

**Empirical Studies on
Technology Acceptance of Mobile Services
and
Information Security Management**

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Dedicated to my Family

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I Abstract/Abstrakt

Information and communication systems as well as mobile services are essential for corporate and private actions and are therefore of high relevance. Their success is determined by different factors that we must consider. One reason is that mere availability of information systems (IS) and mobile services does not provide any direct value. Understanding the use and individual acceptance are some of the most mature streams in many fields of research. This is due to the fact that the lack of technology acceptance can lead to loss of resources and money and is increasingly viewed as an important element for IS success. Furthermore, information security management has become increasingly important for organizations because global networks expand the interconnection of global IS. Thus, security threats can have dire consequences. In the research areas technology acceptance of mobile services as well as information security management, using specific examples, research gaps and a discrepancy between the status quo in research and practice are identified. In both research areas the focus is on empirical studies. Models from different research disciplines are used for analysis and further developed. This illustrates the interdisciplinary nature of this thesis. In order to analyze the complex relationships between latent variables multivariate analysis methods, e. g. structural equation modeling (SEM), are carried out. The considered research area in general, is very complex, multifaceted and characterized by a methodological pluralism. By involving users and experts, an active exchange between science and practice is realized.

Informations- und Kommunikationssysteme sowie mobile Dienstleistungen sind essentiell für unternehmerische und private Handlungen sowie Vorgehensweisen und sind daher von hoher Relevanz. Ihr Erfolg wird durch verschiedene Faktoren bestimmt, die berücksichtigt werden müssen. Ein Grund dafür ist, dass die bloße Verfügbarkeit von Informationssystemen (IS) und mobilen Services keinen direkten Mehrwert bietet. Das Verständnis der Nutzung und der individuellen Akzeptanz sind einige der am meisten ausgereif-

ten Streams in vielen Bereichen der Forschung. Dies beruht auf der Tatsache, dass der Mangel an Technologieakzeptanz zum Verlust von Ressourcen und Geld führen kann und diese zunehmend als wichtiger Bestandteil für IS Erfolg angesehen wird. Darüber hinaus gewinnt das Informationssicherheitsmanagement zunehmend an Bedeutung für Unternehmen, da globale Netzwerke die Verbindung bzw. Kopplung der globalen IS erweitern. So können Bedrohungen fatale Folgen haben. In den Forschungsbereichen zur Technologieakzeptanz mobiler Services sowie Informationssicherheitsmanagement, werden anhand konkreter Beispiele, Forschungslücken und Diskrepanzen zwischen dem Status quo in Forschung und Praxis identifiziert. In beiden Forschungsbereichen liegt der Fokus auf empirischen Studien. Modelle aus verschiedenen Forschungsdisziplinen werden für die Analyse verwendet und weiterentwickelt. Dies verdeutlicht den interdisziplinären Charakter dieser Arbeit. Um die komplexen Beziehungen zwischen latenten Variablen zu analysieren, werden multivariate Analyseverfahren verwendet, wie z. B. die Strukturgleichungsmodellierung (SEM). Das Forschungsgebiet im Allgemeinen ist sehr komplex sowie vielfältig und ist gekennzeichnet durch einen Methodenpluralismus. Durch den Einbezug von Anwendern und Experten, wird ein aktiver Austausch zwischen Wissenschaft und Praxis realisiert.

II Management Summary

Mobile services are considered as a driver of innovation in many areas of the economy. This is promoted among others by the rapid technological developments in the market for mobile devices and the development of mobile networks. Recent observations lead to the assumption that this trend will continue over the next few years or even increase further. The IT market research and consulting company GARTNER announced in November 2012 that e. g. smartphone sales have increased by 47 % in comparison to the third quarter of 2011 (Garnter, 2012). Technology acceptance plays a major role, in particular in the area of mobile services, but also almost in all areas of IS research as well as in practice. In this global context the study of technology acceptance has been important since about 27 years. This is due to the fact that lack of technology acceptance can lead to loss of resources and money and is increasingly viewed as an important element for IS success. Furthermore, information security and, more specific information security management have become increasingly important to organizations as global networks expand the interconnection of the global IS. Today, security threats can have dire consequences and an important issue in organizations is to determine how to create efficient and sustainable information security. In this context, the way information security executives or in general the management of an organization cope with this issue and react in different situations should be considered.

The focus in both research areas is on empirical studies, in order to close the specific research gaps. Therefore, models from different research areas (e. g. IS research, marketing, sociology and psychology) are used for analysis and are developed further. This illustrates the interdisciplinary nature of this thesis. The considered research area is very complex, multifaceted and characterized by a methodological pluralism. For this reason, it is elaborated in more detail. In the respective sub areas, open issues and problem areas were identified and concrete examples are used to answer the research

questions in the overall research field. The research topics will be examined by the following examples:

- Technology acceptance as part of a sustainable business model for m(-obile) learning,
- Technology readiness in customers' perception and acceptance: the example of m(-obile) payment,
- Information security management and personality traits: an empirical study.

Regarding these open research areas explained in the above mentioned examples, there are no or almost no research results. To fill these research gaps, possible solutions are developed and presented.

Technology Acceptance as Part of a Sustainable Business Model for Mobile Learning:

The mobilization of our society as well as the technological advancements encountered in a dynamic private and professional world require lifelong education and training concepts, and thus provide a large market potential for m(-obile) learning services, which can be utilized regardless of temporal and formal boundaries and allow learning even within periods of mobility. But the mere existence of such services does not implicate market readiness. M-learning providers have to successfully and sustainably introduce m-learning services to the market in order to reach sustainable market success. In the past, m-learning projects started in part as enthusiastic idea at academic or industrial institutions but never gained sustainable success in the market due to didactical, technical and/or economical restrictions. For this reason, business models are considered to be critical for success and it is necessary to develop appropriate and sustainable business models for m-learning that provide added value for all parties. The status of research in the area of technology acceptance of mobile services which is an integral component of a sustainable business model, particularly in the area of m-learning is still in its beginnings. However, previous research highlights that the lack of technology acceptance can lead to loss of resources and money. Thus, it is increasingly viewed as an important element for the measurement of IS suc-

cess. In this context, m-learning providers cannot fully rely on the existing findings of earlier research in the area of technology acceptance of mobile services, or systems.

The use of the design-science approach (cf. Figure M-1) is justified on the grounds of this research project and provides a framework for the evaluation of models and/or artifacts. In this specific case, this approach is intended to contribute to the knowledge base of the scientific community in general in an explanatory way as well as to help managers design sustainable m-learning services. Based on an extensive literature review three characteristic aspects of added values that an m-learning service can provide were identified: anywhere, anytime and anyway m-learning.

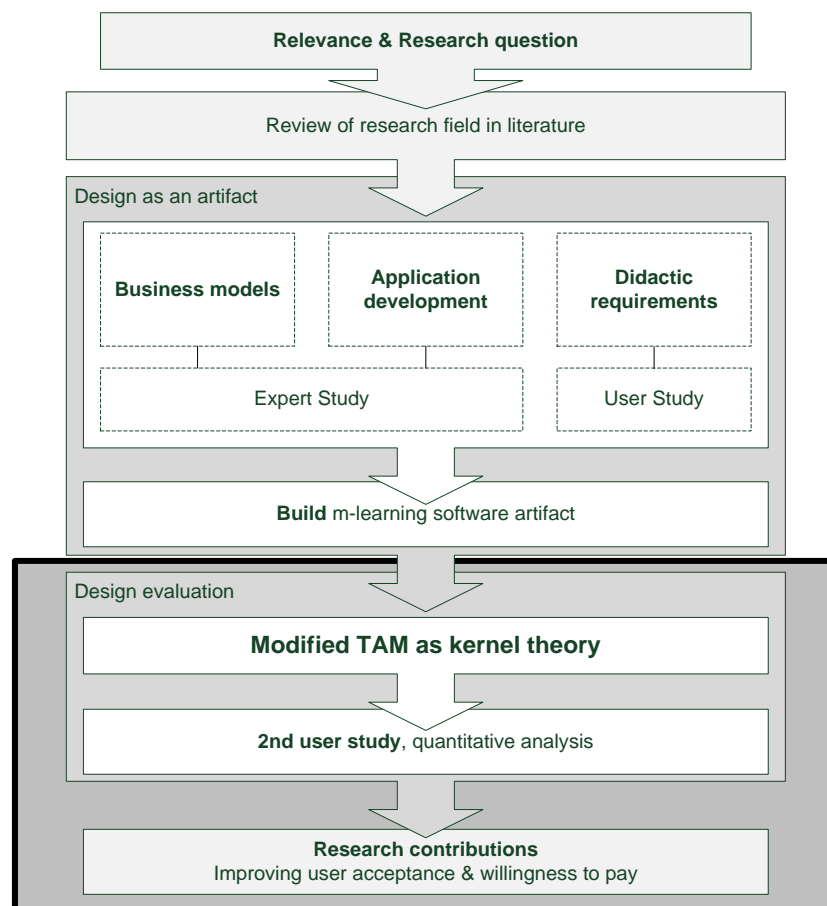


Figure M-1: TAM as Kernel Theory

Furthermore, feedback from users was used to create an m-learning application and several courses, inter alia, didactical requirements, that represent

the artifact. To adjust the didactical requirements, that are necessary to gain m-learning added value, a field study has been conducted with a randomly selected sample of 150 students in several economic courses. For this purpose an exemplary m-learning course was created.

Prior to building the artifact, an expert study (31 German experts from science and industry) was also performed to determine which type of revenue sub model is suitable for business models and which delivery method is acceptable, cf. Table M-1.

Table M-1: Application Development and Revenue Sub Models for M-learning Services

	Median	Frequency suitable or very suitable
M-learning application development		
Offer a web application compatible to all platforms	4	17
Development native applications for each platform	4	17
Users have to use a standardized mobile devices	2	8
M-learning revenue sub models		
Fees per use	4	18
Mobile advertising	3	12
Revenues by brokerage	3	10
Usage-independent fees	3	6
<i>Likert scale: 5=very suitable, 4=suitable, 3=neutral, 2=little, 1=low</i>		

The created artifact was then evaluated against the modified technology acceptance model (TAM) on a randomly selected group of 300 students of economics, cf. Figure M-2. The satisfaction of users' needs focused on providing added value to the user. Added value is necessary to attract new users as well. Predictive functions were identified for the usefulness of anywhere and anyway learning. In order to build an appropriate and sustainable business model for m-learning the positive influence of anytime and anyway learning on the perceived usefulness should be considered. Besides the technological and didactical dimension, the economic dimension plays a significant role in the development, implementation and operation of an m-learning application.

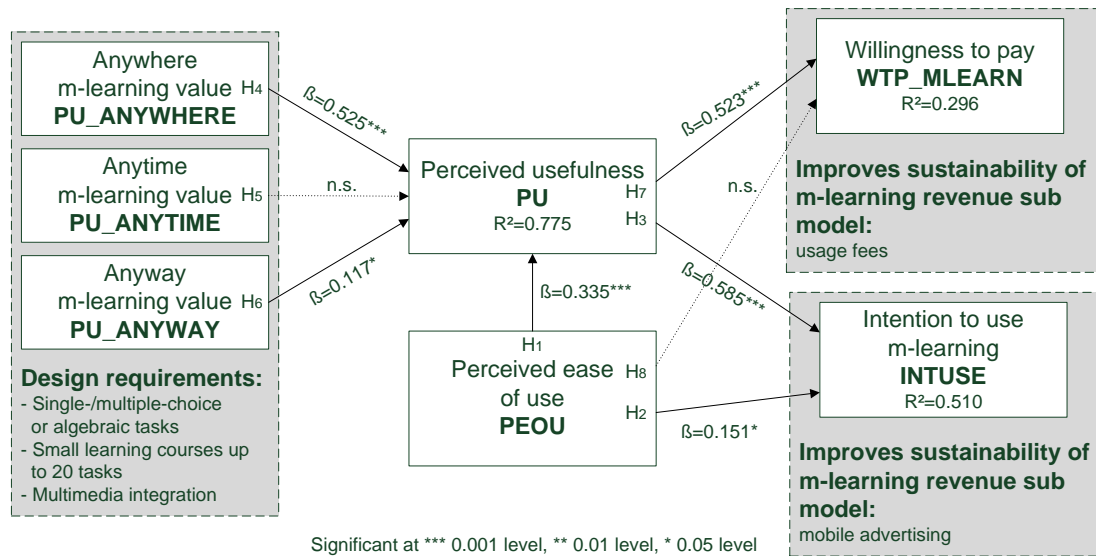


Figure M-2: Modified TAM – Results of the Empirical Analysis

Here, sustainable business models are of major importance because they are close connected with the acceptance of m-learning applications. The costs of application development and maintenance should be balanced against the revenues. The most suitable revenue types for m-learning business models were specified in an expert study and later evaluated in the modified TAM. Empirical studies and the use as well as development of theoretical models e. g. TAM and their evaluation by statistical analysis can aid practitioners and academics in the development of sustainable business models.

This work describes the status quo of research, the further development of the research topic and the transfer of scientific knowledge and methods, especially in the practice in the design of sustainable business models for m-learning. The results of this research were presented at the European Conference on Information Systems (ECIS) 2011 and are published as an essay by Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) in the Proceedings of the ECIS.

Technology Readiness in Customers' Perception and Acceptance: The Example of Mobile Payment:

Companies today are facing multiple challenges. The increasing globalization and the rapid diffusion of communication and information technologies,

make cross-cultural studies necessary to meet the requirements of the current and future users. Particularly in the area of m-payment, these differences are clearly visible. Some countries use m-payment intensive, while the use in other countries is far below expectations. Since inadequate user acceptance has long been an obstacle to the successful adoption of mobile services or technologies in general, it is imperative to consider which factors drive users in different countries and cultures to adopt m-payment solutions or restrain them from doing so. Overall, however, it is expected that m-payment will be gaining in importance in the future. The IT market research and consulting company GARTNER, announced in May 2012 that the worldwide m-payment transaction values will surpass \$ 171.5 billion in 2012 and the number of m-payment users will reach 212.2 million in 2012. Despite the importance of m-payment, particularly in the context of m-commerce, the state of cross-cultural empirical research on use and acceptance has lagged behind technological developments and are therefore scarce. The work by (Guhr, Loi, Wiegard, & Breitner, 2013) addressed this gap by developing and testing an extended TAM across cultures and aims to the following theoretical and practical contributions. It is empirically tested how technology readiness influences customers' perception and acceptance of m-payment in an intercultural setting.

Existing scientific approaches to technology acceptance of m-payment are limited mostly to factors such as trust and security etc., but transnational studies across countries, taking into account the cultural dimensions could not be found. Furthermore, although there are approaches that combine the cultural dimensions with TAM as well as the enablers (innovativeness, optimism) and inhibitors (insecurity, discomfort) in the overall construct TR with TAM, but there is a lack of a holistic approach in the specific context of m-payment, especially taking into account cultural differences.

Based on theory, hypotheses were derived as basis for an empirical examination of the relationships and the latent construct were conceptualized and operationalized and further statistically analyzed using SEM, cf. Figure M-3.

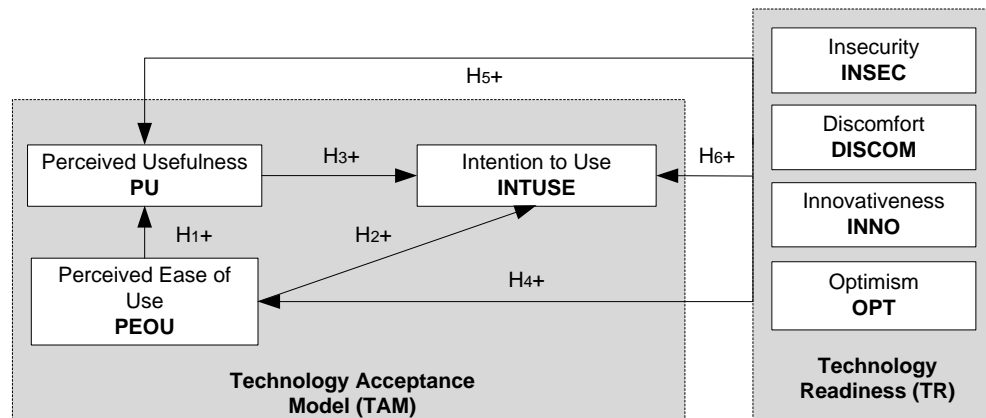


Figure M-3: Research model

To verify the causal relationships mentioned above which are based on theory a quantitative study in the countries Finland, Germany, the USA and Japan was conducted. A summary of the sample can be taken from Table M-2.

Table M-2: Composition of the Sample

	FIN = 50		GER = 115		USA = 52		JPN = 53	
	N	%	N	%	N	%	N	%
Gender								
Female	35	70,0	41	35,7	36	69,2	35	66,0
Male	15	30,0	74	64,3	16	30,8	18	34,0
Age								
<18	3	6,0	0	0,0	2	3,8	3	5,7
18-25	26	52,0	86	74,8	25	48,1	31	58,5
26-35	9	18,0	29	25,2	16	30,8	9	17,0
36-45	1	2,0	0	0,0	3	5,8	6	11,3
46-60	9	18,0	0	0,0	5	9,6	2	3,8
>60	2	4,0	0	0,0	1	1,9	2	3,8
Profession								
Student	22	44,0	96	83,5	31	59,6	29	54,7
Employee	13	26,0	15	13,0	14	26,9	15	28,3
Public officer	4	8,0	3	2,6	0	0,0	1	1,9
Self employed	5	10,0	1	0,9	4	7,7	5	9,4
Pension	0	0,0	0	0,0	0	0,0	2	3,8
Not specified	6	12,0	0	0,0	3	5,8	1	1,9

The results of the analysis (cf. Table M-3) show that the TR in intercultural comparison varies across countries and thus has a different impact on the technology acceptance of m-payment. To give an example which results from the findings, it can be stated that countries that are more masculine (e. g. Japan) are more technology ready than less masculine countries (e. g. Finland) and this in turn has a positive influence on the technology acceptance of m-payment.

Table M-3: Results of the Analysis

Hypotheses	Path coefficient				T-Value				Hypothesis supported			
	FIN	GER	USA	JPN	FIN	GER	USA	JPN	FIN	GER	USA	JPN
H1 PEOU positive influences PU	0.623	0.447	0.559	0.493	6.169***	5.713***	4.694***	3.381*	•	•	•	•
H2 PEOU positive influences INTUSE	0.299	0.257	0.292	0.249	1.650°	2.607*	1.968**	2.591*	•	•	•	•
H3 PU positive influences INTUSE	0.390	0.403	0.458	0.447	1.745°	4.839***	2.777*	4.269***	•	•	•	•
H4 TR positive influences PEOU	0.736	0.718	0.641	0.415	9.551***	17.791***	10.248***	3.310*	•	•	•	•
H5 TR positive influences PU	0.288	0.406	0.360	0.335	3.022*	5.283***	3.236*	2.181**	•	•	•	•
H6 TR positive influences INTUSE	0.206	0.308	0.175	0.325	1.255 n.s.	3.707***	1.548 n.s.	3.273*	○	•	○	•
Hypothesis supported = •; Hypothesis not supported = ○												
° denotes significance at the p < 0.10 level												
* denotes significance at the p < 0.05 level												
** denotes significance at the p < 0.01 level												
*** denotes significance at the p < 0.001 level												

The results of this research were presented at the International Conference on Wirtschaftsinformatik (WI) 2013 in Leipzig and are published as an essay by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) in the Proceedings of the WI.

