacts (e.g. users' enjoyment, aesthetic experience, desire to repeat use, positive decision to use a digital artifact and enhanced mental models) [1, 16]. However, a consensual definition of UX does not yet exist, although ISO 9241-210 [13] provides one: "*A person's perceptions*

and responses that result from the use and/or anticipated use of a product, system or service*" (clause 2.15), which is relatively simpler than, for instance, the comprehensive definition by Hassenzahl and Tractinsky [8], one of the many definitions in the literature [15]. In an attempt to understand the diverse interpretations of UX, the researchers, based on the results of a survey [15], have drawn a conclusion that UX is "*dynamic, context-dependent and subjective, which stems from a broad range of potential benefits users may derive from a product*".

Feedback Formats as a Means to Persuade Designers
Feedback can be understood as "*information about reactions to a product, a person's performance of a task, etc. which is used as a basis for improvement*" [25, 26]. According to Nørgaard and Hornbæk [25], feedback should fulfill the requirement of being persuasive: Firstly, feedback should convince developers that the problem identified does exist and helps them to understand it. Secondly, the persuasiveness of a feedback format is determined by the amount of contextual information about a problem it conveys. Thirdly, the ease the feedback can be used in the developer's everyday work is important. Moreover, given that UX is inherently dynamic, context-dependent and subjective [15, 16], feedback on UX-related problems should essentially be self-reported data to be captured by questionnaire, interview and think-aloud. Nonetheless, data on UX can be gathered with a survey where respondents are first required to rate a set of items with a Likert scale and subsequently interviewed to elaborate their comments on the items.

METHOD
Identifying Students' UX-related Problem Areas
Participants of the current study were eleven students of the online course *Organizational Management*, which was delivered during the summer term 2010 by the Chair of Management Information Systems (MIS) located at Saarland University/Germany. Prior to this study, these participants had been asked to complete a larger-scale online survey with 88 items being originated from ISSM and TAM3. The aim of this first survey (N=30) was to evaluate students' acceptance towards the aforementioned course. Thereby, all items showed high levels of construct validity, evaluated via a satisfactory convergent (Average Variance Explained, Composite Reliability, significant indicator factor loadings exceeding a threshold of 0.70), discriminant, and nomological validity. Some of the first survey items can be mapped to the hedonic attributes of the model of UX proposed by Hassenzahl [6]. As the primary focus lies on more hedonic attributes, more pragmatic/task-related ones such as the perceived usefulness as well as the perceived ease of using a VLE are out of scope of this paper [8, 12, 32]. The mapping was undertaken by the first and second authors of this paper, resulting in 17 items that constitute the second online survey. Consequently, the second survey consists of UX-related items. Specifically, we define a UX-related item as a *problem area* if its mean rating (averaged over all the respondents involved in the first survey) falls between 1.00 and 3.99 and as a *still-to-*

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be-improved area if it is between 4.00 and 4.50. In this case, a UX-related construct (the column Label in Table 1) could contain both types of area. The corresponding boundary values are defined by the MIS monitoring team responsible for the quality control of the MIS's online courses. Moreover, UX-related problem areas originated from either the TAM3 or the ISSM are randomly put in one sequence to prevent sequence effects. In addition to the item (Table 1) the participants were provided with the corresponding average ratings[3] (1 = strongly disagree; 5 = strongly agree) as well as a hint to their individual ratings of the first online survey (students were provided with a copy of their individual ratings after having completed the first online survey) and were asked to comment on them. The reasons for providing students with the averages as well as a corresponding hint to their individual rating in the first online survey are due to the university's data policy prohibiting the chair's monitoring team to confront students with their individual ratings of a preliminary survey directly. Thus, UX-related problem areas were further specified and thus contextualized based on students' additional qualitative written input (illustrative example per item, see Table 1, column 6).

In summary, the tasks the participants of the second survey had to undertake were: (i) They had to provide their personal statements to each item rating by referring to the online course *Organizational Management*; (ii) based on their statements, they had to explain how they would solve the perceived problem areas. This information could serve as a starting point for the evaluator's suggestions (see Table 1, last column), which were presented to the course designers to evaluate their persuasiveness of the feedback format.