Information Security Management and Personality Traits: An Empirical Study:

Information security and especially information security management, which is affected by multiple distinctive dimensions, is one of the most important topics in IS research and is widely discussed in both, the Anglo-American “Information Systems Research” as well as in the German “Wirtschaftsinformatik” and has become increasingly important for organizations as well. Security threats in all its facets can have dire consequences, e. g. loss of prestige and credibility, monetary damage and corporate liability. The way information security executives or in general the management of an organization cope with this and react in different situations depends heavily on their personality or individual characteristics as well as other cognitive factors. This clearly shows, inter alia, that individual differences have become an important area of focus in information security research. However, it should be noted that the study of personality, particularly empirical studies, within the behavioral IS literature is sparse and there is no research that has explored the influence of personality on top management in regards to security. Previous studies in the field of information security were limited to users or employees. Furthermore, focusing on the research problem from a multidimensional, holistic approach allows the examination and evaluation of infor-

mation security phenomena from the individual information security executives' perspective.

To receive a valid theoretical foundation, perspectives of prior research in combination with national and international information security standards (ISO/IEC 27001; ISO/IEC 27002 and the special publications SP 800-39 from the National Institute of Standards and Technology) were used. In the research work, it was outlined that holistic security management aims to maximize the number of prevented security breaches by the management applying an efficient set of five non-technical components and one technical component. Because individual differences play a ubiquitous role in the IS domain the "NEO-FFI" format by Costa and McCrae was also considered. With regard to the research topic and based on a theory, hypotheses about the influence of an information security executive's personality traits on the above mentioned six dimensions of information security management were developed. To test the revised model and the underlying hypotheses, existing empirical data was used (Pomes, 2011) in the form of a secondary data analysis. A secondary data analysis is defined as the re-analysis of existing data for answering the original or new research questions with more adequate statistical methods (Glass, 1976; Schell, Hill, & Esser, 2011; Kromrey, 2009). The data basis, which consists of 174 information security executives, was collected in prior work at the Institute of Information Systems, Gottfried Wilhelm Leibniz Universität, by Robert Pomes and was published in (Pomes, 2011). To analyze the data, which were partly adapted from (Pomes, 2011), several statistical methods were used in this thesis e. g. factor analysis and SEM. The results of the empirical analysis (cf. Figure M-3) show that personality traits are influential in determining attitudes towards holistic information security management cf. Figure M-3. This work describes the status quo of research, the further development of the research topic and the transfer of scientific knowledge and methods, especially in the practice in information security management. The results were presented at the International Conference on Information Systems (ICIS) 2012 and are published as essay by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) in the Proceedings of the ICIS 2013.

The research and the resulting publications are used to initiate a debate in the scientific community. This relates to the field of mobile services as well as information security management. It is assumed that the presented research papers, including those who could not be described in detail, contribute to increasing knowledge in the respective research areas.

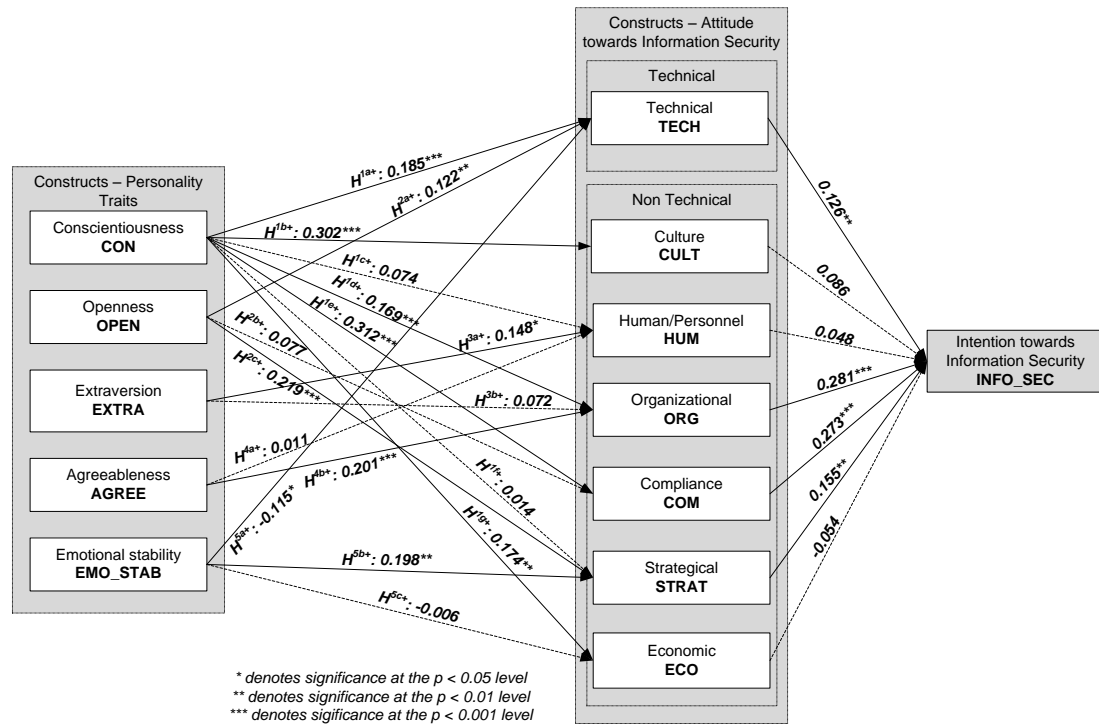


Figure M-3: Research model

Among other things, this can be justified by the fact that the research papers were published in the proceedings of generally accepted conferences. This reflects the acceptance of the scientific community. By evaluating the publications by professional colleagues within the double-blind peer review process e. g. of the European Conference on Information Systems, the International Conference on Wirtschaftsinformatik and the International Conference on Information Systems the scientific quality of the publications was secured.

Keywords: Technology Acceptance, Mobile Services, Information Security Management

Schlagworte: Technologieakzeptanz, mobile Services, Informationssicherheitsmanagement

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VI List of Abbreviations

AB5C	A brided B ig F ive C ircumplex
ACM	A ssociation for C omputing M achinery
AGREE	A greeableness
AIS	A ssociation for I nformation S ystems
BFAS	B ig 5 A spect S cales
BFM	B ig F ive M arkers
BIT	B anking and T echnology
cf.	compare
CIO	C hief I nformation O fficer
CMS	C ampus M anagement S ystem
COM	C ompliance
CON	C onscientiousness
CULT	C ulture
ECIS	E uropean C onference on I nformation S ystems
ECO	E conomic
Eds.	E ditors
BFI	B ig F ive I nventory
e. g.	exempli gratia / for example
EJIS	E uropean J ournal on I nformation S ystems
EMO_STAB	E motional S tability
EPI	E ysenck P ersonality I nventory
EPP	E ysenck P ersonality P rofiler
EPQ	E ysenck P ersonality Q uestionnaire
et seqq.	et sequentes
e. V.	eingetragener V erein
EXTRA	E xtraversion
FB	F achbereich
FFI	F ive F actor I nventory
FFM	F ive F actor M odel
FIN	F inland

GER	Germany
GI	Gesellschaft für Informatik
GZTS	Guilford Zimmerman Temperament Survey
H	Hypothesis
HUM	Human
IAIM	International Academy for Information Management
ICC	International Cruise Conference
ICIS	International Conference on Information Systems
IDV	Individualism vs. Collectivism
IEC	International Electrotechnical Commission
IFIP	International Federation for Information Processing
INFORMS	Institute for Operations Research and Management Sciences
INTUSE	Intention to Use
IPIP	International Personality Item Pool
IS	Information Systems
ISO	International Standards Organization
ISR	Information Systems Research
IT	Information Technology
IVR	Indulgence vs. Restraint
IWI	Institut für Wirtschaftsinformatik
JPN	Japan
LISREL	Linear Structural Relations
LNI	Lecture Notes in Informatics
LTO	Long-Term Orientation
MAS	Masculinity vs. Femininity
MISQ	Management Information Systems Quarterly
MKWI	Multikonferenz Wirtschaftsinformatik
MPQ	Maudsley Personality Questionnaire
MPQ	Multidimensional Personality Questionnaire
NFC	Near Field Communication
NIST	National Institute of Standards and Technology
OPEN	Openness

OPQ	O ccupational P ersonality Q uestionnaire
ORG	O rganization
p.	p age
PDI	P ower D istance I ndex
PIR	P ersonality I nventry R evised
PLS	P artial L east S quare
PEOU	P erceived E ase of U se
P2P	P erson to P erson
POS	P oint of S ale
PQ	P ersonality Q uestionnaire
PU	P erceived U sefulness
RBQ	R iverside B ehavioral Q -Sort
RFID	R adio F requency I dentification
SEM	S tructural E quation M odel
SIM	S ociety for I nformation M anagement
SMS	S hort M essage S ervice
SP	S pecial P ublication
STRAT	S trategic
TAM	T echnology A cceptance M odel
TECH	T echnical
TPB	T heory of P lanned B ehavior
TR	T echnology R eadiness
TRA	T heory of R easoned A ction
TRI	T echnology R eadiness I ndex
TTFM	T echnology- T ask- F it- M odel
UAI	U ncertainty A voidance
USA	U nited S tates of A merica
UTAUT	U nified T heory of A cceptance and U se of T echnology
WAP	W ireless A pplication P rotocol
WI	W irtschaftsinformatik
WKWI	W issenschaftliche K ommission W irtschaftsinformatik
WTP	W illingness-to-pay

0 Preliminary Remark: Overall View of Publications

An initial examination of the research field on the adoption and acceptance of mobile services and systems took place during the author's diploma thesis at the institute for information systems research at the Gottfried Wilhelm Leibniz Universität Hannover in September 2009. The work was titled "*Nutzerakzeptanz ubiquitärer Lernsysteme und Konzeption multimedialer Inhalte*". Parts of this thesis e. g. the data of the quantitative study and the results of the empirical analysis were published later in three different publications (cf. Appendices A1, A3, and A4).

Another essay that deals with the topic of scenario analysis and technology assessment, appeared in the "IWI Discussion Paper # 45 (cf. Appendix A2). The edited volume titled "*Cruise Management: Information & Decision Support*" is more attributable to the research field of tourism. This also affects the paper "*Influence of E-Trust on Direct Online Bookings of Sail-Cruises in Turkey*" which will be published in the proceedings of the 4th INTERNATIONAL CRUISE CONFERENCE (ICC) and the paper "*A specific Technology Acceptance Model for Mobile Services in the Cruise Sector*" which is published in the book "*Cruise Tourism and Society*" (cf. Appendix A10).

The research focus of the author, however, is based on the technology acceptance of mobile services, as well as personality traits in the context of information security.

Three of the paper shown in the appendix are attributable to the research field of m(-obile) learning (cf. Appendices A1, A3 and A4). The first paper entitled "*Microlearning mit UbiLearn*" was published in the "Handbuch E-Learning: Expertenwissen aus Wissenschaft und Praxis – Strategien, Instrumente, Fallstudien" (cf. Appendix A1).

A further, to the research area of m-learning attributable publication titled "*Microlearning in der berufsbegleitenden Fort- und Weiterbildung – Mit Wissenshäppchen zum Lernen verführen*", is published in the journal "PERSONALFÜHRUNG" (cf. Appendix A3).

The third paper entitled "*Towards a Sustainable Business Model for Mobile Learning Services*", which can be associated with this research topic was presented on the EUROPEAN CONFERENCE ON INFORMATION SYSTEMS (ECIS) 2011 in Helsinki (Finland) and was published in the conference proceedings. The study underlying the paper, utilizes the design science paradigm to ad-

dress the design of an m-learning application that meets the needs of users and augments their willingness-to-pay so that suppliers can market sustainably. The results of an extended technology acceptance model (TAM) based evaluation show that user acceptance and willingness-to-pay (WTP) for m-learning is driven by the special exploitation of didactic added value of m-learning content and technologically adopted implementation of m-learning applications (cf. Appendix A4).

The technology acceptance of mobile applications has been further investigated in various applications. First, the adoption of mobile technology applications for campus management systems has been tested empirically, the results of which were presented at the JAHRESTAGUNG DER GESELLSCHAFT FÜR INFORMATIK 2011 in Berlin. The aim of this paper was to answer the research question of when, and under what conditions, a mobile application can be a useful additional service for students at universities (cf. Appendix A5).

Three more publications are dedicated to the research topic of acceptance of m(-obile) payment. The first publication entitled “*Investigating Technology Acceptance of Mobile Payment in Germany and the USA*” was presented at the MULTIKONFERENZ WIRTSCHAFTSINFORMATIK (MKWI) 2011 in Braunschweig and is published in the conference proceedings (cf. Appendix A6).

The second publication in the context of the mentioned research field is published in the journal “BANKING AND TECHNOLOGY (BIT)” in 2012 (cf. Appendix A7). The issue of technology acceptance of m-payment in the international context was prepared using a literature review. Based on this analysis an extended TAM was developed and empirically evaluated using multivariate analysis methods such as SEM.

In another step, the empirical research was extended to the countries of Japan and Finland. Furthermore, there was a revision of the underlying approach to cultural aspects, and an extension of the TAM for technology readiness (TR) as an attitudinal construct referring to an individual's predisposition to use new technologies. The results which are presented in the research paper “*Technology Readiness in Customers' Perception and Acceptance of M(obile)-Payment: An Empirical Study in Finland, Germany, the*

USA and Japan” was accepted to the INTERNATIONALEN TAGUNG WIRTSCHAFTSINFORMATIK 2013 in Track “Individualization and Consumerization” (cf. Appendix A9) and published in the conference proceedings.

The analysis of the research topic personality traits and information security arose from the fact that the topic is novel, certainly worthy of investigation, and the study of personality traits and other cognitive factors within the behavioral science is sparse. First, a comprehensive literature review and a status quo analysis are presented. Furthermore, Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) consider the constructs of the Five Factor Model (FFM) as influence factors for attitudes towards technical and non-technical dimensions of information security management. The hypothesized relationships are validated via SEM using empirical data from information security executives (Pomes, 2011). The results of this paper, entitled “*Personality Traits and Information Security Management: an Empirical Study of Information Security Executives*” were presented at the INTERNATIONAL CONFERENCE ON INFORMATION SYSTEMS in December 2012 in Orlando, Florida (cf. Appendix A8) and are published in the conference proceedings.

An overview of all publications is shown in Table 0-1.

Table 0-1: Overall View of Publications

Publication Date	Titel	Authors	Conference/Journal/Book	VHB / WKWI*	VHB / JO2.1**	Chapter	Appendix
06/2010	Microlearning mit UbiLearn®	BREITNER, M. H.; GUHR, N.; KÖNIG, C. M.; KÖPP, C.; MASKE, P.	In: HOHENSTEIN, A.; WILBERS, K. (Eds.): Handbuch E-Learning: Expertenwissen aus Wissenschaft und Praxis - Strategien, Instrumente, Fallstudien. Wolters Kluwer Verlag, Köln, 33. Erg.-Lfg.				A1
01/2011	Szenarioanalyse und Technologiefolgenabschätzung	GUHR, N.; KÖPP, C.	In: BREITNER et al.: Aspekte der Wirtschaftsinformatik 2010. IWI Discussion Paper # 45. Institut für Wirtschaftsinformatik der Leibniz Universität Hannover, pp. 59 - 104.				A2
02/2011	Microlearning in der berufsbegleitenden Fort- und Weiterbildung	BREITNER, M. H.; GUHR, N.; KÖNIG, C. M.; KÖPP, C.; MASKE, P.	In: Personalführung - Für alle die Personalverantwortung tragen. PERSONALFÜHRUNG 2/2011, Deutsche Gesellschaft für Personalführung e. V., p. 40 - 48.		E		A3
06/2011	Towards a Sustainable Business Model for Mobile Learning Services	MASKE, P.; GUHR, N.; KÖPP, C.; BREITNER, M. H.	In: Proceedings of the 19th European Conference on Information Systems (ECIS) 2011, 09.-11.06.2011, Aalto University School of Economics, Helsinki, Finland.	A	B	2	A4
2011		PAPATHANASSIS, A.; BREITNER, M. H.; SCHÖN, C.; GUHR, N.	Eds.: Cruise Management Information & Decision Support. Gabler, Wiesbaden.				
10/2011	Technologieakzeptanz mobiler Applikationen für Campus-Management-Systeme	BÜHRIG, J.; GUHR, N.; BREITNER, M. H.	In: HEISS, H.-U., PEPPER, P.; SCHLINGOFF, H.; SCHNEIDER, J. (Eds.): Informatik schafft Communities. Beiträge der 41. Jahrestagung der Gesellschaft für Informatik e.V. (GI), 04. - 07.10.2011, Band P192	B	C		A5
2012	Investigating Technology Acceptance of Mobile Payment in Germany and the USA	WIEGARD, R.; GUHR, N.; LOI, T.; BREITNER, M. H.	In: MATTFELD, D. C.; ROBRABISSANTZ, S. (Eds.): Multikonferenz Wirtschaftsinformatik 2012 - Tagungsband der MKWI 2012, pp. 407 - 418.	C	D		A6
2012	Das Mobiltelefon als Geldbörse - Technologieakzeptanz von Mobile Payment in den USA und Deutschland	BREITNER, M. H.; GUHR, N.; LOI, T.; WIEGARD, R.	In: Banking and Information Technology (BIT), 2/2012, pp. 42 - 49.		D		A7
12/2012	Personality Traits and Information Security Management: An Empirical Study of Information Security Executives	UFFEN, J.; GUHR, N.; BREITNER, M. H.	In: Proceedings of the 33rd International Conference on Information Systems (ICIS) 2012, 16.-19.12.2012, Orlando, Florida (USA)	A	A	4	A8
2012/2013	Technology Readiness in Customers' Perception and Acceptance of Mobile-Payment: An Empirical Study in Finland, Germany, USA and Japan	GUHR, N.; LOI, T.; WIEGARD, R.; BREITNER, M. H.	In: AL T, R.; FRANCIK, B. (Eds.): Proceedings of the 11th International Conference on Wirtschaftsinformatik (WI) 2013, 27.02.-01.03.2013, Leipzig (Germany), pp. 119 - 135.	A	C	3	A9
2012	Influence of E-Trust on Direct Online-Bookings of Sail-Cruises in Turkey	GUHR, N.; WIEGARD, R.; BREITNER, M. H.	Will be published in: Proceedings of the 4th International Cruise Conference (ICC) 2012, 21.05.-23.05.2012, Stenden (Netherlands)				
2013	A Specific Technology Acceptance Model for Mobile Services in the Cruise Sector	WIEGARD, R.; GUHR, N.; BREITNER, M. H.	In: PAPATHANASSIS, A.; LUKOVIC, T.; VOGEL, M. (Eds.): Cruise Tourism and Society - A Socio-economic Perspective. Springer-Verlag, Berlin Heidelberg, pp. 127 - 140.				A10

* Assignment by the "Wissenschaftliche Kommission Wirtschaftsinformatik im Verband der Hochschullehrer für Betriebswirtschaft e. V." and the "Fachbereich Wirtschaftsinformatik der Gesellschaft für Informatik" in the WI-Oriented Journals, cf. WKWI and GFB WI (2008)
 ** cf. VHB-JOURQUAL 2.1 (2011)

1 Introduction

1.1 Motivation, Problems and Questions

The field of IS and especially the academic field of IS has been developing ever since the first business applications of communication and information technologies were implemented (Galliers, Oja, & Whitley, 2012). The development is accompanied by an increasingly international IS community and leads to different research orientations, expectations and interests. The research area of this study includes a thematically spectrum from empirical studies on technology acceptance of mobile services as well as information security management.

Mobile services are considered in various areas of the economy as a driver of innovation. This is promoted among others by the rapid technological developments in the market for mobile devices and the development of mobile networks. Recent observations lead to the assumption that this trend will continue over the next few years or even increase further. The IT market research and consulting company GARTNER, announced in November 2012 that e. g. Smartphone sales increased 47 % from the third quarter of 2011 (Garnter, 2012). This supports the already stated assumption. In recent years, new areas of use in mobile applications and / or mobile services have been developed, some of it could be successfully penetrated to the market, and other have failed.

Information and information systems (IS) have a significant global economic factor (Schryen, 2010) and therefore information security is a highly relevant topic both in research and in practice. In the last few years, the rapid development of information technologies (IT), have brought consumers and business ever closer and enabled businesses to become players in the global economy. Unfortunately, the high level of connectivity and the personality traits of the actors e. g. executives involved have also created unprecedented opportunities for the dark side of the technological world to emerge (Yayla & Hu, 2011). Modern organization cannot survive without an adequate and sustainable information security management. The majority of serious IS security problems result from human failure to comply with basic security procedures,

thus security solutions lose their usefulness (Karjalainen & Siponen, 2011; Siponen & Vance, 2010; Kruger & Kearney, 2006; Spears & Barki, 2010). Employees and executives who comply with regulations and rules of the organization are the key to strengthening information security (Bulgurcu, Cavusoglu, & Benbasat, 2010).

In this context, in both research fields models from different research areas (e. g. information systems research, marketing, sociology and psychology) are used for analysis and further developed which illustrates the interdisciplinary nature of this thesis. Numerous studies in IS research focus on differences between groups and the ability to assess these differences in theoretical models (Qureshi & Compeau, 2009; Hsieh, Rai, & Keil, 2008; Keil, et al., 2000; Zhu, Kraemer, Gurbaxani, & Xu, 2006). The importance of social issues related to computer-based IS has been recognized increasingly over the last decades, and this has led some IS researchers to adopt empirical approaches which focus particularly on human interpretations and meaning (Walsham, 1995).

Technology adoption, use and acceptance have attracted significant attention from the academic community (Mishra, Anderson, Angst, & Agarwal, 2012). In this context a variety of theoretical perspectives has been studied, such as the institutional perspective (Teo, Wei, & Benbasat, 2003), the TAM and its extensions (Davis, 1989; Kim S. , 2009; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003), knowledge- and resource based views (Armstrong & Sambamurthy, 1999), adoption of IS (Tung, Chang, & Chou, 2008), economics (Brynjolfsson & Kemerer, 1996).

The object of research is in its entity, however, very complex and multifaceted. In this work should not be simplified, but rather clarified in terms of the research object while open areas of concern are identified (Bortz & Döring, 2006). To this end, three sub areas are precisely defined as research gaps and examined as separate research topics. This detailed examination with these sub areas is provided in the three essays in Chapter 2, 3, and 4. After a consideration of the overall research field, the sub areas are formulated more precisely in form of research topics. Starting from a parent issue a specific research question in each section will be developed. It applies to (A. Papathanassis, public presentation at the Leibniz Universität Hannover, Oc-

tober 2011) and (Punsch, 2005) to consider what is meant to answer the research questions, why this would be worthwhile, whether this is a realistic research path and how or rather with which research method they are to be processed.

In the following the motivation for a deeper examination of problem areas were outlined in the individual sub areas. Further, the access to the areas as well as the purpose will be explained and specific research questions will be presented.

A Sustainable Business Model for Mobile Learning Services (Chapter 2):

The research contribution of (Maske, Guhr, Köpp, & Breitner, 2011) to the research topic of a “*Sustainable Business Model for Mobile Learning Services*” was enabled and motivated by the “UbiLearn”¹ project and an empirical analysis conducted during the diploma thesis “*Nutzerakzeptanz ubiquitärer Lernsysteme und Konzeption multimedialer Inhalte*” served as the basis for this research. Mobile devices range from embedded or small devices for everyday life, through a variety of common cellular phones to smartphones and handheld devices (Charsky & Raisinghani, 2009; Wu & Unhelkar, 2009) and m-learning is made possible by the existence and application of mobile computing technologies. But it should be noted that m-learning is significantly different from traditional learning or e-learning as it is capable of generating its own value-due to its “mobility” and coupled with the appropriate pedagogy (Mostakhdemin-Hosseini, 2009; Maske, Guhr, Köpp, & Breitner, 2011). To gain success, m-learning providers have to successfully and sustainably introduce m-learning services to the market. It is necessary to develop sustainable and appropriate business models for m-learning that provide added value for both users and providers (Breitner & Hoppe, 2005).

The research question that will be assigned to this field of research was:

a) Which critical factors can strengthen the sustainable design of business models for m-learning services?

¹ Since 2002, UbiLearn is a practically oriented research project at the Institute for Information Systems Research at the Gottfried Wilhelm Leibniz Universität Hannover. C.f. <http://www.ubilearn.de>

Technology Acceptance of Mobile Services and Systems (Chapter 3):

The motivation for the research paper of (Guhr, Loi, Wiegard & Breitner, 2012) concerning the topic of “*Technology Readiness in Customers’ Perception and Acceptance of M(obile) Payment: An Empirical Study in Finland, Germany, the USA and Japan*” stems from the fact that the possibilities and opportunities for m-payment are huge but m-payment has been successful in only few countries. The success or the failure of m-payment depends heavily on consumer acceptance and their technology readiness. Additionally, there is a need for comparative studies across cultures and countries. This study aims to fill this research gap by developing and testing an extended TAM that integrates the direct role of TR in the specific context of m-payment. The research question that will be assigned to this field of research was:

b) How does TR affect the acceptance of consumers towards m-payment in different countries?

Personality Traits and Information Security Management (Chapter 4):

Information security management is a highly relevant topic in IS research and the study of personality within the behavioral IS literature is sparse. However, within the context of information security management, it is not clear how personality traits of executives will ultimately impact the security level of IS and management. It is certain that executives’ behavior causes potential information security management risks and has a direct influence on the security level of IS and management. The research paper by (Uffen, Guhr, & Breitner, 2012) is therefore devoted to the research question:

c) Which personality traits of an information security executive have a major influence on technical and non-technical components of information security management?

By answering these research questions, the work contributes to both research and practice.

1.2 Methodology

To answer the research questions outlined previously, several methods are used and it should be noted that the IS research community is characterized by a large diversity of research approaches, methods, and topics. A method is in general a procedure, which is characterized by a certain set of instruments as a means to achieve a certain research objective (Wilde & Hess, 2006; Chmielewicz, 1994). In IS research the concept of method is characterized by two different forms: On the one hand, in IS research methods are used as a tool for gaining knowledge. On the other hand, methods serve to design IS (Wilde & Hess, 2006; Simon, 1996; March & Smith, 1995). The methods pluralism, as one of the most important cornerstone of the German “Wirtschaftsinformatik”, utilizes instruments of related disciplines like engineering, natural science, and formal science (Wilde & Hess, 2006). As a result, this methodological duality of IS research gives rise to various content and functional areas that can be edited by each knowledge or design-oriented goals with research methods. These two fundamental paradigms of IS research are subsumed in the literature under the following two terms (March & Smith, 1995).

The **design-oriented paradigm** (“Design Science”): “Design is fundamental to the IS discipline” (March & Storey, 2008). This paradigm is a quest for knowledge gained through development and evaluation of information technology solutions in the form of models, methods, constructs, IT artifacts or systems (Adomavicius, Bockstedt, Gupta, & Kauffman, 2008). “Whereas natural sciences and social sciences try to understand reality, design science attempts to create things that serve human purposes” (Simon, 1996, p. 55) and is therefore a problem solving-paradigm (Hevner & Chatterjee, 2010). Because the design science research paradigm addresses two key issues the central role of IT artifacts in IS research (Orlikowski & Iacono, 2001; Benbasat & Zmud, 2003) and the perceived lack of professional relevance of IS research, this paradigm is highly relevant to IS research (Hevner & Chatterjee, 2010; Hirschheim & Klein, 2003; Benbasat & Zmud, 1999;

Pfeffers, Tuunanen, Rothenberger, & Chatterjee, 2007; Pries-Heje & Baskerville, 2008). The results of design research include innovative artifacts as well as knowledge about creating other artifacts (“design principles”) (Sein, Henfridsson, Purao, Rossi, & Lindgren, 2011). The design-oriented paradigm seeks to extend the boundaries of organizational and human capabilities by creating innovative and new artifacts (Hevner, March, Park, & Ram, 2004).

The **behavioral paradigm** (“Behavioral Science”): This paradigm focuses on the analysis of the behavior and the impact of existing IS with regard to organizations and / or individuals and has its roots in natural science research methods (Hevner & Chatterjee, 2010; Hevner, March, Park, & Ram, 2004). It seeks to develop and justify theories that predict or explain human and organizational phenomena surrounding the design, analysis, implementation, and use of IS (Hevner & Chatterjee, 2010; Hevner, March, Park, & Ram, 2004).

Initially the two paradigms are an opposite and excluded significantly from each other (Kuechler, Vaishnavi, & Kuechler, 2007). This is especially due to different priorities – truth as objective or goal and rigor, e. g. methodological rigor as a priority on the side of the behavioral science versus benefits as objective and practical relevance as a priority on the side of the design science (Benbasat & Zmud, 1999; March & Smith, 1995; Hevner, March, Park, & Ram, 2004; Lee A. S., 1999). More recent sources emphasize that rigor and relevance not exclude themselves. They demand an integrated approach of the two paradigms considered as complementary parts and thus a methodological pluralism in information research (Hevner, March, Park, & Ram, 2004; Kuechler, Vaishnavi, & Kuechler, 2007; Becker & Pfeiffer, 2006; Schelp & Winter, 2008). However, it should be observed that behavior and technology are not dichotomous in IS and therefore inseparable in IS research because they are two sides of the same coin (Lee A. S., 2000; Hevner, March, Park, & Ram, 2004).

At one level (degree of formalization), research methods in science and especially in IS research, can broadly be categorized into two dimensions or streams: qualitative and quantitative (Lee & Hubona, 2009; Myers & Avison, 2002; Venkatesh, Brown, & Bala, 2012-2013). The two terms qualitative and

quantitative are differentiated by the coarse and mainly numerically predominant language represent able issues. Based on the method, it is the formalization of the research object (Wilde & Hess, 2006). It is observed, however, that mixed-method approaches are becoming increasingly important in IS research because they offer not only the possibility for analysis the collected data, they also have the potential to foster theory building (Wu P. F., 2009). Nine possible combinations in accordance with Johnson and Onwuegbuzie (Johnson & Onwuegbuzie, 2004) are illustrated in Figure 1-1.

	Concurrent	Sequential
Equal Status	QUAL + QUAN	QUAL → QUAN QUAN → QUAL
Dominant Status	QUAL + quan QUAN + qual	QUAL → quan qual → QUAN QUAN → qual quan → QUAL

Legend:
 quan = quantitative; qual = qualitative
 Capital letters = high priority or weight
 + = concurrent
 → = sequential

Figure 1-1: Matrix of the Mixed Methods Design
 (Johnson & Onwuegbuzie, 2004, p. 22)

To answer the research questions outlined previously, several methods are used for both research paradigm but their formalization varies. In order to narrow down specific areas of research and to derive relevant factors, the argumentative-deductive analysis based on literature review was used (Wilde & Hess, 2007). Although representative expert studies within the meaning of (Wilde & Hess, 2006, p. 8) are not a complete research method, we used it in the sense of a mixed-method approach as mentioned above in combination with quantitative-empirical analysis. It should be noted that the focus of the methodology is primarily on the quantitative-empirical analysis. But the au-

thor agree with Chin, Junglas & Roldán that “quantitative methods can be used to explore and generate new understanding, opening the door for qualitative methods to dig deeper into a particular research area.” (Chin, Junglas, & Roldán, 2012, p. 1). Ultimately it was also mentioned by Lyytinen (Lyytinen, 1999) that “research practices that engage researchers deeply – like development research, which combines both constructive and empirical elements – are largely missing” (Lyytinen, 1999, p. 26). In particular, this aspect is taken into account in this thesis (e. g. Chapter 2).

1.3 Interdisciplinary models and multivariate analysis

In both research fields models from different research areas (e. g. IS research, marketing and psychology) are used for analysis and further develop and illustrate the interdisciplinary nature of this thesis. To this end, the created and / or extended models and the underlying hypotheses were tested by means of multivariate analysis. For this reason, in the following two sections (1.3.1 and 1.3.2) the author take a closer look at the basic adjustments of the theory, the derivation of appropriate hypotheses and its evaluation using multivariate analysis methods in the form of SEM and analysis of variance approaches.

1.3.1 Technology Acceptance

The use of information technology such as for mobile services and the individual acceptance of such technologies is one of the most mature streams of IS research (Venkatesh, Thong, & Xu, 2012; Benbasat & Barki, 2007; Lee, Cho, Gay, Davison, & Ingraffea, 2003). Furthermore, previous research highlights that the lack of technology acceptance can lead to loss of resources and money (Hossain & de Silva, 2009). At the same time it is increasingly viewed as an important element for measurement of IS success (DeLone & McLean, 1992). In the 1970's, growing technology needs and increasing failures of technology adoption, predicting system use became an area of inter-

est for many researchers (Chuttur, 2009) and IS research has contributed to a deeper understanding of this process. In 1985, Davis suggested the TAM, which examines the role of perceived usefulness and perceived ease of use in their relation between the probability of system use as an indicator of system success and the system characteristics as external variables (Legris, Ingham, & Colletette, 2003). Recent work in a variety of disciplines, including e. g. IS, marketing, psychology, sociology and economics, have demonstrated the value of using research models for a variety of important problems. The development of research on technology acceptance was mainly coined by the following research approaches and models (cf. Table 1-1).

Table 1-1: Expression and development of acceptance research

Source: Own illustration according to (Königstorfer, 2008)

Sources that have shaped the following concepts/models crucial	<ul style="list-style-type: none"> • Diffusion of Innovation (Rogers, 1962; Rogers, Diffusion of Innovations, 2003) • Theory of Reasoned Action TRA (Fishbein & Ajzen, 1975) • Theory of Planned Behavior TPB (Ajzen, The theory of planned behavior, 1991; Ajzen, 1985; Ajzen & Madden, 1986)
Diffusion theory by Rogers (Rogers, 1962)	<ul style="list-style-type: none"> • Diffusion Theoretical Approach under validation of "Perceived Characteristics of Innovations" (Moore & Benbasat, 1991)
IS research (mainly Anglo-American adoption and acceptance research)	<ul style="list-style-type: none"> • Technology Acceptance Model TAM (Davis, 1989) • Social Cognitive Theory (Compeau & Higgins, 1995) • Technology-Task-Fit-Model TTFM (Goodhue, 1995) • Unified Theory of Acceptance and Use of Technology UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) • UTAUT 2 (Venkatesh, Thong, & Xu, 2012)
Marketing and the German „Wirtschaftsinformatik“ (particularly common in Germany)	<ul style="list-style-type: none"> • Acceptance Model of Degenhardt (Degenhardt, 1986) • Dynamic Acceptance Model of (Kollmann, 1998) • Compass-Akzeptanzmodell (Amberg, Figge, & Wehrmann, 2002; Amberg, Hirschmeier, & Wehrmann, 2004; Amberg, Hirschmeier, & Wehrmann, 2003)

The TAM by Davis (Davis, 1989) (cf. Figure 1-2) that is related to alternative models such as TRA and TPB, and its extensions e. g. TAM 2, TAM 3 (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008) are at present a preeminent theory of technology acceptance in IS research (Lee, Kozar, & Larsen, 2003). Legris, Ingham & Colletette describe the main contribution of the TAM to provide a basis for tracing the impact of external variables on internal beliefs, attitudes, and intentions (Legris, Ingham, & Colletette, 2003). One of the most notable developments of the original TAM, which is based on a synthesis of eight models / theories of technology use, is the UTAUT (Unified Theory of Acceptance and Use of Technology) model by Venkatesh et al. (Venkatesh, Morris, Davis, & Davis, 2003). This model includes 41 independent variables for predicting intentions and eight independent variables for predicting behavior (Venkatesh, Morris, Davis, & Davis, 2003; Wu P. F., 2009). This model was developed in 2012 by Venkatesh, Thong, & Xu (Venkatesh, Thong, & Xu, 2012) to UTAUT 2.

Numerous empirical tests have shown that TAM is a robust and parsimonious model of technology acceptance behaviors in a wide variety of IT (Gefen & Karahanna, 2003)(a summary of this literature is available in e. g. (Gefen & Straub, 2000; Legris, Ingham, & Colletette, 2003)), across different levels of expertise (Taylor & Todd, 1995) and across countries e .g. (Straub, Keil, & Brenner, 1997; Rose & Straub, 1998; Guhr, Loi, Wiegard, & Breitner, 2013). The TAM by Davis (Davis, 1989) includes five connected dimensions: Perceived Usefulness, Perceived Ease of Use, Attitude toward Use, Intention to Use and Actual Usage, cf. Figure 1-2. The arrows represent the connections between the proposed dimensions. The TAM theorizes that the effects on external variables such as development process, training, system characteristics on the intention to use are mediated by perceived ease of use and perceived usefulness (Venkatesh & Davis, 2000). Furthermore, perceived usefulness is influenced by perceived ease of use, other variables / parameter being equal. This is because "...the easier the system is to use the more useful it can be." (Venkatesh & Davis, 2000, p. 187). The attitude toward use in turn has a direct impact on the intention and these in turn to the actual use of a system.

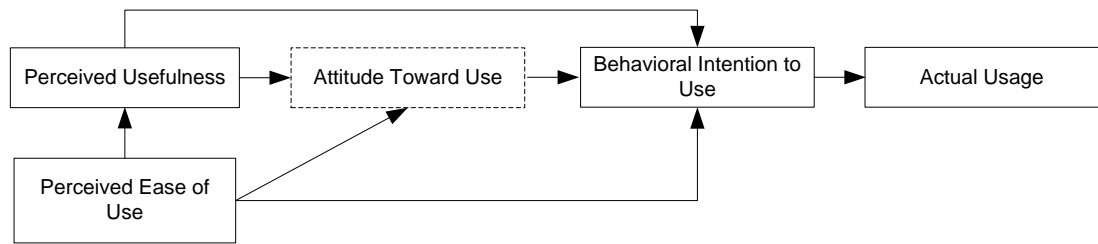


Figure 1-2: Technology Acceptance Model

The model is grounded in theory and in terms of the validity of the connections shown in the model, there is no doubt. TAM consistently explains about 50 % of the variance in technology usage and behavior (Venkatesh & Davis, 2000; Dillon, 2001; King & He, 2006).

1.3.2 Structural Equation Modeling (SEM)

Researchers devote time to investigate, design and develop sound methods, which are often viewed as a byproduct or ‘sidetrack’ topic, to best conduct their research topic (Chin, Junglas, & Roldán, 2012). Furthermore, the creation and development of models in science plays a central role in evaluating and explaining different situations, facts and aspects. SEM, as a standard tool for empirical hypothesis testing, are of paramount importance in any scientific discipline such as e. g. psychology (Iacobucci, 2010), marketing (Jarvis, MacKenzie, & Podsakoff, 2003; Hair, Sarstedt, Ringle, & Mena, 2012), organization research (Bagozzi, 2011; Podsackoff, MacKenzie, Podsackoff, & Lee, 2003), social science (Gefen, Rigdon, & Straub, 2011) as well as business disciplines (Gefen, Rigdon, & Straub, 2011) and has become a quasi-standard for empirical studies in IS research (Henseler, Fassott, Dijkstra, & Wilson, 2012; Petter, Straub, & Rai, 2007; Gefen, Rigdon, & Straub, 2011). SEMs (Bollen, 1989; Kaplan, 2000) include a variety of statistical methodologies including a variety of quality assurance methods as well as apparent varying fit indices (Gefen, Rigdon, & Straub, 2011).