Evaluating the Persuasiveness of the Feedback Format by Course Designers

Three course designers (1 professor, 1 research professional, 1 research assistant) were invited to attend semi-structured interviews to gather their evaluation of the persuasiveness of the UX-related problem areas (the first five columns of Table 1). In addition, the contextual information gathered from the participants in the previous step (the 6th column in Table 1) was further concretized with *evaluators' suggestions* how to solve particular UX-related problem areas (the last column of Table 1). The concretization was undertaken by the MIS monitoring team based on the participants' qualitative written input as described in the previous step. Hence, the final feedback format that the course designers were provided with was a context-rich blending of a) a problem list and b) corresponding redesign proposals [25]. Presumably, this can better illustrate the causes and solutions of the UX-related problem areas, and thus enhance the persuasiveness of such a context-rich feedback format as distinct from pure

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problem enumerations [14]. In order to survey the *persuasiveness* of a) the overall feedback format in general as well as b) the *UX-related problem areas* in particular (see Table 1), a questionnaire was administered which was mainly based on Norgaard and Hornbaek's [25] measurement instrument to evaluate the persuasiveness of a feedback format as perceived by developers. The corresponding questions are:

Q1: "How useful is the information provided in Table 1 (*construct label*, *construct definition*, *item wording*, *item-UX-match*, *students' item rating* and *students' item rating statement*) to your work on the online course *Organizational Management*? (1=not useful – 5=very useful). Furthermore, please comment on the usefulness of the information provided by referring to the UX-related problem areas *label* (e.g. *user interface appeal*, see Table 1, first column).

Q2: How well does the information provided in Table 1 help you to understand the UX-related problem area(s)? (1= very poor – 5 = very well).

a) Please comment on the level of understandability of the information provided in Table 1 by referring to particular *columns* (i.e. vertical evaluation).

b) Additionally, please differ between the understandability of the information provided in Table 1 by referring to particular *item* (i.e. horizontal evaluation).

Q3: How well does the information provided in Table 1 have an impact on assessing the severity of the UX-related problem area(s)? (1=very poor – 5= very well). Please comment on the severity of (a) particular problem area(s).

Q4: How well does the information provided in Table 1 help you solve the UX-related problem area(s)? (1= very poorly – 5= very well). Please comment on the ability of the information provided in Table 1 to solve a particular problem area(s).

Q5: Do you intend to solve the UX-related problem areas illustrated in Table 1? (1 = not at all – 5 = absolutely). If so, which of the problem area(s) and why?

Q6: Are you convinced that the information provided in Table 1 depicts real UX-related problem areas? (1 = not at all – 5 = absolutely). If not, which of the problem areas and why?

Q7: Is the information provided in Table 1 easy to use to solve particular UX-related problem areas? (1 = not at all – 5 = absolutely). If not, which of the problem area(s) and why?

Q8: Does the information provided in Table 1 have an impact on your (re-)design strategy of particular UX-related problem areas of the online course *Organizational Management* (*here: prioritization of particular problem areas*)? (1 = not at all – 5 = absolutely). Please comment on particular problem areas.

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[3]The mean values of the corresponding UX-related problem areas are based on students' ratings gathered within the realm of the preliminary large-scaled online survey to evaluate their acceptance with the online course Organizational Management.