SEMs are among the multivariate analysis methods, as regression analysis and factor analysis are interconnected. It follows that both components of a SEM, structure and measurement model, can be estimated simultaneously

(Bollen, 1989; Gefen, Rigdon, & Straub, 2011), either together as in covariance-based SEM (CBSEM) or iteratively as in Partial Least Squares (PLS) (Gefen, Rigdon, & Straub, 2011). In general, they should estimate a network of causal relationships, according to a theoretical model, linking two or more complex latent constructs, each measured through a number of observable indicators (Vinzi, Trinchera, & Amato, 2010). The “concepts are the starting point in measurement” (Bollen, 2011, p. 360) and thus the concept of an empirically verifiable theory. They refer to the ideas that have a common basis and their meaning is described in a theoretical definition. The number of different components that encompasses the concept is the dimensionality and therefore the theoretical definition should make clear the number of the dimensions which in turn reflect the latent constructs (Bollen, 2011). Therefore, latent variables can be described as conceptual, hypothetical variables that represent the truth that cannot be observed directly (Bollen, 2002). Before the process of pure analysis, there are further steps to conduct: the conception and operationalization of the latent constructs (construct development) as well as the quality control (Weiber & Mülhauß, 2010). The bases for these are, as mentioned above, theories from which ultimately hypotheses are derived, allowing an empirical examination of the relationship. A theory “defines the variables, specifies the domain, builds internally consistent relationships, and makes specific predictions” (Wacker, 1998, p. 361) on the basis of axioms and assumptions. Hypotheses include generally consistent and by the considered theory justifiable statements, whose validity is in reality only suspected (Weiber & Mülhauß, 2010). As scientific hypotheses are considered only if they meet the following criteria (Bortz & Döring, 2006, p. 4):

- The statement of a hypothesis is generally valid.
- The hypothesis has a relation to real situations that can be empirically tested.
- The hypothesis is based, at least implicitly, on the formal structure of a meaningful conditional sentence.
- The conditional sentence must be potentially falsifiable (it must be a possible result to contradict this statement or sentence).

The conception and operationalization is one of the most important aspects in SEM to ensure consistency (Polites, Roberts, & Thatcher, 2012), which implies, as already indicated, that the researcher has extensive theoretical and factually logical skills that allow him to formulate a sufficiently justified a priori formulation of the causal relationship. Before that, researchers generally have to distinguish between two approaches or SEM techniques: variance-based techniques (represented e. g. by (Wold, 1996), PLS) and covariance-based techniques (represented e. g. by LISREL, AMOS, EQS) (Henseler, Fassott, Dijkstra, & Wilson, 2012; Gefen & Straub, 1997; Diamantopoulos, 2011). In this thesis, only a few aspects should be addressed with regard to the selection of the approach. The respective quality criteria and fit-indices should not be considered in detail due to the scope and the fact that e. g. LISREL as a covariance-based techniques alone print about 38 different indices in the “Goodness of Fit Statistic” (Iacobucci, 2010). Furthermore, the focus of the author is on the analysis of variance-based techniques such as PLS. This is partly due to the fact that all examined models in the research papers represent fully- or partly-recursive models, which did not require approaches such as LISREL, EQS or AMOS. However, of course, other factors have had influence on the decision of the approach that will be described in more detail in the individual chapters. Further, extensive reference is therefore made to the literature. But it should be briefly noted at this point that PLS path modeling has specifically become a key multivariate analysis method in top-tier IS journals such as the *Management Information Systems Quarterly* (MISQ), *Information Systems Research* (ISR), and the *European Journal of Information Systems* (EJIS) (Henseler, Fassott, Dijkstra, & Wilson, 2012).

One aspect that is critically discussed in literature and should be addressed in this thesis is the selection of an appropriate measurement model, which is a key criterion for the selection of an appropriate approach as well. Generally, one can distinguish between two types of measurement models, reflective and formative measurement models (cf. Figure 1-3).

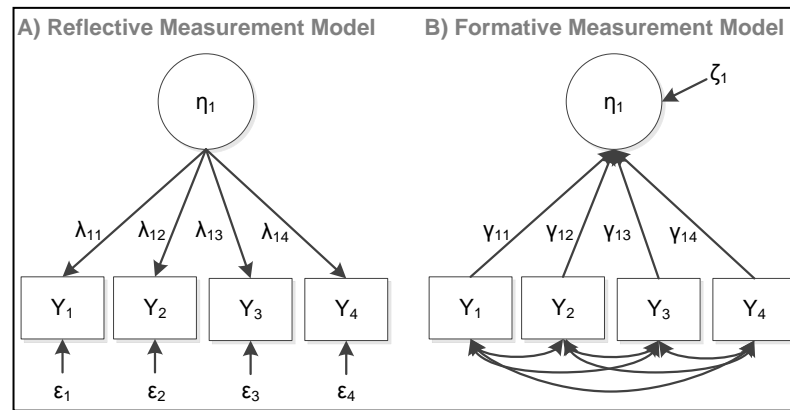


Figure 1-3: Measurement Models

The measurement model analyzed the relationship between the latent constructs and their associated indicators, also known as measures or items (Bollen, 2011). Measurement models and their conceptualization differ with regard to their basic premises (Uffen, Guhr, & Breitner, 2012) and therefore they can be modeled with either reflective or formative indicators (MacKenzie, Podsackoff, & Podsackoff, 2011), because they are not inherently formative or reflective as mentioned above. The first scientist who made a distinction between effect and causal indicators is Blalock (Blalock, 1964; Bollen, 2011). This distinction is important because proper specification of a measurement model is necessary to assign meaningful relationships in the structural model (Anderson & Gerbing, 1982; Coltman, Devinney, Midgley, & Venaik, 2008). Reflective measurement models are the most common type of measurement models used in SEM (Centefelli & Bassellier, 2009), but in recent popularity and interest in formative measurement has increased in different scientific disciplines e. g. marketing (Jarvis, MacKenzie, & Podsakoff, 2003), social science and IS research (Petter, Straub, & Rai, 2007; Shin & Kim, 2011; Henseler, Fassott, Dijkstra, & Wilson, 2012; Bollen, 2007; Centefelli & Bassellier, 2009; Diamantopoulos & Papadopoulos, 2010; Diamantopoulos, Reifler, & Roth, 2008), quality of life research (Fayers & Hand, 2002), strategy (Podsackoff, Shen, & Podsackoff, 2006) and beyond (Diamantopoulos & Siguaw, 2006). Reflective constructs have observed measures that are affected by an underlying, unobservable, latent construct (MacCallum & Browne, 1993; Petter, Straub, & Rai, 2007). In IS literature, reflective constructs are used for e.g. attitude or personality (cf. Chapter 4),

where the unobservable can be considered as giving “rise to something observed” (Haenlein & Kaplan, 2004). The interchangeability of the indicators, the direction of the causality, the co-variation among the indicators, and the nomological net of the constructs, should not differ (Petter, Straub, & Rai, 2007). But it should be noted that not all latent constructs in research are measurable with a variety of positively correlated indicators (Coltman, Devinney, Midgley, & Venaik, 2008; Bollen & Lennox, 1991).

In contrast to their reflective counterparts, formative constructs reverse the direction of causality, which means that the indicators define the characteristics of the construct and changes in indicators causing changes in the underlying construct (Chwelos, Benbasat, & Dexter, 2001; Bagozzi, 2011; Diamantopoulos, 2011; Henseler, Fassott, Dijkstra, & Wilson, 2012). They are also known as causal indicators and reflect the idea that “[...] indicators could be viewed as causing rather than being caused by the latent variable measured by indicators” (MacCallum & Browne, 1993, p. 533). The main difference between these two forms of measurement models is the reverse direction of the relationship or the assumed causality between indicators and the latent construct. This should be considered with caution, and, as (Jarvis, MacKenzie, & Podsakoff, 2003, p. 199) mentioned, a “...few studies use formative indicator measurement models, even though they should” and on the other side, a large number of presumably reflective constructs can be regarded as misspecified, and should rather be specified as formative (Petter, Straub, & Rai, 2007). Fassott & Egger (Fassott & Eggert, 2005) noted in a meta-analysis of 25 articles with 135 latent constructs that they were treated as reflective, even though in 109 cases they must be operationalized as formative. A similar result was shown in a study of Eberl (Eberl, 2004). He examined the specification of latent variables in 34 articles of the “Journal of Marketing”, and concluded that 11% of 353 latent variables were specified incorrectly (Weiber & Mülhhaus, 2010). However, recently researchers in a variety of disciplines deal with the issue of misspecification and the resulting question of the proper operationalization and conceptualization of measurement models, especially formative measurement models (MacKenzie, Podsackoff, & Podsackoff, 2011; Franke, Preacher, & Rigdon, 2008; Kim, Shin, & Grover, 2010; Howell, Breivik, & Wilcox, 2007; Aguire-Urreta &

Marakas, 2012). Others try to give guidance to researchers in determining which type of measurement model is conceptually suitable, in developing scales using formative indicators and specifying SEMs incorporating these variables (MacKenzie, Podsakoff, & Podsakoff, 2011). This led to increasing attention on more rigorous assessment of the measurement properties of constructs and on construct validity in general (Jarvis, MacKenzie, & Podsakoff, 2003). “When the ultimate of researchers is to build models that reflect the underlying nature of the phenomena under study, this is clearly a valuable development” (Aguire-Urreta & Marakas, 2012, p. 136). Therefore, researchers must ensure that the theoretical and the operational levels of a construct are connected (Petter, Rai, & Straub, 2012). This will require a correct specification of the measurement model. A misspecification could impact on theory and may ultimately lead to an empirical and theoretical misinterpretation. For these reasons, it should be noted that the model is based on theory and researchers specify their measurement models to match their theoretical conceptualization.

1.4 Structure of the thesis

The results of the research areas are divided into the sections *Technology Acceptance as part of a Sustainable Business Model for Mobile Learning Applications* (Chapter 2), *Technology Readiness in Customers’ Perception and Acceptance of M(obile)-Payment: An Empirical Study in Finland, Germany, the USA and Japan* (Chapter 3), and *Information Security Management and Personality Traits: An Empirical Study* (Chapter 4). Each of these sections has its own focus, forms an independent research topic with specific research questions, and, as mentioned, already presented in a separate chapter. The relationship of the sections to each other and their integration into the overall themes are discussed below. The frames around the three chapters span the Chapter 1 and a critical appreciation of the whole research in Chapter 5. Fundamental elements for all areas, such as methodological similarities and unique models are explained in detail in Chapter 1.2. Any further developments of the models are described in each chapter in detail. A

comprehensive management summary and an overall view of the publications can be found in the prefix, cf. Figure 1-4.

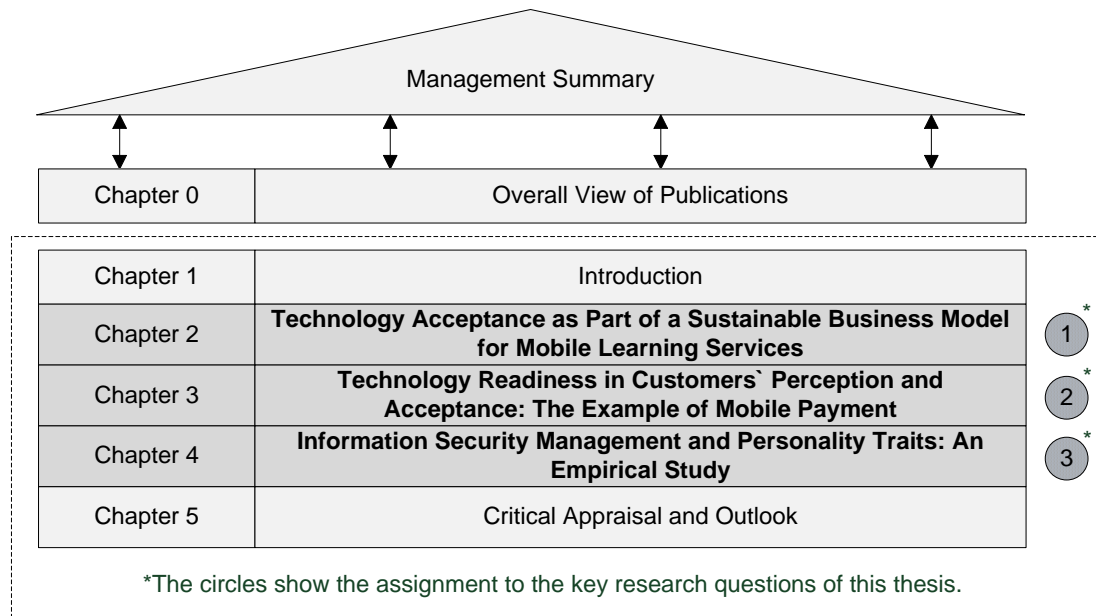


Figure 1-4: Structure of the Thesis

The presented research papers devoted to various aspects of technology acceptance of mobile services and information security management, take different perspectives. The different aspects are illustrated in each case with a specific example. The structural design of the chapter 2-4 is comparable, cf. Figure 1-5. Due to the fact that each chapter will have a different focus, in section 1 of each chapter a specific introduction is made. In Section 2 specific theoretical foundations are explained and the state of research is presented. These remarks are made, because of the special importance of a common understanding and a precise terminology in the scientific approach (Bortz & Döring, 2006). This is followed by presentation of the selected research design and the used research method (Section 3). A summary of the results is presented in section 4. The elaborations are limited to the main results of the respective research topic. Following this, in section 5, a critical appraisal of the research paper is given. In this case, limitations are demonstrated as well as an outlook on further research is given. The conclusion of each chapter is the classification of the respective publication. Next to nam-

ing of the involved authors, it is illustrated, where the research paper was published and which target group is addressed (section 6).

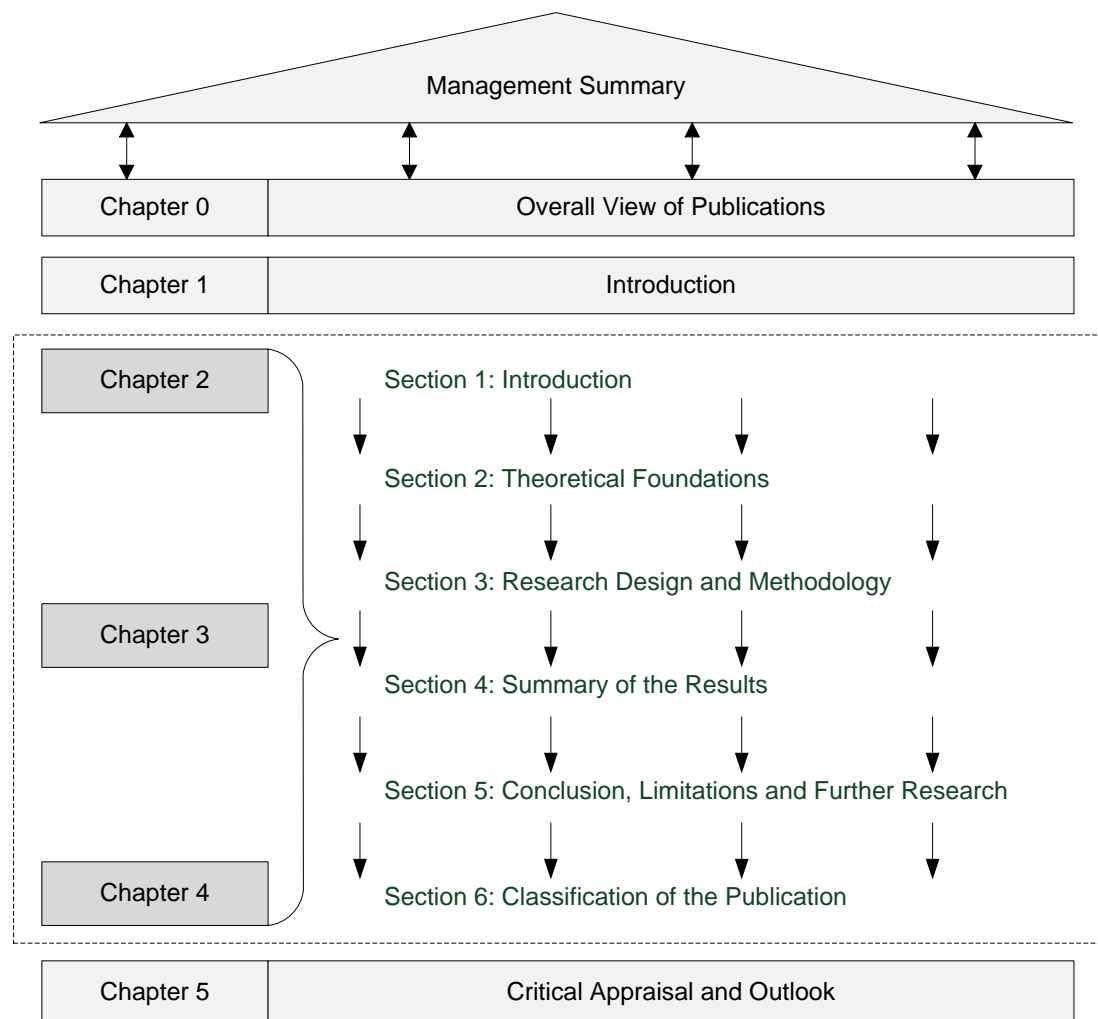


Figure 1-5: Structure of the Section 1 – 6 in the Chapter 2 – 4

2 Technology Acceptance as Part of a Sustainable Business Model for Mobile Learning Services

2.1 Introduction

The latest advances in the field of communication network and tools have led to the development of mobile devices and communication technologies and the market for mobile computing technologies has changed dramatically. The last decade is marked by a dramatic increase in interest in these devices and communication technologies. Mobile devices have transformed the lives of many people and simplified many tasks. Due to the possibility of location- and time-independent communication and because mobile technologies generate a reconstruction of the relationship between time and space, they have become an important tool in work-life balance (Leclercq-Vandelannoitte, 2009). The term ‘mobility’ is not characterized by technology. By replacing physical mobility by informal mobility, tasks can be done more efficiently and effectively. Lyytinen and Yoo define mobile technologies as a network “of interconnected technological, and social, and organizational elements” (Lyytinen & Yoo, 2002, p. 377). By 2011 the number of mobile phone subscriptions grew to 5.972 billion which is close to the 7.1 billion world population (ITU, 2012). Ally (Ally, 2007) discusses the phenomenon that “people are on the move and demanding access to learning materials and information anytime and anywhere”. M-learning is made possible by the existence as well as application of mobile technologies. It enables the presentation and use of learning materials that make it more adaptable to individual learning styles and levels the way for tackling problems with literacy or numeracy (Tetard & Patokorpi, 2008; Attewell & Savill-Smith, 2003). Furthermore, m-learning applications range, from corporate learning settings, distance learning, informal and formal learning to classroom learning, and field study (Park Y. , 2011). On the one hand, the mobile market is characterized by an extremely high number of products, services and brands that try to attract customers in a very competitive market. On the other hand, customers have become more and more demanding with regard to innovation and are quick to change mobile devices if something new is introduced to the market and/or promoted by media (Garito, 2009). As a result, the number of different smartphone plat-

forms continues to grow and each device's individual characteristics continue to evolve. To gain sustainable market success, m-learning providers have to successfully and sustainably offer m-learning services to the market. It is necessary to develop appropriate and sustainable business models for m-learning that provide added value for both users and providers (Breitner & Hoppe, 2005). Figure 2-1 give an overview of the structure and the research methodology used in the paper of Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011).