Table 1: UX-related Problem Areas as Perceived by Students' of the Online Course "Organizational Management": Overview

A. ISSM-originated						
Label**	Definition**	Item*/**	Item-UX-mapping** (based on the model of UX [6, 16])	Average Item Rating from the 1st survey/ UX-related problem areas item*/**	Additional UX Problem Specification	
					Participants' qualitative comments given in the second survey/ UX Item-related Problem Description**	Evaluators' Suggestion/ UX-related item problem concretization**
User Interface Appeal	VLE are *appealing* if their graphical user interface has a pleasant appearance [11].	The VLE has an attractive graphical user interface [5].	beauty, visual aesthetics	3.36	-	-
Information Credibility	The information provided by VLE is *credible* if they originate from a trustworthy source (e.g. teacher, certified and/or reputable organizations, etc.) [21].	I trust the learning material's originator (e.g. teacher, professional institution/organization) [22].	trust	4.27	„Your learning materials are arranged very neatly, but they are incomplete in parts."	„Please clarify with your students what exactly is perceived to be incomplete, i.e. missing sample solutions and/or missing learning materials? In case the latter does apply, please clarify once again the chair's didactic policy, i.e. the initial set of slides provided constitute a "starting point" which has to be "enriched" by the students' themselves (dilemma: student vs. teacher viewpoint).
		The learning material's originator (e.g. teacher, professional institution/organization) is an (officially) approved source of information [22].	trust	4.18	„I am not able to judge if he is a recognized source of information."	„If applicable, emphasize the chair's competence in this subject domain (e.g. insert a MIS seal of approval on the learning materials/slides provided which is associated with the chair's latest publications (papers, textbooks), awards, etc.)."
		The learning material's originator (e.g. teacher, professional institution/organization) has a good reputation [22].	trust	4.09	„I cannot answer this question likewise."	„If applicable, insert a MIS seal of approval on the learning materials/slides provided which is associated with the chair's reputation in this subject)."

Information Challenge	The information provided by VLE is *challenging* if the learning materials contain difficult but interesting tasks which stimulate learners' curiosity to solve them [21].	The tasks contained (with)in the learning materials arouse my curiosity [19].	Stimulation	3.36	Partly. It may be better to work with open questions that are discussed with the tutor in class.	„If applicable, please consider open questions too which should be discussed mutually in class (i.e. "offline")."
		The tasks contained (with)in the learning materials arouse my ambition [22].	competence	3,55	["Partly."]	If applicable, please consider open questions too which should a) require students' initiative for further research (i.e. stimulate self-directed learning processes) and which should b) discussed mutually in class (i.e. "offline")."
		The tasks contained (with)in the learning materials are appropriately tricky [22].	competence	3,36	„The tasks seem to be far away from the aspiration level of the final examination. Would be better to provide questions which do have the same difficulty level as the ones asked in the final examination."	„Please carify if the sample exercises do have the same difficulty level as the ones provided in the final examination. If not, please upload a mock exam which should be discussed mutually in the final tutorial."

B. TAM3-originated

Label**	Definition**	Item*/**	Item-UX-mapping** (based on the model of UX [6, 16])	Average Item Rating from the 1st survey/ UX-related problem areas item*/**	Additional UX Problem Specification	
					Participants' qualitative comments given in the second survey/ UX Item-related Problem Description**	Evaluators' Suggestion/ UX-related item problem concretization**
Subjective Norm	The degree to which an individual perceives that most people who are important to him think he should or should not use the system [4, 33].	People who influence my behavior (e.g. fellow students, friends, parents, etc) think that I should use the VLE within the scope of my studies [22, 30, 32].	identification	2.00	Those who are not studying at the university may not deal, and thus may not be interested in the VLE."	„If applicable, communicate the benefits of using the VLE (with)in the course to your students (e.g. citing empirical studies which proved the VLE to have a positive impact on students' training success) so that most of them may perceive the use of the VLE/online course to be "obligatory".