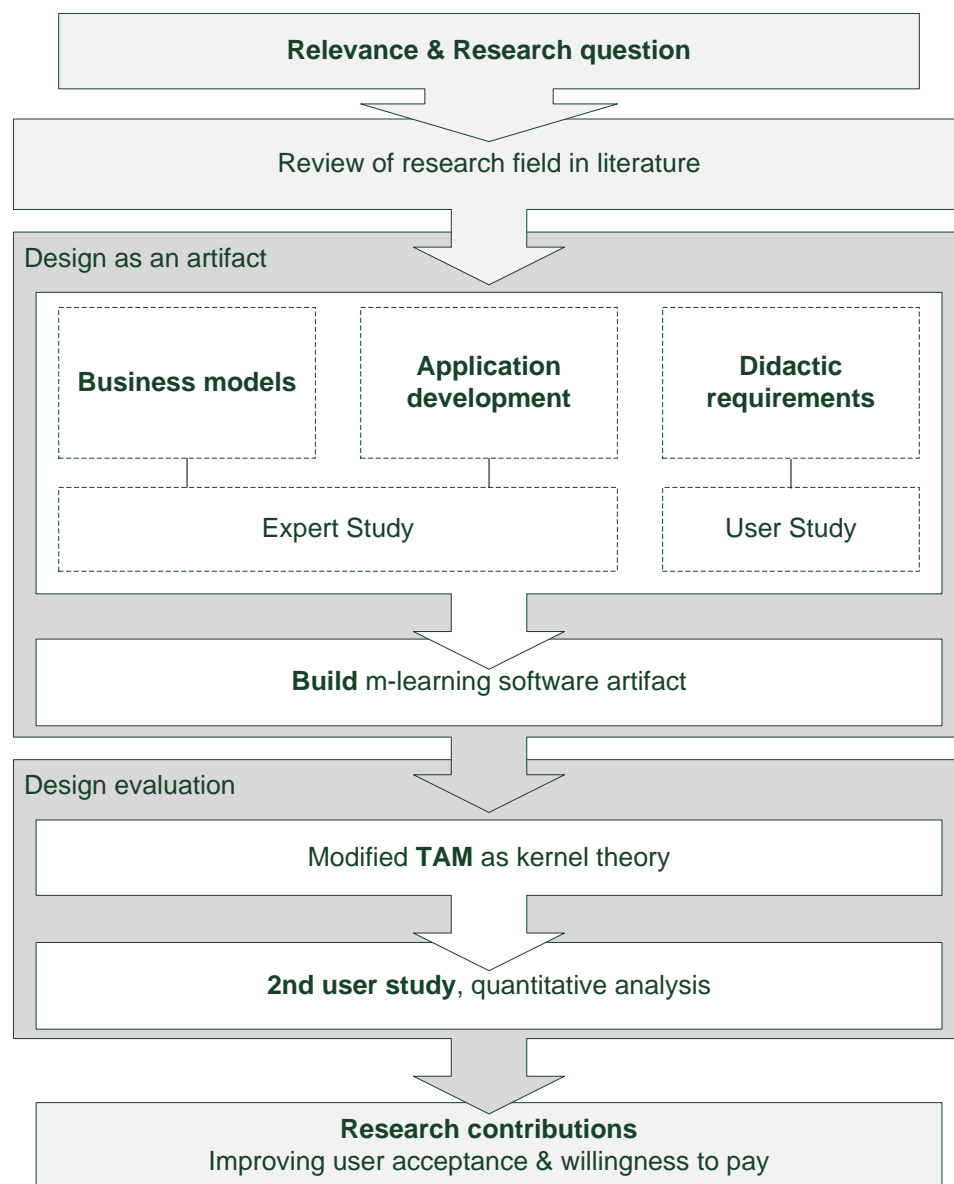


Figure 2-1: Research Process and Methodology

2.2 Theoretical Foundations

2.2.1 M-Learning

There are a number of different definitions of m-learning in literature that are expressed in a variety of different viewpoints. M-learning shares some similarities with e-learning but complies with the basic definition of an m-business application: "...use of the mobile information technologies, including the wireless Internet, for organizational communication and coordination, and the management of the firm" (Scornavacca, Barnes, & Huff, 2006). In the research paper of Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) the most common definition from Trifonova (Trifonova, 2006) is used: "m-learning is described as e-learning through mobile [...] devices". Laptops or similar devices (e. g. netbooks or subnetbooks) are excluded because even if they can be transported easily from one place to another, they are commonly not used in phases of mobility like it's typical for m-learning (e. g. cycling, walking etc.) (Georgiadis, 2006). In addition to the above mentioned definitions Traxler (Traxler & Kukulska-Hulme, 2007) explored two main directions for defining and conceptualizing m-learning:

1. The technology-centric perspective, which defines it purely in terms of its technologies and its hardware.
2. The learning-oriented perspective that examines the underlying learning experiences and asks how m-learning differs from other forms of education, especially other forms of e-learning.

Considering the various definitions there are a number of possible prospects of m-learning, which are essential for the interpretation. Adapted from Cobcroft (Cobcroft, Towers, Smith, & Bruns, 2006) Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) identified three characteristics added values that m-learning services can provide: Anywhere m-learning, anytime m-learning and anyway m-learning. The results of a literature review are shown in table 2-1.

Table 2-1: Characteristic Added Values of M-learning

Characteristics of M-learning	Description	Source
Anywhere m-learning	Location independent learning	(Quinn, 2000; Harris, 2001; O'Malley, et al., 2003; Naismith, Lonsdale, Vavoula, & Sharples, 2004; Sharma & Kitchens, 2004; Keegan, 2005; Traxler & Kukulska-Hulme, 2007; Jones, Issroff, Scanlon, Clough, & McAndrew, 2006; Trifonova, 2006; Motiwalla & Jialun, 2007) (Patokorbi, Tétard, Qiao, & Sjövall, 2007; Pozzi, 2007; Winters, 2007; Tetard & Patokorpi, 2008; Khaddage, Lanham, & Zhou, 2009; Ismail, Idrus, & Johari, 2010; Wendeson, Ahmad, & Haron, 2011; Park, Kim, & Lee, 2011; Ciurea & Pocatilu, 2012) (Hung & Zhang, 2012; Gu, GU, & Laffey, 2011; Seraj & Wong, 2012; Zhou & Hu, 2012)
Anytime m-learning	Time-independent learning	(Harris, 2001; O'Malley, et al., 2003; Naismith, Lonsdale, Vavoula, & Sharples, 2004; Sharma & Kitchens, 2004; Traxler & Kukulska-Hulme, 2007; Jones, Issroff, Scanlon, Clough, & McAndrew, 2006; Trifonova, 2006; Motiwalla & Jialun, 2007; Patokorbi, Tétard, Qiao, & Sjövall, 2007; Pozzi, 2007) (Winters, 2007; Tetard & Patokorpi, 2008; Khaddage, Lanham, & Zhou, 2009; Ismail, Idrus, & Johari, 2010; Park, Kim, & Lee, 2011; Ciurea & Pocatilu, 2012) (Hung & Zhang, 2012; Gu, GU, & Laffey, 2011; Seraj & Wong, 2012; Zhou & Hu, 2012)
Anyway m-learning	Informal learning concepts	(O'Malley, et al., 2003; Naismith, Lonsdale, Vavoula, & Sharples, 2004; Sharma & Kitchens, 2004; Traxler & Kukulska-Hulme, 2007; Motiwalla & Jialun, 2007; Winters, 2007; Tetard & Patokorpi, 2008; Khaddage, Lanham, & Zhou, 2009; Ismail, Idrus, & Johari, 2010; Zhou & Hu, 2012)

The use of mobile internet in teaching leads to numerous technical problems, especially regarding the design and development of applications to be considered for mobile devices. This also led to economic consequences. The heterogeneity of mobile hardware and software platforms complicates the process. Mobile application development depends mainly on specific features in terms of user interface, interoperability features and targeted mobile devices and is influenced by their underlying platform for running these applications (Shanmugapriya & Tamilarasi, 2011). The average memory capacity and the power of mobile CPUs are much lower than that of stationary CPUs. Due to the small displays, the playback of multimedia content is commonly limited and the user interface suffers from small keypads and multiple-shared touch pads or keys. Because of the mobile devices' miniaturization and their commonly battery-powered use, these limitations are conceptual and it is argued that every software engineering process for mobile devices must also take these special mobile characteristics into consideration (Marhameh & Unhelkar, 2009; Rupnik, 2009). Furthermore, it has to be considered that m-learning applications can be developed either as client-side applications that run natively on the mobile device or as web application that run on a remote server and are displayed on a mobile web browser (Wagner, Gruber, & Hartmann, 2008). As a result, development and maintenance of mobile applications such as m-learning applications is cost-intensive (Mostéfaoui, 2006). The synopsis of supported programming languages by mobile operating systems presented in the research paper by Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) has been aggregated from a literature review of 50 technological specifications provided by producers of mobile operating systems and programming languages. As mobile technologies evolve and change rapidly, it should be noted that the literature review has been done from January to September 2010.

2.2.2 Business Models

Business models are used in many fields of research and are becoming increasingly popular in management, strategy and IS literature (Hedman & Kalling, 2003). With the rise of the dot.com the term “business model” has gained popularity in practice and theory (Osterwalder, Pigneur, & Tucci, 2005). It is often used to describe the key components of a business, but the literature about electronic and mobile business is not consistent in the usage of this term (Hedman & Kalling, 2003; Seddon, Lewis, Freeman, & Shanks, 2004). In general, a business model can be understood as “an architecture for the product, service and information flow, including a description of the various business actors; and a description of the sources of revenues” (Timmers, 1998).

Because m-learning services have to be sustainably and successfully introduced into the market, it is necessary to develop sustainable and appropriate business models and the different actors are still trailing by ways of a diversity business models to overcome (Nasiri & Deng, 2009). A business model for m-learning consolidates and integrates strategic prepositions concerning an activity sub model, a market sub model, and an asset sub model (see Figure 2-2). An analysis of these issues provides the identification of critical success factors for the commercialization of m-learning services (Breitner & Hoppe, 2005).

To motivate users to a high frequency and intensity of use the activity sub model needs to be linked to the market sub model that itself is strongly characterized by critical user acceptance factors as well as added values. These special added values in the context of m-learning are: anywhere learning, anyway learning and anytime learning (cf. Table 2-1). But to gain these mentioned values, the application need to fit to didactic-related requirements as multimedia integration, interactive exercises an appropriate number of exercises that give immediate response to improve learner’s receptiveness (Petrova, 2007; Liu, Li, & Carlsson, 2009; Sharp, Rogers, & Preece, 2007).

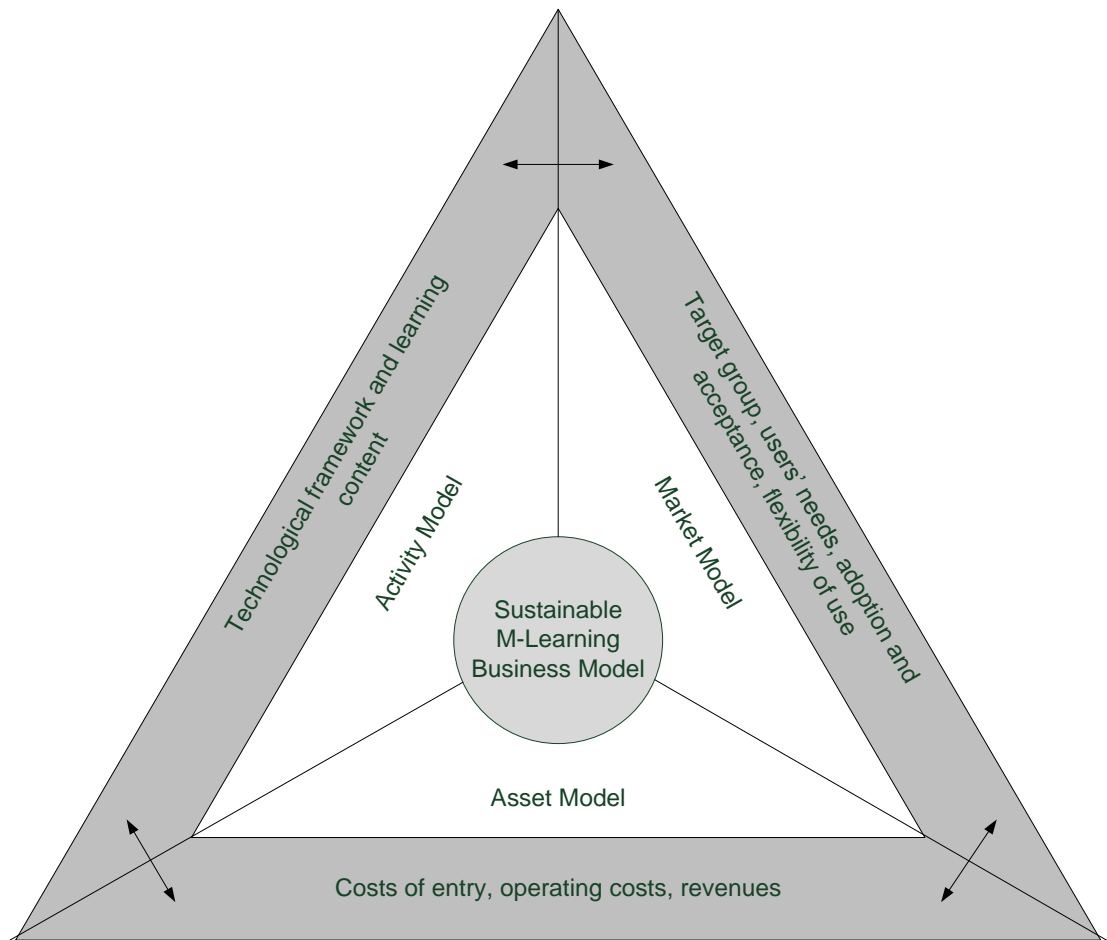


Figure 2-2: Trilateral Business Model

Source: Illustration according to Breitner & Hoppe (2005) and Maske (2011)

Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) focus in their work on the activity sub model that integrates the application design as well as the design of learning courses.

Successful m-learning business models allows all parties in the value chain to generate revenue streams and requires a revenue sub model as part of the asset model that usually describes the generation of the revenue streams. The four types of the revenue sub model according to Breitner & Hoppe (Breitner & Hoppe, 2005) and De Reuver, Bouwman & De Koning (De Reuver, Bouwman, & De Koning, 2008) for electronic markets are shown in Figure 2-3. The cost model of m-learning development projects, deducted from software projects in general, are highly impacted by application devel-

opment and maintenance costs (Jorgensen & Shepperd, 2007) and linked to the asset model.

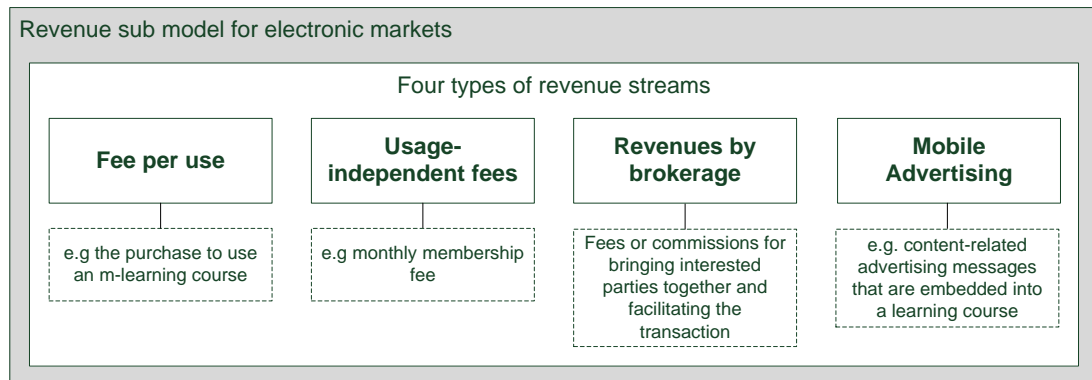


Figure 2-3: Revenue Sub Model for Electronic Markets

Source: Own illustration according to Breitner & Hoppe (2005) and DeReuver, Bouwman & De Koning (2009)

2.3 Research Design and Methodology

The objective of this research contribution by (Maske, Guhr, Köpp, & Breitner, 2011) is to show a path towards a sustainable business model for m-learning applications. For this purpose, the researchers use the design science approach that is justified on the grounds of the research project (cf. Figure 2-1). The design science research framework is used, because it provides a framework that can be used for IS applied research. Furthermore, it provides an adequate framework for the evaluation of models and/or artifacts and can be used to extend the scope of the research (Adomavicius, Bockstedt, Gupta, & Kauffman, 2008). The design science approach is intended to contribute to the knowledge base of the research community in general in an exploratory way as well as to help practitioners in designing m-learning applications. Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) have identified a specific aspect of problem relevance to design m-learning applications that can be introduced sustainably to the market. According to Hevner, March, Park & Ram (Hevner, March, Park, & Ram, 2004), both the construction and the evaluation of the artifact uses rigorous

research methods. The intended artifact in the research paper from Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) is an m-learning application running on smartphones that provides a sample of an interactive learning course to students. Prior to building the artifact, an expert study with 31 German experts from science and industry was performed to determine which delivery method is acceptable and which type of revenue sub model is suitable for business models. In the next step, an exemplary m-learning course is created. To adjust the didactic-related requirements that are necessary to gain m-learning added value, a field study has been conducted with a randomly selected sample of 150 students in several economic courses, but, the research model itself was developed, through different techniques. Considering the recommendations of Hevner, March, Park & Ram (Hevner, March, Park, & Ram, 2004), a quantitative research based on the results of the preceding cycles was carried out to evaluate the usability and acceptance of the artifact. Based on the preceding analysis and the TAM of Davis, Bagozzi & Warshaw (Davis, Bagozzi, & Warshaw, 1989) the research model (extended TAM) and the underlying hypotheses were generated, cf. Figure 2-4.

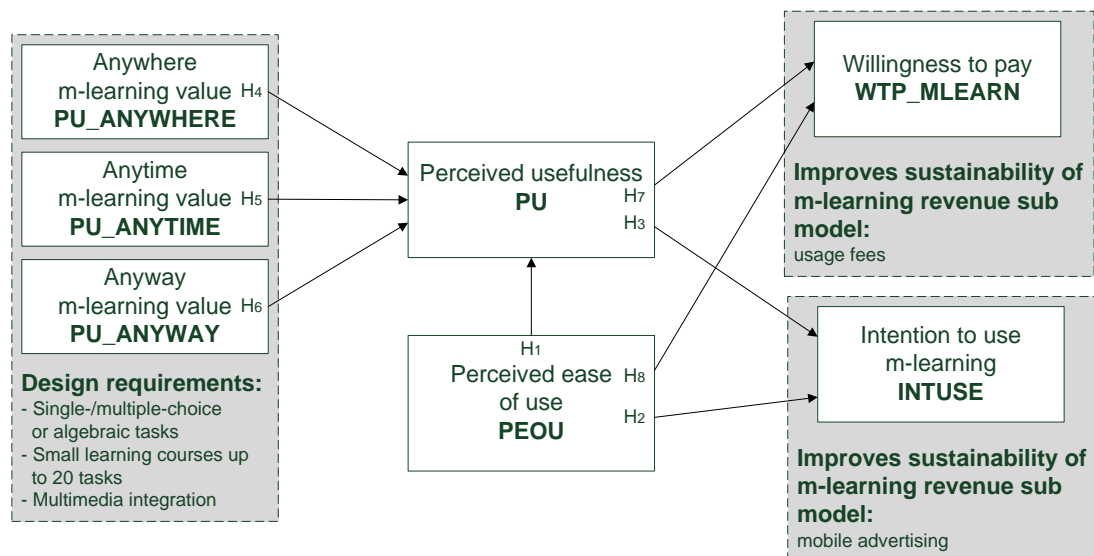


Figure 2-4: Research Model

Various models have been used to investigate the adoption of mobile services. In this context, research leading to the acceptance of IS draws back on

intention-based models of cognitive psychology the “Theory of Reasoned Action” (TRA) (Fishbein & Ajzen, 1975) and the “Theory of Planned Behavior” (TPB) (Ajzen, The theory of planned behavior, 1991). The adoption of technical services and products is mainly explained by these models and their extensions to the TAM (Davis, Bagozzi, & Warshaw, 1989), TAM 2 (Venkatesh & Davis, 2000), UTAUT (Venkatesh, 2003) and UTAUT2 (Venkatesh, Thong, & Xu, 2012). In general, TAM is an IS theory that models how users accept and use technology that was originally introduced and developed by (Davis, Bagozzi, & Warshaw, 1989) and further developed from a variety of authors.