Image	The degree to which an individual perceives that use of an innovation will enhance his or her status in his or her social system [20].	Fellow students at my university who use the VLE have more prestige than those who do not [20, 22].	identification	1.18	„Strange question again!“	„If applicable, please point to the innovative kind of teaching method which is applied (with)in the course so that students may get more aware of the novelty of the approach undertaken (as long as this effect may endure, a "demarcation" from other fellow students may be possible)."
		Fellow students at my university who use the VLE have a high profile [20, 22].	identification	1.18	„One does have a high profile when using the VLE?"	-
		Having the VLE is a status symbol at my university [20, 22].	identification	1.27	"What?"	-
Computer Anxiety	The degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" [31].	VLEs do not scare me at all [31].	evocation (negative)	4.00 (inverse)	„Sure…the use of the VLE was explained very well by the tutor!“	"In order to avoid any kind of inhibition in dealing with the VLE/the online course, a compulsory introduction in the use of the VLE/online course should be implemented at the beginning of the semester."
		Working with a VLE makes me nervous [31].	evocation (negative)	1.18 (inverse)	"Nervous?"	-
		VLEs make me feel uncomfortable [31].	evocation (negative)	1.27 (inverse)	"This question is pretty strange too!"	-
Computer Playfulness	"….the degree of cognitive spontaneity in microcomputer interactions" [35].	I would characterize myself very spontaneous when I use the VLE [31].	stimulation	3.64	„Just do it, don't think about it!“	"In order to avoid any kind of inhibition in dealing with the VLE/the online course, a compulsory introduction in the use of the VLE/online course should be implemented at the beginning of the semester."
		I would characterize myself very creative when I use the VLE [31].	stimulation	2.64	"Strange question likewise. What do you mean by creative?"	-
		I would characterize myself very playful when I use the VLE [31].	stimulation	2.45	Playful? Do not know how to interpret and answer this question?"	-

RESULTS

Course Designers' Ratings of the Feedback Format
Table 2 summarizes the quantitative ratings per question (Q1-Q8) by providing the overall persuasiveness of the feedback format (see Table 1) per course designer, the corresponding mean values, standard deviations and perceived persuasiveness of UX-related problem areas.

Course Designers' Comments on the Feedback Format
Supplement to course designers' overall ratings of the feedback format (see Table 2) the following description reveals how course designers perceived the persuasiveness of particular UX-related problem areas.

Perceived Usefulness of the Information Provided (Q1)
All in all, the *item ratings* and *evaluator's suggestions* are considered to be useful to address the following UX-related problem areas, namely *computer playfulness* and *computer anxiety*. Furthermore, students' critique concerning *information challenge* (i.e. provision of sample tests) was assumed to originate from the lack of publicity for the announcement of such tests which were published in the VLE on a regular base. Besides, one of the course designers raised his concerns regarding *image* as a useful UX-related problem area as it was considered to be not related to the course designers' work as a lecturer or author of the course.

Understandability of UX-related Problem Areas (Q2)
With regard to the course designers' *vertical evaluation* of the understandability of individual variables in the feedback format presented in Table 1, the following results were obtained: The *item* as well as the *combination of item and students' comments* per UX-related problem area was found to a) give the first idea that there exist particular UX-related problem areas and to improve the understanding

Table 2: Perceived Persuasiveness of UX-related Problem Areas Feedback Format

Question		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Overall Rating	Designer #1	4	3	2	2,5	5	5	2	4
	Designer #2	4	4	4	5	4	5	5	5
	Designer #3	4	3	3	4	2	4	4	4
Mean Values		**4.00**	**3.33**	**3.00**	**3.83**	**3.67**	**4.67**	**3.67**	**4.33**
Standard Deviation		**0.00**	**0.58**	**1.00**	**1.26**	**1.53**	**0.58**	**1.53**	**0.58**
Perceived Persuasiveness of Particular UX-related Problem Areas									
User Interface Appeal			+	+	0	+			
Information Credibility			+	+	0	+	+		
Information Challenge		-	+	+	0	+	+		++
Subjective Norm				-	0	+	-		
Image		-		-	0	++	-		
Computer Anxiety		+			0	++			+
Computer Playfulness		+	+	+	0	++	+		

- = UX problem areas considered not to be persuasive

0 = neutral

+ = UX problem areas considered to be persuasive

of particular UX-related problem areas. However, in order to solve the problem the *evaluator's suggestions* are inevitable. Furthermore, the information provided in Table 1 was considered to give valuable hints, which, however, would need more in-depth information to understand what actually the problem was (e.g. Is the problem of understanding the material caused by the fact that questions do not have examination-level? Or is the VLE misunderstood as a mere examination-preparation-tool?).

Concerning the *horizontal evaluation* of the information provided in Table 1, course designers found that the following UX-related problem areas were easy to understand: *Computer playfulness*, *user interface appeal*, *information credibility* and *information challenge*. On the other hand, *image* and *subjective norm* were considered to be very intangible and not reasonable at all.

Assessing the Severity of UX-related Problem Areas (Q3)
According to Hertzum [9], the severity of a UX-related problem area "is an assessment of the amount of trouble and inconvenience users will experience as a result of a specific aspect of a system. Severity assessments are, however, also recommendations about the urgency of fixing problems". In the context of the current study, our concern was whether the feedback could facilitate the prioritization of UX-related problem. In other words, .the evaluation feedback was intended to persuade the course designers to fix problem areas of different levels of severity (here: ranging from 1.00 – 4.50) (cf. [14]).

Regarding the severity assessments of the given UX-related problem areas (Q3 in Table 2), course designers did not evaluate the construct *computer anxiety*. In addition to that, *subjective norm* and *image* were considered not to constitute severe UX-related problem areas. On the other hand, the remaining set of UX-related problem areas (*user interface appeal, information credibility, information challenge* and *computer playfulness*) was considered to constitute severe UX-related problem areas which should be addressed to improve the course for the forthcoming semester. However, in order to improve course designers' severity assessments, they required the feedback format to contain even more explicit students' severity rankings in order to understand how severe a problem was actually perceived by them.

Capability of the Feedback to Solve UX Problems (Q4)
Concerning the capability of the information provided in Table 1 for solving the UX-related problem areas, the course designers appreciated the way the information was presented ("the table does provide the causes and solutions of the problems"), and here especially *evaluators' suggestions* even though they were considered to be "not operative enough". Thus, the *item* was considered to give "an idea that there exist particular UX-related problem areas, in order to solve them the *evaluator's suggestions* are inevitable."

Course Designers' Intention to Solve UX Problems (Q5)
Concerning the course designers' intention to solve the UX-related problem areas illustrated in Table 1, the variation was relatively large (i.e. the column Q5 in Table 2, Mean = 3.67, SD = 1.53). Specifically, we computed the so-called impact ratios [28] per course designers:

$$\frac{\text{Number of problems committed to be fixed} * 100}{\text{Total number of problems found}}$$

The results range from one course designer showing an impact ratio of 14% ("The UX-related problem areas presented do not constitute real problems […] So why should I solve them?") to the other two course designers showing an impact ratio of 100% ("I'll try to tackle all problems so as to improve the course and contributing to good learner relations"; "Depending on the resources available one could tackle each of the UX-related problem areas illustrated, especially to foster students' *computer playfulness* and their perceived *image* of using the online course"). However, given that the re-design of the online course takes place within the upcoming semester break, the completed-to-date impact ratio is out of scope of this paper [28]:

$$\frac{\text{Number of problems committed receiving a fix} * 100}{\text{Total number of problems found}}$$

Persuasiveness of the UX Problems (Q6)
Two of the three course designers considered the following UX-related problem areas 1 to constitute no "fake problems" (see Table 1): *Information challenge*, *information credibility* and *computer playfulness*. On the contrary, *image* and *subjective norm* were considered not to constitute real UX-related problem areas. This was mainly due to the fact that course designer could not relate them to the course.

Ease of Use of the Feedback to Solve UX Problems (Q7)
In total, the feedback was considered to be not operative enough. One of the course designers remarked that "for instance, knowing that students perceive materials as incomplete does not help me which concrete information lacks, in which part and why?"

Impact on the Prioritization of UX Problems (Q8)
In a nutshell, the feedback format helped course designers to classify the subsequent UX-related problem areas as critical, namely *computer anxiety* and *information challenge*. The corresponding fixing plan was to formulate exercises more precise and understandable.

DISCUSSION
The present study provides a systematic evaluation of how course designers perceived the persuasiveness of a theoretically-grounded feedback format concerning students' UX with a university's online course.