The randomly selected sample in the work by Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011), which did not overlap with previous samples of research, contains a population of 300 students of economics. To receive the most relevant results, the participants were asked prior to the interview to use the m-learning course with their private smartphones. Between the announcement of the study and its closing, there was a period of two weeks. In this time span, the participants could use the m-learning course anywhere, anytime and anyway. Of the issued questionnaires, 257 were returned of which due to incompleteness or inconsistencies 230 were usable. In order to obtain meaningful and valid results, a data analysis was performed using a multiple regression analysis using SPSS software.

2.4 Summary of the Results

The first steps of the multi-stage research process, the literature analysis as well as the findings during the artifact design showed that the market trends in mobile devices are dynamically evolving and an m-learning application can be designed either as a native or as a web application. The findings of the expert study showed an undetermined suitability of both development types. In this context, it is necessary to balance the costs of development, operation and maintenance against the revenues. If web applications are not suitable, the results of the study by Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) indicate that the provider of m-learning ser-

vices have to consider the cost of individual application development processes for each mobile platform expected maintenance costs of these application instances as well as the target user group. The most suitable revenue types for m-learning business models, “*fee per use*” and “*mobile advertising*”, were specified by the expert study. To further supplement the design of the sustainable business model for m-learning services, Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) use an extended TAM based evaluation to support the aforementioned business model. The verification of the hypotheses during the evaluation phase, respectively the results of the empirical study confirm a positive relationship between the perceived usefulness of m-learning services and the users’ willingness to pay as well as the intention to use m-learning services. A good intensity and frequency of use is necessary to increase revenue of mobile advertising as advertisers’ demand for attractive ad space that provide large numbers of possible ad impressions (Vatanparast & Butt, 2009). As an extension of the TAM the influences from the usefulness of the didactic values anytime, anywhere, and anyway learning on PU were analyzed (cf. Figure 2-5).

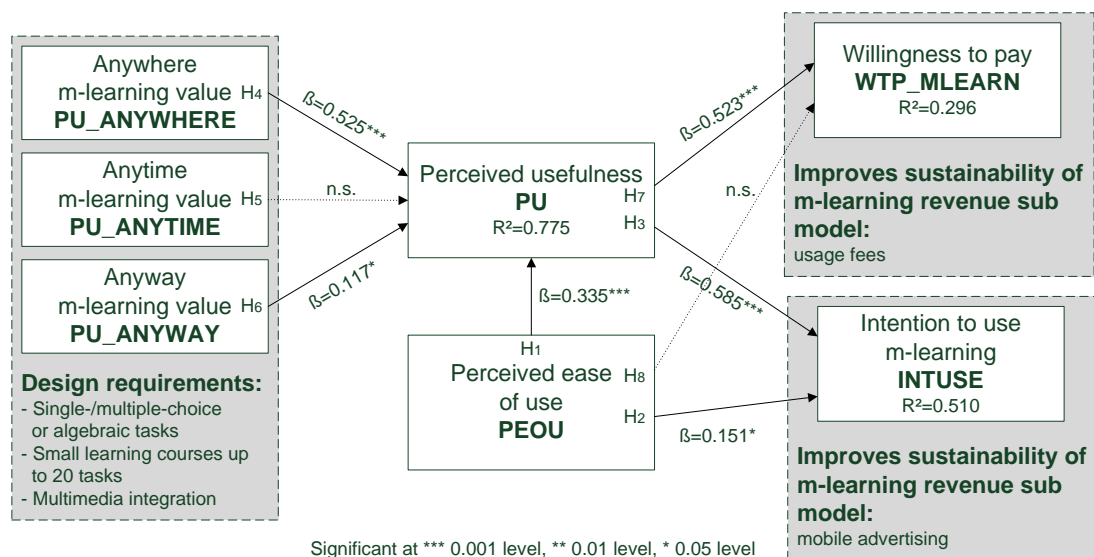


Figure 2-5: Quantitative Analysis against the modified TAM

Due to the lack of significance a predictive function for the usefulness of anytime learning cannot be accepted but for anywhere and anyway learning. In order to build sustainable business models for m-learning the positive influ-

ence of m-learning specific added values anywhere and anyway should be considered. To gain these m-learning specific added values, some basic requirements, which are further described in the research paper by Maske, Guhr, Köpp & Breitner (Maske, Guhr, Köpp, & Breitner, 2011) should be followed at preliminary stage during the learning course design. In general the results shows that the special exploitation of didactic added value of m-learning content and the technologically adopted implementation of m-learning applications as well as adequate revenue models are the key factors of the sustainable business model.

2.5 Conclusion, Limitations and Further Research

The investigation generally serves the development toward a sustainable business model for m-learning services. Studies on the state of research in m-learning show that previous research focused primarily on an analysis of the didactic and technological dimensions. For the operational dimension (economic, integrated business models, user acceptance and willingness to pay), however, further basic research is urgently needed. Business models have been sufficiently illuminated in many areas. A detailed discussion in the context of m-learning and an investigation of the critical factors can strengthen the sustainable design of business models for m-learning services. By taking an external and integrated perspective on the topic and by actively developing a scientific model for both, theoretical and practical application, the research gap should be closed. The terms of knowledge and the research carried out here together, parallel or iteratively. The individual results within the research are only partially new, their combination and the practical application in the context of the presented approach, however, make a contribution to the interdisciplinary research field of m-learning. Furthermore, the utilization of design-science research framework can potentially be a contribution to the research area, in which the focus among other aspects is placed on empirical evaluation. The authors use the design science approach to address the design of an m-learning application that meets the needs of users and augments their willingness-to-pay so that suppliers can yield mar-

ket sustainability. Furthermore, the researchers developed an extended TAM with the addition and analysis of four new external variables: willingness-to-pay, anywhere, anyway and anytime learning.

The present study is subject to some limitations. A limitation is the sample of the quantitative study. The participants were exclusively economic students. It is possible that students do, e. g. not benefit from anytime added value because their personal environment there is simply no lack of time. In addition to the group of students, there are different groups, which have a more time-critical daily routine, e. g. executives, politicians or health professionals. These groups should be included in future studies in order to counteract this limitation.

For future studies, because of the complexity of the underlying research topic, the structure of the paper should be reconsidered. The research paper can be divided into two parts. The first part (section 1-3) identifies the critical factors of a sustainable business model for m-learning. In the second part (section 4) the focus lies on the design of a sustainable business model and the evaluation of the extended TAM. The continuation of the research project in terms of the business model should take into account the core aspects of a business including purpose, strategies, offers, infrastructure, organizational structures, and operational processes and policies. The business model the research paper is based on is the e-learning business model by Breitner & Hoppe (Breitner & Hoppe, 2005). For diverging definition of the business model in the context of m-learning it is to examine whether the business model can continue to be applied. Additionally, a potential direction for further research is to look at the differences and similarities in values between personal m-learning and business m-learning.

Future studies on technology acceptance of m-learning should be analyzed using SEM rather than a simple regression analysis.

2.6 Classification of the Publication

The English research paper “Towards a Sustainable Business Model for Mobile Learning Services” was developed in collaboration with Dr. Philipp

Maske, Cornelius Köpp and Prof. Dr. Michael H. Breitner. The research paper was accepted after a double-blind peer review and one revision by the European Conference on Information Systems 2011 (ECIS 2011) and presented at the 19th ECIS 2011 in Helsinki (Finland).

The ECIS is Europe's largest and most prestigious conference on IS. It is the second largest conference in this field of research (Allwein, 2005; ECIS, 2008). Furthermore, the ECIS is accepted as the European counterpart of the International Conference on Information Systems (ICIS), providing a platform for international IS researchers to present their findings (ECIS2008, 2008). Beginning in 1993, the conference is held annually, each time, in a different European country. The original idea was the merging of the IS of Henley Management College and the London School of Economics (ECIS, 2008). Due to the large number of paper submissions, the acceptance rates have decreased heavily over the years (European Conference on Information Systems). The result of this development is that the recent acceptance rates have been roughly in the range of 30 percent (ECIS2012). The ECIS focuses both well established and current, up-to-date topics in the field of IS research (ECIS2008, 2008).

The paper (Maske, Guhr, Köpp, & Breitner, 2011) was published in the proceedings of the 19th European Conference on Information Systems. The conference proceedings of ECIS will be assigned by the WKWI and GI-FB WI in category "A" (WKWI - Wissenschaftliche Kommission Wirtschaftsinformatik im Verband der Hochschullehrer für Betriebswirtschaft e.V., 2008) In the VHB-JOURQUAL2.1 by SCHRADER und HENNIG-THURAU the rating is "B" (VHB-JOURQUAL2.1, 2011).

3 Technology Readiness in Customers' Perception and Acceptance: The Example of Mobile Payment

3.1 Introduction

The past decades have witnessed the rapid diffusion of communication and information technologies. The globalization of markets and mobile technologies has become increasingly common in today's everyday life. New retail channels such as mobile commerce create requirements for new payment instruments like m-payment to enable convenient and feasible transactions (Mallat, 2007; Ondrus & Pigneur, 2006). Mobile commerce as well as m-payment are becoming a critical component of the new digital economy (Bamasak, 2011) with great market potential (Schierz, Schilke, & Wirtz, 2010; Zhou T. , 2012). Buying and selling goods or services implies payment and in the past this activity has been done by cash. But with the emergence of communication and information technologies as well as the constant advancement of mobile devices, it is possible to locate services closer to the users (Taeb, Keramati, & Larijani, 2009). However, since insufficient user acceptance has long been an impediment to the successful adoption of new services and systems especially payment systems (Wu & Wang, 2005), it is necessary to consider which factors positively and negatively influence adoption of new m-payment for users in different countries (Taeb, Keramati, & Larijani, 2009). It should be noted, that m-payment is not among the frequently used mobile services, although technologically advanced solutions exist (Schierz, Schilke, & Wirtz, 2010). Wareham, Zheng & Straub (Wareham, Zheng, & Straub, 2005) noted that the area of m-payment in the IS community is under-represented though m-payments are extremely important for the growth of mobile commerce. Nevertheless, the IT market research and consulting company GARTNER, announced in May 2012 that worldwide m-payment transaction values will surpass \$ 171.5 billion in 2012, a 61.9 % increase from 2011 values. Furthermore, GARTNER estimates that the number of m-payment users will reach 212.2 million in 2012 (Gartner, 2012). Despite the importance of m-payment as a new payment technology and as an important and emerging application of mobile commerce (Yang, Lu, Gupta, Cao, & Zhang, 2012), the state of empirical research into the use

and acceptance of mobile technologies especially cross-cultural studies has lagged behind technological developments and are therefore scarce. In the research field of mobile services like m-payment there are a large number of scientific publications and theoretical models for technology acceptance. The TAM by Davis (Davis, 1989) is a widely used scientific model. This model is discussed in the scientific community and is used by many scientists as a basis for their models. Numerous empirical studies regarding content validation were performed and scientific "rigor" of the model has been fully proven. In various empirical studies on technology acceptance of m-payment, researchers have focused on the construct of trust (Luo, Li, Zhang, & Shim, 2010; Mallat, 2007; Zhou T. , 2012; Bamasak, 2011; Lu, Yang, Chau, & Cao, 2011; Dahlberg, Mallat, & Öörni, 2003; Karnouskos, Hondroudaki, Vilmos, & Csik, 2004; Rouibah, 2007; Li, Zhang, Seifert, & Zhong, 2008; Chandra, Srivastava, & Theng, 2010), costs (Schierz, Schilke, & Wirtz, 2010; Cheong & Park, 2008; Zmijewska, Lawrence, & Steele, 2004; Kleijnen, Wetzels, & de Ruyter, 2004), security (Mallat, 2007; Bamasak, 2011; Dewan & Chen, 2005; Schierz, Schilke, & Wirtz, 2010; Zmijewska, Lawrence, & Steele, 2004), convenience (Chen L.-D. , 2006; Dahlberg, 2006), ease of use and usefulness (Dewan & Chen, 2005; Van der Heijden, 2002; Zmijewska, Lawrence, & Steele, 2004) but there are no specific studies that examine the adoption of m-payment extending the TAM by TR in different countries and cultures. TR refers to an individual's predisposition to use new technologies for accomplishing goals in life (Westjohn, Arnold, Magnusson, Zdravkovic, & Zhou, 2009; Parasuraman, 2000). Given the ongoing globalization, there is an urgent need to learn whether TAM applies in different countries because individuals are different in their human-technology interaction (Straub, Keil, & Brenner, 1997). Furthermore, when examine the behavior and perception of m-payment it is necessary to take the individual's personality traits concerning the tendency to use technology into account (Straub, Keil, & Brenner, 1997). Parasuraman further states "there is also a need for comparative studies of technology readiness across countries and cultures" (Parasuraman, 2000, p. 319). The importance of the combination of TAM and TR in general, as mentioned above, is also seen by (Lin, Shih, & Sher, 2007) who remark

that “TAM and TR are interrelated” and “the measurement of usefulness and ease of use in TAM is specific for a particular system (i.e., system-specific) while TR is for general technology beliefs (i.e., individual-specific)” (Lin, Shih, & Sher, 2007, p. 644).

The interest behind the paper by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) centers on gaining a deeper understanding on how TR relates to various aspects of technology acceptance of m-payment in different countries. Due to this, the paper by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) aims to fill the research gap by developing and evaluating an extended TAM that integrates the direct role of TR and therefore examine how TR influences customers' perception and acceptance of m-payment in Finland, Germany, the USA and Japan.

3.2 Theoretical Foundations

3.2.1 M-Payment

M-Payment can be defined “as the use of a mobile device to conduct a payment transaction in which money or funds are transferred from payer to receiver via an intermediary or directly, without an intermediary” (Mallat, 2007, p. 415). The main advantage of m-payment is ubiquity in comparison to traditional and online payment, so that users can conduct payment from anywhere at anytime (Zhou T. , 2012). The earliest m-payment is short-messages services (SMS) based. Later applications allow the users to conduct m-payment via wireless application protocol (WAP) sites (Zhou T. , 2012). In general m-payment includes two types, proximity and remote payment (Chandra, Srivastava, & Theng, 2010; Zhou T. , 2012; Agarwal, Khapra, Menezes, & Uchat, 2007). Proximity payment, which means that users conduct m-payment via their mobile devices is often based on technologies such as near field communication (NFC) and radio frequency identification (RFID) (Zhou T. , 2012). Typically payment transaction in this case are e. g. paying bus fees, subway fees or mobile based coffee

purchasing, and mobile parking whereby the mobile device locally communicates with point of sales (POS). Remote m-payment applications are m-payment solutions facilitating payment transactions that can be performed remotely, independent of the location of the user, e. g. PayPalMobile, Mobipay (Chandra, Srivastava, & Theng, 2010). This type of m-payment application is typically for three kinds of transactions: (1) M-commerce payments to the mobile service provider for purchases of contents and mobile services (e. g. ringtones, location information), (2) M-payments for items purchased online, and (3) person to person (P2P) m-payment, through mobile services using mobile devices (Chandra, Srivastava, & Theng, 2010; Zhou T. , 2012).

3.2.2 Technology Readiness

Research on determinants and consequences of adopting new technologies and services has been conducted for years (Parasuraman, 2000). New technologies in general are now proliferating through various facets of everyday life at a much faster speed than ever before. Research by Rogers (Rogers, 1995) suggests that there are differences in people's attitudes towards using technologies. TR has an effect on acceptance of information technologies and systems and thus also on the acceptance of mobile services such as m-payment. It refers to the propensity of consumers to use and embrace new technologies for accomplishing goals at work and in leisure time (Parasuraman, 2000; Parasuraman & Colby, 2001). TR explains the manner in which technologies are used and predicts the adoption rate of new technologies like mobile services. This assumption is based on the idea that consumers hold both underlying negative or positive beliefs about technology (Massey, Khatri, & Ramesh, 2005; Cowles & Crosby, 1990; Dabholbar, 1996). The proliferation of technology-based services and products, and evidence of the frustrations and challenges associated with using them effectively, suggest an urgent need for academic inquiries into important issues like aspects on how ready potential users are to embrace and effectively use

new technologies (Parasuraman, 2000). To identify and qualify the psychological processes of the perceptions of a technology's value like m-payment a model incorporating variables of individual difference is necessary (Lin, Shih, & Sher, 2007). TR has been studied in many different research areas including consumer markets (e. g. educational choice (Hendry, 2000), e-insurance (Taylor, Celuch, & Goodwin, 2002), health care (Rosen, et al., 2003), wireless web (Massey, Khatri, & Ramesh, 2005), and self-service technology acceptance (Lin & Chang, 2011). Thus, it cannot be ignored in assessing users' adoption of technology-based services like m-payment.

In their work, Parasuraman and Parasuraman & Colby (Parasuraman, 2000; Parasuraman & Colby, 2001) note that measurement of TR can be classified in four dimensions. These four dimensions are relatively independent of each another, with each trait indicating a person's openness to technology. Discomfort (DISCOM) and insecurity (INSEC) are inhibitors of TR, while innovativeness (INNO) and optimism (OPT) are drivers of TR (Parasuraman, 2000; Parasuraman & Colby, 2001).

- **DISCOM** represents the extent to which people have a general anxiety about technology-based products and services and is a perception of lack of control over technology and a feeling of being overwhelmed by it.
- **INSEC** means distrusting technology and skepticism for privacy and security reasons.
- **OPT** describes a positive belief about technology to increase control, efficiency and flexibility.
- **INNO** describes the tendency of an individual to be first in using a new technology (technology pioneer or leader) (Parasuraman, 2000).

Negative and positive beliefs about technology in general may coexist. Humans can be arrayed along a technology beliefs continuum anchored by strongly negative at one side to strongly positive at the other side (Lin, Shih, Sher, & Wang, 2005).

3.2.3 Cultural Differences

In literature, researchers can find different views on how a culture can be characterized, compared and measured. In this thesis the framework by Hofstede (Hofstede G. , 2004; Hofstede G. , 1983; Bond, 2002; Hofstede G. , 1980) is used which separates the cultural dimension into six partially bipolar dimensions. This is because in this research topic cultural differences are an important part. These dimensions became the basis for his characterization of culture for each country.

- **Individualism vs. Collectivism (IDV):** Collectivism defines unquestioning loyalty between members of a particular group in a society. In contrast, individualism reflects the high side of this dimension and can be understood as a preference for a social framework in which individuals are only expected to take care of themselves and their immediate families (Hofstede G. , 2012).
- **Masculinity vs. Femininity (MAS):** The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material reward for success. On the other hand, femininity, stands for a preference to care for the weak and quality of life as well as for cooperation (Hofstede G. , 2012).
- **Power Distance Index (PDI):** The PDI describes the degree to which the less powerful members of a society expect and accept that wealth and power is distributed unequally (Hofstede G. , 2012; Jones M. L., 2007).
- **Uncertainty Avoidance (UAI):** The UAI dimension expresses the degree to which the members of a society feel uncomfortable with ambiguity and uncertainty. How a society deals with the topic that the future can never be known, is the fundamental issue here (Hofstede G. , 2012).
- **Long-Term Orientation (LTO):** The LTO dimension can be understood as dealing with society's search for virtue (Hofstede G. , 2012).
- **Indulgence vs. Restraint (IVR):** Indulgence describes the human drive related to enjoying life and having fun and therefore stands for a

society that allows relatively free gratification. Restraint on the other side stands for a society that suppresses gratification (Hofstede G. , 2012).

Due to the fact that there were no scores available, the dimension IVR was excluded. Table 3-1 presents the cultural dimensions of Finland, Germany, the USA and Japan.

Table 3-1: Cultural Dimensions for Finland, Germany, the USA and Japan

Country	PDI	IDV	MAS	UAI	LTO
Finland	33	63	26	59	41
Germany	35	67	66	65	31
USA	40	91	62	46	29
Japan	54	46	95	92	80

3.3 Research Design and Methodology

Objective of this research project by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) is to investigate how TR affects the acceptance of consumers toward m-payment in different countries. As a method to evaluate the hypotheses based on theory (cf. Figure 3-1), the SEM technique was used (cf. Chapter 1.2.2). First of all a survey instrument is used for data collection. The first part of the survey was designed to capture respondents' PU, PEOU, and INTUSE m-payment. The second part measured respondents TR including the sub-dimension mentioned above. Furthermore, two approaches were used to collect data. First, online networking websites were used to contact potential participants. Second, the link to the questionnaire was mailed to further participants with personalized cover letters that explained the study and guaranteed the confidentiality of the collected data.