In total, course designers' mean ratings across the eight questions in the questionnaire were all above 3.00 with standard deviations ranging between 0.00 (*usefulness of the feedback*) and 1.53 (*intention to solve UX-related problem areas*; *ease of use of the feedback to solve particular UX-related problem areas*). The large variations are due to the fact that one course designer did not perceive the UX-related problem areas listed in Table 1 as "real" problems (Q5), and they were found to be not operative enough (Q7).

In particular, the findings revealed that *computer anxiety* and *computer playfulness* were perceived as very useful (Q1). Furthermore, the feedback regarding *user interface appeal*, *information credibility*, *information challenge* and *computer playfulness* helped course designers to understand the corresponding UX-related problem areas (Q2), had an impact on the course designers' severity assessments of the corresponding problem areas (Q3), their intention to solve the UX-related problem areas revealed (Q5, + *subjective norm*, *image* and *computer anxiety*) as well as the persuasiveness of the UX-related problem areas (Q6) illustrated in Table 1. Moreover, *information challenge* and *computer anxiety* were considered to be the two most critical UX-related problem areas to be addressed within the forthcoming re-design of the online course (Q8). Finally, in order to solve particular UX-related problem areas as revealed by use of students' item ratings (see Table 1, column 5), course designers required the feedback format to contain *evaluator's suggestions* (Q4).

Regarding the research questions addressed in Introduction, we revisit them here with reference to the empirical findings gathered:

RQ1: Students had more problems in specifying UX-related problem areas based on TAM3-related UX items than those based on their ISSM-related counterparts (see the column Participants' qualitative comments in Table 1). In particular, students struggled in specifying TAM3-related UX problem areas such as *image* ("One does have a high profile when using the VLE?"), *computer anxiety* ("This question is pretty strange too!") and *computer playfulness* ("Playful? Do not know how to interpret and answer this question?"), whereas this was only the case for *information credibility* ("I am not able to judge if he is a recognized source of information") regarding ISSM-anchored UX problem areas.

RQ2: As depicted in Table 2, course designers considered UX-related problem areas originated in the ISSM to be more persuasive than their TAM3-related counterparts. This may be mainly due to the fact that course designers did not perceive the "intangible" TAM3-anchored UX-related problem areas as relevant to their particular course (e.g. *subjective norm* and *image*).

RQ3: Course designers perceived UX-related problem areas anchored in TAM3 or the ISSM to be most persuasive in case evaluators' suggestions (see Table 1, column 7) were provided in addition to the other UX problem area-related contextual information provided in Table 1 (see Q1/4: "in order to solve the problem the evaluator's suggestions are inevitable"). No significant differences between TAM3- and ISSM-anchored UX-related problem areas were reported by the course designers.

IMPLICATIONS
The above mentioned results should generally provide a starting point for future research. In particular, future research efforts should focus on elaborating ways how to

formulate items related to TAM3 constructs such as *subjective norm* and *image* so that they may better relate to (course) designers' concrete work. Furthermore, course designers' severity assessments as well as their evaluation of the persuasiveness of the realness of such problem areas may be improved and facilitated by the use of more explicit students' severity ratings (i.e. underline the meaning of students' item ratings). The main benefit of further refining UX-related items anchored in theory-grounded constructs may be the improvement of the transparency and comparability of the corresponding research outcomes.

In addition, as the capability of the feedback to solve UX-related problem areas was considered to be limited due to its lack of information richness, future research work should investigate which potentially persuasive elements need to be included in a re-design proposal for fixing UX-related problems.

CONCLUSION

In this paper a systematic evaluation of how course designers' perceived persuasiveness of a theoretically grounded feedback format was carried out. Specifically, a problem list with corresponding redesign proposals of TAM3- and ISSM-anchored UX-related problem areas was identified and evaluated. Outcomes of this study will presumably stimulate future research on resolving UX problems. In particular, the combination of quantitative and qualitative data can not only gain better insights into issues but also support future (course) design and evaluation efforts that may contribute to students' positive UX while interacting with a VLE and online courses.

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