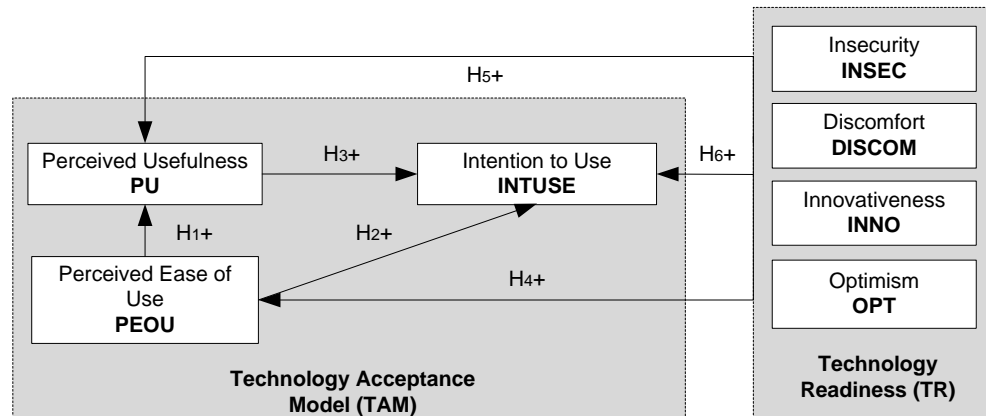


Figure 3-1: Research Model

The composition of the sample can be found in Table 3 in Appendix 9. The survey consists of closed-ended questions on a five point Likert scale and was sent out to respondents in Finland, Germany, the USA and Japan. One thousand questionnaires were issued and 438 people responded, for an initial response rate of 43,8 %. Incomplete or unusable entries were discarded from the data set. The adjusted response rate was 27 % final (270 usable responses).

As mentioned above, the empirical data were analyzed via SEM to test the causal-effect relations among the latent constructs. Before that the conception and operationalization was done, based on extensive theoretical and factually logical skills (cf. Figure 3-1). The TAM scales of PU, PEOU, and INTUSE were measured using indicators adapted from Davis (Davis, 1989) as well as Davis, Bagozzi & Warshaw (Davis, Bagozzi, & Warshaw, 1989) and the measurement of TR was partly adapted from (Parasuraman, 2000). Due to the large number of indicators, a factor analysis was conducted as a dimensional reduction method. The entire domain of the constructs was captured and it was decided, at a theoretical level, whether the constructs in the field of m-payment are formative or reflective to ensure content validity. All constructs in this model are conceptualized as reflective, because of the direction of the causality, the interchangeability of the indicators, the co variation among the indicators, and the nomological net of the constructs, which should not differ (Lin, Shih, Sher, & Wang, 2005; Chen & Li, 2010; Lin, Shih, & Sher, 2007; Hwang, 2005; Chen, Hsu, Chang, & Huang, 2012). Model test-

ing and measurement validation were conducted using SmartPLS (Partial Least Squares) version 2.0.M3. The PLS approach by Chin (Chin, 1998) is used to test the underlying research model, using the empirical data. PLS is advantageous when the research model has a variety of indicators, is relatively complex, and the measures are not well-established (Fornell & Bookstein, 1982; Guhr, Loi, Wiegard, & Breitner, 2013).

3.4 Summary of the Results

Overall, the TAM with its original constructs (PEOU, PU, INTUSE) shows almost the same results in the studied countries as previous studies in the field of m-payment (Cheong & Park, 2008; Dewan & Chen, 2005; Zmijewska, Lawrence, & Steele, 2004; Goecke & Pousttchi, 2010; Van der Heijden, 2002), cf. Figure 3-2.

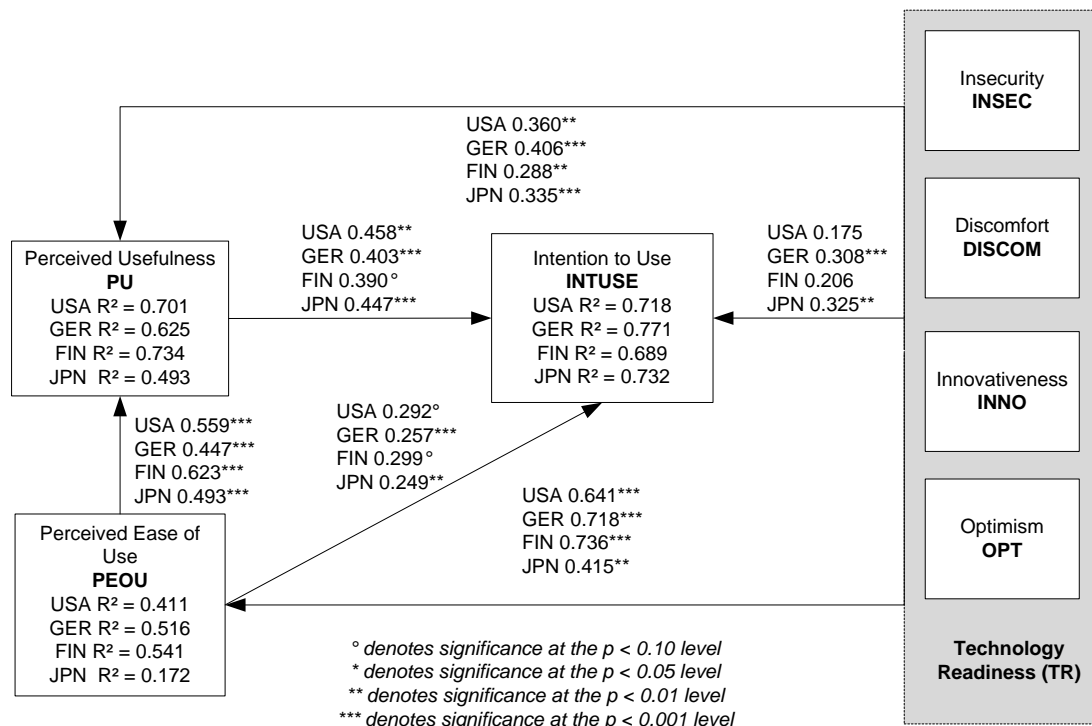


Figure 3-2: Quantitative Analysis against the modified TAM

Companies should pay attention to simple and practical functions while also increasing useful features. These features are important to prevent consumers' frustration if m-payment is difficult to use and it should fulfill the different

needs of consumers to reach the broad mass. There is no "one size fits all" approach and the use of technology by consumers is not a foregone conclusion. To achieve this, target companies have to consider an increase in user pretests. Furthermore, the study by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) shows that TR, which provides a more comprehensive measurement of the consumers' overall state of mind (Parasuraman, 2000), was positively associated with all constructs of TAM for each country and that TAM and TR overall represent suitable approaches to evaluate technology acceptance and technology readiness in an international context for m-payment.

As introduced in Chapter 3.2.3 the cultural dimensions of Hofstede (Hofstede G. , 2012) show partly significant differences for the four examined countries. These differences are in terms of reviewing the model noticeable. It can be argued that cultures that are more masculine (GER and JPN) will be more technology ready than in less masculine cultures (e. g. FIN) and this in turn positively influences the intention to use m-payment. A further implication concerns the relationship between PU and INTUSE m-payment. In the Finnish sample, this relationship is significantly weak while in the German and Japanese sample it is significantly strong. This underlines the argument that perceptions of technology usefulness in the context of m-payment are more significant than in less masculine cultures like Finland. The better m-payment providers become familiar with these differences, the more likely they are to create an m-payment solution that meets the needs of the consumer. The current study may serve as a guide for researchers to examine the influence of cultural dimensions of m-payment.

3.5 Conclusion, Limitations and Further Research

From the theoretical point of view, the paper by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) contributes to acceptance research by providing a better understanding of the impacts of TR and therefore acceptance of m-payment in an international context. Additionally, better understanding of impacts of the constructs TR (with its subdimensions), PU

and PEOU on INTUSE m-payment can be achieved. For this purpose an extended TAM is created and several techniques are used to validate measurements and to examine the model testing. Factors such as PEOU and PU show similarity in all four countries and increase the intention to use m-payment. Furthermore, it became apparent that TR is an important factor to measure the consumers' acceptance of m-payment and that there are differences in the way individuals adopt and perceive new technologies due to their cultural background. The study by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) reveals some features and effects and may be valuable to business organizations in the m-payment sector. As organizations operate more internationally, there is a growing need to understand how cultural factors might affect the adoption of m-payment.

The present study is subject to some limitations. First, a bias exists because the sample is self-selected. Second, the survey was only provided in English. This can lead to misunderstandings due to language barriers. To avoid this, it has to be considered that the surveys for Germany, Finland, and Japan should be conducted in their native languages. Third, this study considers the adjustment of user in the chosen countries, but other countries (e. g. Kenia) could demonstrate notable differences for economic and cultural reasons. Furthermore, the study did not directly measure cultural dimensions. Due to this, it is not possible to fully prove that a link between technology acceptance as well as technology readiness and cultural factors has been empirically established. Ultimately, (Venkatesh, Morris, Davis, & Davis, 2003) stated that not all of the variance in user's intention can be explained by the current TAM research approach. Further research in this field should investigate the relationship between personality traits and the attitudes towards the dimensions of TAM. Does personality affect peoples' attitude towards m-payment use? In some areas of the research on mobile services, the importance of the influence of personality traits has already been recognized (Phillips, Butt, & Blaszczyński, 2006).

3.6 Classification of the Publication

The English research paper "Technology Readiness in Customers' Perception and Acceptance of M(obile)-Payment: An Empirical Study in Finland, Germany, USA and Japan" (Guhr, Loi, Wiegard, & Breitner, 2013) was written in collaboration with TAI LOI, ROUVEN WIEGARD, and PROF. DR. MICHAEL H. BREITNER. This work is accepted to the International Conference Wirtschaftsinformatik (WI) 2013. The double-blind peer review process is based on other international conferences and on the experience and processes of previous WI conferences (Alt, Franczyk, & Hrach, 2012). The WI 2013 addresses with their central topics, integration, innovation and individualization three key developments in IS research. These range from new business models based on efficient information technologies (IT) and the realization of media-consistent business processes to increased interaction with users, such as the Social Web. This orientation emphasizes the increasing importance of IT in all sectors of business-related activities. In addition to the main topics the WI 2013 tracks cover the whole spectrum of the Wirtschaftsinformatik (WI2013, 2012).

The paper was submitted in Track 1 "Individualisierung und Konsumentenorientierung", which addresses all aspects of consumerization and personalization of IT and all methodological approaches to the topic, and was published in the proceedings of the 11th International Conference on Wirtschaftsinformatik (WI). As one of eleven tracks, this track is supported by the Fachgruppe CSCW of the Gesellschaft für Informatik (www.fgcscw.gi-ev.de).

The conference proceedings of the WI will be assigned by the WKWI and GI-FB WI in category "A" (WKWI - Wissenschaftliche Kommission Wirtschaftsinformatik im Verband der Hochschullehrer für Betriebswirtschaft e.V., 2008). In the VHB-JOURQUAL2.1 by SCHRADER und HENNIG-THURAU the rating is "C" (VHB-JOURQUAL2.1, 2011)

4 Information Security Management and Personality Traits: An Empirical Study

4.1 Introduction

Studies of personality within the behavioral IS literature are sparse and there is no research that has explored the influence of personality on top-management in regards to information security. As global networks expand the interconnection of the global IS information security has become increasingly important to organizations (Boss & Kirsch, 2007; Garfinkel, Spafford, & Schwartz, 2003). This applies both to the dangers that threaten the organization from the outside, as well as the intentional insider misuse of IS resources that represents a significant threat to organizations (D'Arcy, Hovav, & Galletta, 2008).

Security threats can have dire consequences, for corporate liability, monetary damage including loss of prestige and credibility (Bulgurcu, Cavusoglu, & Benbasat, 2010). Research studies emphasize management's increasing concerns about the protection of organizational information assets (Straub & Welke, 1998; Taylor R. , 2006). Hence, an important issue in today's organizations is to determine how to create efficient and sustainable information security. The way management – or information security executives – copes with potential information security risks and react in different situations varies from individual to individual and depends on personality and other cognitive factors (Straub & Welke, 1998; Vroom & von Solms, 2004). Individual management differences have become an important area of focus in information security research (Sharma & Yetton, 2003; Ashenden, 2008; Stanton, Stan, Mastrangelo, & Jolton, 2005).

The purpose of the study by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012) was to investigate how individual differences between information security executives affect holistic information security management within companies and organizations. Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012) examined the relationship between executives' personality and information security for several reasons.

1. Personality traits have been shown to be an important instrument in IS literature, because they emphasize an individual's cognitive processes, attitudes, and behaviors (Junglas, Johnson, & Spitzmüller, 2008).

Yet a number of studies have shed some light on the individual differences in the IS domain (e.g. (Lee & Larsen, 2009; Benlian & Hess, 2010; McElroy, Hendrickson, Townsend, & DeMarie, 2007). In the information security field, target subjects of previous studies were limited to users or employees (e.g. (Shorpsire, Warkentin, Johnston, & Schmidt, 2006). Incorporating the FFM from the executives' perspective has largely been ignored.

2. Researchers have called for more rigorous empirical research to advance sustainability and efficiency in the information security domain, e.g. (Kotulic & Clark, 2004; Zhao, Xue, & Whinston, 2009).

The role and responsibility of executives in information security have been shown to be main predictors of success (e.g. (Straub & Welke, 1998; McFadzean, Ezingear, & Birchall, 2007).

3. Focusing on the problem from a multidimensional, holistic rather than a simple, one-dimensional information security management approach allows researchers to examine and evaluate information security phenomena from the individual executives' perspective.

Personality traits can illustrate how individual differences determine the strength of a person's attitude towards holistic information security management.

4.2 Theoretical Foundations

4.2.1 Information Security Management

A review of the literature makes it clear that information security management is affected by multiple distinctive dimensions and several researchers highlight the importance of a holistic, multidimensional information security management approach to securing technology, people, processes, and other organizational factors (Da Veiga & Eloff, 2007; Hu, Hart, & Cooke,

2006; May & Dhillon, 2010). Researchers, which have used different theoretical perspective on information security research (Hsu, Lee, & Straub, 2012) are paying more attention to incorporating several dimensions, such as social and technical issues, into information security management models, frameworks, and architectures (May & Dhillon, 2010). May & Dhillon (May & Dhillon, 2010) conceptualized a holistic information security management model and elaborated that the human and technical dimensions of information security management can be brought together via six layers, the output of which provides information for other layers in a collaborative manner. Zafar & Clark, (Zafar & Clark, 2009) presented an information security capability reference model that is based on nine dimensions – governance, privacy, threat mitigation, transaction and data integrity, identity and access management, application security, physical security, personnel security, and information security economics. In addition, national and international organizations issued fundamental best practices, guidelines and standards, e.g. National Institute of Standards and Technology (NIST) or International Standards Organization's (ISO) Code of Practice (ISO/IEC 27001; ISO/IEC 27002). These standards indicate that information security must be managed using a holistic, multidisciplinary approach, cutting horizontally across units within and across organizational boundaries along the entire value chain.

In information security research, one limitation is that there is no generally accepted model or framework with coherent dimensions or labels (Kritzinger & Smith, 2008; May & Dhillon, 2010). Due to the lack of awareness and expertise, complex and extensive processes, and high cost, organizations often face difficulties in managing a holistic information security concept (Eloff & Eloff, 2005). In addition, (Siponen & Willison, 2009) noted that standards or guidelines are generic in scope and do not focus on the different security requirements in organizations.

To get a valid theoretical foundation, in this work the perspectives of prior work of (Da Veiga & Eloff, 2007; Kritzinger & Smith, 2008; Ma & Pearson, 2005; Saleh, Alrabiah, & Bakry, 2007; Werlinger, Hawkey, & Beznosov, 2008) are used in combination with the above-mentioned national and international information security standards. These are not explained in detail

here but the interested reader is referred to the previously mentioned literature.

Security management approaches can generally be divided into two essential components – *technical*, which addresses the technical dimension that enables the technology and services and *non-technical* information security components (Kritzinger & Smith, 2008), which includes human-related issues (e.g. (Werlinger, Hawkey, & Beznosov, 2008; Da Veiga & Eloff, 2007; Saleh, Alrabiah, & Bakry, 2007). The technical perspective has been the dominant research perspective for the past decades (Hsu, Lee, & Straub, 2012; Siponen & Willison, 2007; Straub, Goodman, & Baskerville, 2008) but Dhillon and Backhouse (Dhillon & Backhouse, 2001) explain that this technology-centric view is not sufficient or appropriate.

In the work by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012) the non-technical component includes the information security dimensions human, strategic, organizational, and compliance. In contrast to (Saleh, Alrabiah, & Bakry, 2007), who incorporated ISO 17799:2005 into a framework with the basic dimensions of strategy, organization, people, and environment as non-technical components, in this work the latter is divided into cultural and economic dimensions due to their high relevance to information security research, e.g. (Cavusoglu, Mishra, & Raghunathan, 2005; Da Veiga & Eloff, 2007; Ruighaver, Maynard, & Chang, 2007). In information security research, the cultural dimension is separated from the human dimension. Cultural dimensions are based on assumptions about encouraged and accepted aspects such as norms, attitudes and shared expectations, which are seen as an accepted type of employee conduct (Ruighaver, Maynard, & Chang, 2007). The human dimension, on the other hand includes issues relating to security training, education, computer monitoring and awareness programs (e.g. (D'Arcy, Hovav, & Galletta, 2008; Bulgurcu, Cavusoglu, & Benbasat, 2010). The human factor differs from the cultural factors. This is due to the fact that humans are regarded as a whole within the organizational context instead of being seen as an individual who guides actions like security training methods (Vroom & von Solms, 2004). The economic dimension of information security management takes non-financial and financial factors into

account (Cavusoglu, Mishra, & Raghunathan, 2005; Park, Ahmad, & Ruighaver, 2010). However, in this work, holistic information security management aims to maximize the number of prevented and deterred security breaches (D'Arcy, Hovav, & Galletta, 2008) by the management of an efficient set of non-technical components, represented by strategy (STRAT), human (HUM), organization (ORG), compliance (COM), culture (CULT) and economic (ECO) dimensions, and technical (TECH) component.

Regarding the requirement for a multi-disciplinary view (Theoharidou, Kokolakis, Karyda, & Kiountouzis, 2005) executives are not only responsible for communicating an acceptable security culture, but they also should exhibit information security behavior and compliance (Da Veiga & Eloff, 2007). Therefore, executives must be able to integrate organizational security needs into business objectives and goals (Whitten, 2008).

4.2.2 Personality in Information Security Research

Personality in general can be described as a set of characteristics and tendencies that determines peoples' commonalities and differences in feelings, thoughts, and actions (Maddi, 1989; McElroy, Hendrickson, Townsend, & DeMarie, 2007). The way individuals act in different situations varies from person to person and depends on their personality (Vroom & von Solms, 2004).

Because individual differences play a ubiquitous role in the IS domain, researchers have incorporated related cognitive and personality-related variables into various IS success outcome models. During the past several decades, personality psychologists use classification systems that summarize individual differences in personality into fundamental facets of each human being. The five-factor model (FFM) of personality has evolved and may be the most widely used personality theory within the research field of psychology (Rosellini & Brown, 2011; Costa & Widiger, 2002; Barrick, Mount, & Judge, 2001), e. g. career success (Seibert & Kraimer, 2001; Judge, Higgins, Thoresen, & Barrick, 1999), job satisfaction (Judge, Heller, & Mount, 2002)

individual differences in a variety of process and outcomes (Nofhle & Shaver, 2006), performance motivation (Judge & Illies, 2002), job performance (Salgado, 1997), life satisfaction (DeNeve & Cooper, 1998) and the relationship between the FFM and personality disorders (Rosellini & Brown, 2011). The FFM as a parsimonious and comprehensive model of personality became widely accepted in personality research because its validity was verified by multiple empirical studies (McCrae & John, 1992).

An executive's perceptions of security risks have a strong influence on the decision-making process (Straub & Welke, 1998; Taylor R. , 2006). There is also evidence that an information security executive's sensitivity towards security activities and advanced security software is associated with a higher perceived effectiveness of information security (Straub & Welke, 1998; Krankanhalli, Hock-Hai, & Bernard, 2003). These traits determine cognitive and behavioral patterns that remain more or less stable across situations (Costa, McCrae, & Dye, 1991). Personality traits are commonly referred to as the agile organization within the human being "of those psycho physiological systems that determine his characteristic behavior and thought" (Allport 1961, p. 28).

In the twentieth century, psychologists undertook serious efforts to measure the broad constructs or dimensions of personality (Wilt & Revelle, 2008), cf. table 4-1. The most frequently used taxonomy in personality research is the FFM (Barrick et al. 2001). Despite criticism of the number and labels of FFM factors (e.g. Eysenck 1992; Barrick et al. 2001), several beneficial properties, that are associated with the use of the FFM are stability, presence, and collective appreciation (Costa et al. 1991).

Table 4-1: Taxonomies in Personality Research

Classification / Approach	Author(s)	Year
Guilford Zimmerman Personality Survey (GZTS)	Guilford and Zimmerman	1949
Maudsley Personality Questionnaire (MPQ)	Eysenck	1959
Eysenck Personality Inventory (EPI)	Eysenck, H. J. and S. B.	1968
Eysenck Personality Questionnaire (EPQ)	Eysenck, S.B. & H.J.	1975
Multidimensional Personality Questionnaire (MPQ)	Tellegen	1982
Occupational Personality Questionnaire (OPQ)	Saville et al.	1984
Big Five Inventory (BFI)	John	1990
Eysenck Personality Profiler (EPP)	Eysenck & Wilson	1991
Abridged Big Five Circumplex (AB5C)	Hofstee, de Raad, & Goldberg	1992
Big Five Markers (BFM)	Goldberg	1992
Personality Inventory Revised (NEO-PI-R)	Costa & McCrae	1992
NEO Five Factor Inventory (NEO-FFI)	Costa & McCrae	1992
International Personality Item Pool (IPIP)	Goldberg	1999
Riverside Behavioral Q-Sort (RBQ)	Funder, Furr, and Colvin	2000
Five Factor Model (FFM)	Barrick et al.	2001
Personality Questionnaire (FF-NPQ)	Paunonen and Ashton	2002
HEXACO Personality Inventory (HEXACO-PI)	Lee and Ashton	2004
Big 5 Aspect Scales (BFAS)	DeYoung, Quilty, & Peterson	2007

The following five broad constructs are generally referred to:

- **Conscientiousness (CON):** level of self-control in organization and planning,
- **Agreeableness (AGREE):** cooperative, altruistic, and sympathetic tendencies,
- **Extraversion (EXTRA):** the degree of positive emotionality, sociability, and common activity,
- **Openness (OPEN):** levels of independent judgment, curiosity and conservativeness, and
- **Emotional stability (EMO_STAB)** or Neuroticism: the tendency to experience negative emotions (e.g. (Rosellini & Brown, 2011;

Costa, McCrae, & Dye, 1991; Digman, 1997; Eysenck & Himmelweit, 1947; Goldberg, 1990).

Most empirical studies that focus on the human factor with regard to information security tend to emphasize user or employee behavior (Bulgurcu, Cavusoglu, & Benbasat, 2010) in an end-user context in terms of a user's or employee's contribution to individual mistakes, inaccuracies, or faults in order to improve information security. Bansal (Bansal, 2011) examined the relation of FFM and concerns of privacy and security on websites. Results indicate that conscientiousness, neuroticism, and extraversion are positively related with concerns for security. Personality traits of agreeableness and openness are significantly associated with concern for privacy. In the same context, (Junglas, Johnson, & Spitzmüller, 2008) showed that personality traits influence concern for privacy in location-based services. Using protection motivation theory, the authors investigated whether agreeableness, conscientiousness, and openness affect the concern for privacy.

Although the studies provide the groundwork for the analysis by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012), they do not quantify the relation between information security management dimensions from the perspective of executives' personalities. Empirical studies that address an executive's personality when assessing the impact on information security are still lacking. By focusing on personality traits of information security executives, the paper by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) provides a more global perspective for analyzing the impact of personality traits on holistic information security management components.

4.3 Research Design and Methodology

The objective of the research project is to analyze how executive's personality affects his or her attitude towards selected information security management activities. With regard to the research objective, Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) developed, based on an extended literature review, hypotheses (H_1 - H_5) about the influence of an information security executive's personality traits on the above-mentioned technical and

non-technical components of information security management (see Figure 4-1).

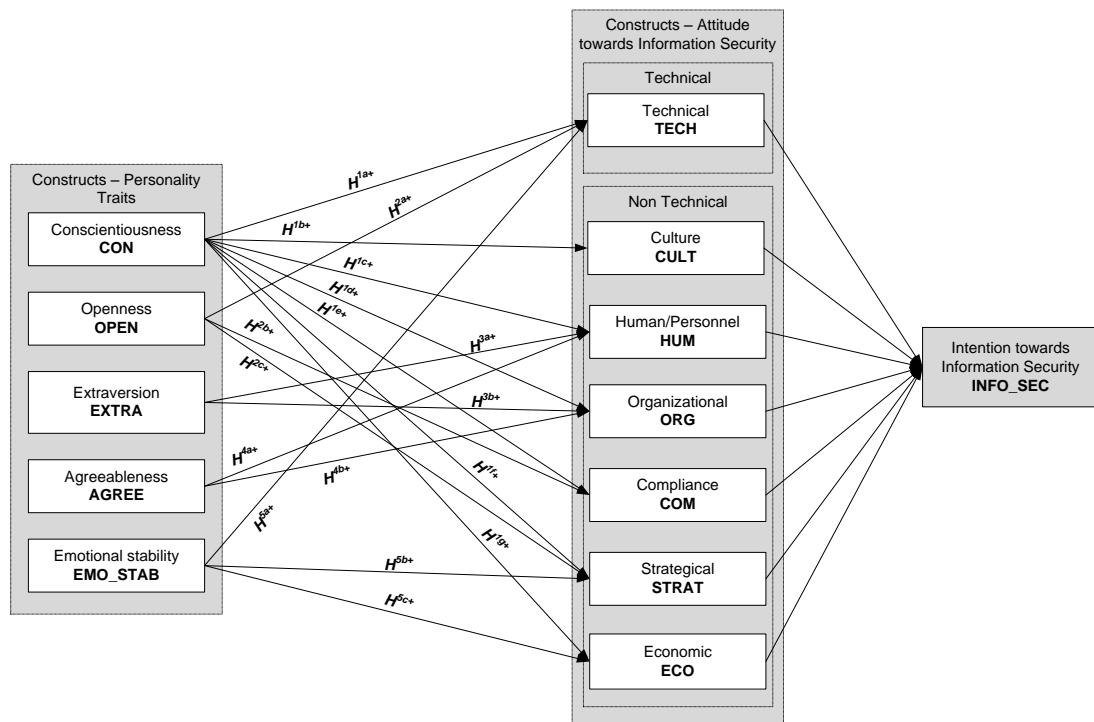


Figure 4-1: Research Model

As described in Chapter 1.2, there are various methods of analysis in quantitative research that can be used depending on the research topic and the underlying research model. As mentioned above, the hypothesized research model was tested empirically via structural equation modeling. Due to the large number of items, first a factor analysis was conducted as a dimensional reduction method. The construct contained in the research model are latent constructs, i. e. not directly observable or measurable constructs (Homburg & Dobratz, 1998). As mentioned in Chapter 1.2, the latent variables can be operationalized using reflective or formative measurement models. The constructs in the field of information security management are operationalized as formative. Based on the theory and as mentioned by Fornell and Bookstein 'constructs such as "personality" or "attitude" are typically viewed as underlying factors that give rise to something that is observed. Their indicators tend to be realized, then as 'reflective' (Diamantopoulos & Siguaw, 2006; Fornell & Bookstein, 1982, p. 292). Therefore, reflective constructs are used for personality traits and were therefore operationalized as reflective (Eysenck &

Eysenck, 1987). As an example, the construct EXTRA is latent, thus merely behavioral observations are possible. The verbalizations of cognition suggest how an individual is extraverted. Because this trait is expressed in the same way in many situations, there are high correlations between their indicators. Strongly extraverted people appear as talkative, cheerful, optimistic, and active. Finally, the empirical data in the work by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) was analyzed via SEM using Smart PLS version 2.0 M3.

4.4 Summary of the Results

The results of the empirical study illustrate that personality traits are influential in determining attitudes towards holistic information security management. Figure 4-2 provides a summary of the test results and the estimates of the path coefficients. The results of the study indicate that attitudes towards different information security management dimensions vary depending on the personality traits. In addition to the main focus of the study by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012), the results indicate a statistical significance of the attitudes towards TECH, ORG, COM, and STRAT dimensions as main predictors of an information security executive's intention to apply information security with a holistic focus. The ECO dimension as well as the attitude towards the CULT dimension and the contextual connected dimension of HUM does not significantly influence the intention construct. Regarding the assumed causal relationships between the personality traits and the attitudes towards different information security management dimensions, the following results can be noted. Out of the seven hypothesized relationships between CON and information security management, five significantly positive relationships (CON → TECH; CULT; ORG; COM; STRAT) were identified. The HUM and the STRAT dimensions of information security management were not found to be influenced by CON. Regarding the construct OPEN, which describes that open information security executives react flexibly and critically examine changes in existing requirements, rules, and

norms, two of the three hypotheses can be confirmed (OPEN → TECH; STRAT).

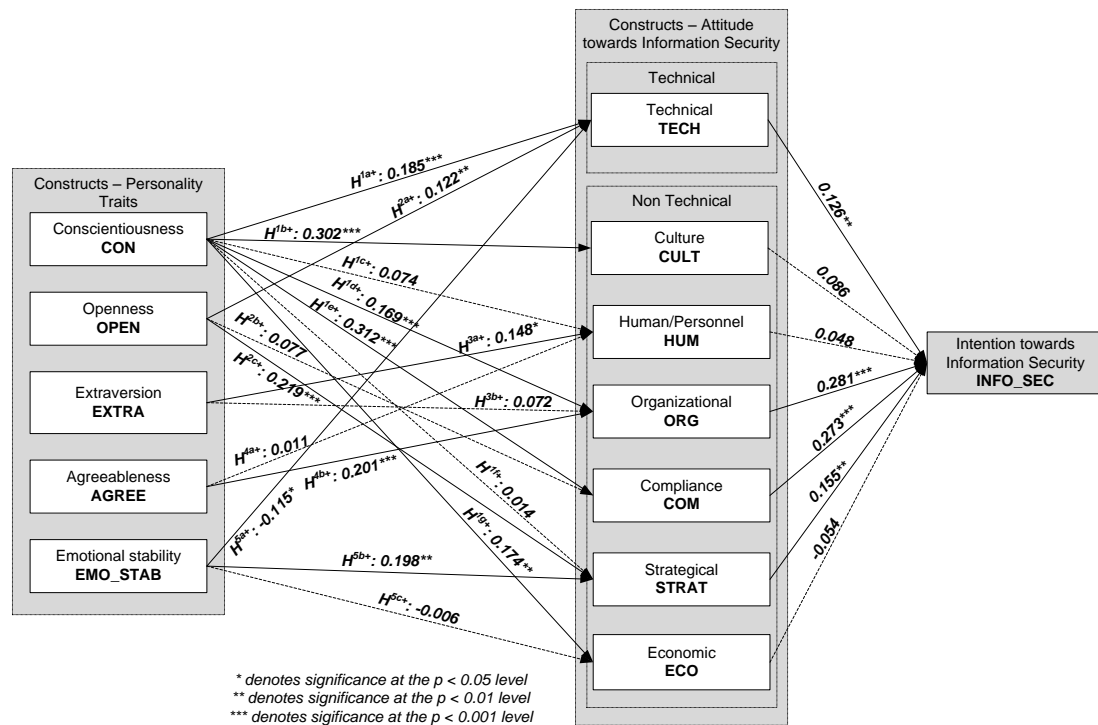


Figure 4-2: Research Model – Results of the Analysis

A significant relationship between OPEN and COM could not be confirmed. Turning to EXTRA, one out of two hypothesized relationships can be confirmed as significantly positive (EXTRA → HUM). The influence of EXTRA on the ORG dimension of information security management was not found to be influential. Agreeable information security executives are hypothesized to show a positive relation to HUM and ORG dimensions of information security management. In terms of information security executives' responsibilities a positive significant relationship can be confirmed (AGREE → ORG). Interestingly, the hypothesized positive relationship between AGREE and HUM cannot be identified. As the results shown in Figure 4-2 illustrate, EMO_STAB has a positive influence on the STRAT dimension but a negative impact on the TECH dimension of information security management; the effect on the ECO dimension is not significant.

4.5 Conclusion, Limitations and Further Research

In recent decades, most research in information security focused on the technology-centric approach, with a predominance of conceptual and descriptive papers (Hsu, Lee, & Straub, 2012; Siponen & Willison, 2007; Straub, Goodman, & Baskerville, Framing of information security and practices, 2008). In the review by Siponen & Willison (Siponen & Willison, 2007), 79 % of information security-related studies were “subjective argumentative” (p. 1556), and other studies adopted methods such as field experiments (Hsu, Lee, & Straub, 2012; Siponen & Willison, 2007). In this sense, the paper by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) concerning the topic of personality traits and information security management, advances information security management research by adding empirical findings to the descriptive literature. The topic, which deals with a relatively unstudied domain in the stream, is novel and certainly worthy of investigation. The empirical study in the paper by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012) shows that personality traits are influential in determining attitudes towards holistic information security management (cf. Figure 4-2) and is therefore a first step towards understanding the influence of personality traits on a holistic information security management approach.

The model developed by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012), which is tested via multivariate analysis methods allows both recommendations for practice and for theory. From a practical perspective, the results indicate that there is no “one size fits all” approach. An information security executive’s personality traits affect her or his attitude towards information security management dimensions, and it can be assumed that his or her focus would also be different. Even if regulatory requirements and other policies and standards guide information security executives in their daily tasks, their attitudes and behavioral patterns are different. The study by Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) has further practical implications for determining team composition on security projects and selecting appropriate people for information security positions. Pre-employment

screening is currently an acceptable practice. Consequently, if a company understands the behavior traits of its information security executives, it can improve the information protection level.

Some general limitations exist. First, this work could suffer from internal validity threats such as history, morality, and maturation (Huck, Cormier, & Bounds, 1974). Second, the majority of the participants in this study were CIOs, which is justified by the underlying research question. As a result a single respondent selection bias could exist, although CIOs should provide a high level of confidence in the quality of their reply (Hsu, Lee, & Straub, 2012). Third, the results of this study may include regional biases as data collection took place solely in German speaking countries (Pomes, 2011). The German speaking sample is appropriate for the exploratory phase but it would be beneficial to extend the sample to a more culturally diverse population. As Uffen, Guhr, & Breitner (Uffen, Guhr, & Breitner, 2012) mentioned in their study, culture has been shown to influence personality dimension (e. g., (Hofstede G. , 2004). It would be interesting to determine whether there is empirical support for the propositions in an international context and if cultural and regulatory differences might affect the findings.

Short-term effects that mainly influence the cognitive processes of an information security executive in her or his daily tasks can be integrated into this model. This is because personality traits are stable over time. Further research is also needed to explore whether external cues influence both attitudes towards information security management and personality traits.

4.6 Classification of the Publication

The article by Uffen, Guhr & Breitner (Uffen, Guhr, & Breitner, 2012) entitled "Personality Traits and Information Security Management: An Empirical Study of Information Security Executives" was submitted on May 3rd 2012 to the International Conference on Information Systems (ICIS) 2012 in the track "IS Security and Privacy". On 24 July 2012 the manuscript has been conditionally accepted for presentation at the ICIS and for publication in the ICIS

Proceedings, subject to revisions. After revision of the article, the article was accepted for presentation at ICIS 2012 and for publication in the ICIS 2012 Proceedings. The acceptance rate of submissions for the ICIS was between 20 and 30 percent in recent years.

The ICIS is the largest Conference on IS worldwide, thus being the most prestigious encounter of academics and practitioners relating to science in the context of IS research. Its high academic standard is being communicated clearly, and many of the submitted papers have a strong professional orientation. The “Conference on Information Systems” was held for the first time in 1980, back then without the extension „International“, which was first introduced in 1986, caused by the increasing participation of Canadian and European scientists. The ICIS is primarily being hosted by the AIS (“Association for Information Systems”). Additionally the ACM (“Association for Computing Machinery”), the IAIM („International Academy for Information Management“), the IFIP (“International Federation for Information Processing“), the INFORMS (“Institute for Operations Research and Management Sciences”) and the SIM (Society for Information Management“) are involved in its organization (AIS, 2012a; AIS, 2012b). The ICIS has over 4,000 members from universities in more than 95 different countries and provides a forum for networking, presentation and discussion about the latest ideas and premium quality scientific work in the field of IS research. Every year, more than 1,000 academic professions contribute to the conference program, which includes about 60 sessions and 180 presentations, in addition to keynotes, CIO panels, and research panels (ICIS, 2012). The conference proceedings of the International Conference on Information Systems will be assigned by the WKWI and GI-FB WI in category “A” (WKWI - Wissenschaftliche Kommission Wirtschaftsinformatik im Verband der Hochschullehrer für Betriebswirtschaft e.V., 2008). In the VHB-JOURQUAL2.1 by SCHRADER und HENNIG-THURAU the rating is also “A” (VHB-JOURQUAL2.1, 2011).

5 Critical Appraisal and Outlook

The intention of this thesis, which is in its entirety, however, very complex and multifaceted, deals with different research questions in two areas of empirical studies on technology acceptance of mobile services as well as information security management. The general focus lies on empirical studies and not on formal sciences.

The final sections in each of the Chapters 2-4 summarize the main contents and methodology and classify them in the state of knowledge. Other concerns of the final chapters are to provide a critical assessment of the overall work and to give an overview of possible future research needs, based on the limitations that were identified in the individual research papers. Out of the available publications, which were presented at the beginning of this work at a glance (cf. Table 0-1), three publications were selected and summarized. The research gaps and objectives presented here, together with the used methodology spectrum and research results, are rooted in IS research. In the findings and discussion in each chapter it has been shown that empirical studies in the two different research fields of technology acceptance of mobile services as well as information security management are a very important instrument. Models, partially from other disciplines, were developed and evaluated on a theoretical basis and as part of a rigorous research approach. They include not only research results but also practical experiences of experts in the different research fields.

In the beginning, the main findings of the overall research topic are summarized in the form of a compressed response. Due to this the research questions proposed in section 1 are answered in the following paragraphs separately.

The specific research question concerning the topic of the **“Technology Acceptance as Part of a Sustainable Business Model for M-learning”** is:

a) Which critical factors can strengthen the sustainable design of business models for m-learning services?

The status of research in the field of technology acceptance of m-learning shows a research gap. In scientific literature, previous studies focused mostly

on technical and didactical aspects. A holistic approach in terms of a sustainable business model, which also recognizes the economic dimension, could not be identified. In this work, based on the design science approach, the methodology has been split in several, complementary and coordinated, phases. First of all, based on an extensive literature review, three characteristic added value for m-learning were identified: “anywhere”, “anytime” and “anyway” m-learning. These characteristics are assumed to represent critical success factors. To verify whether these added values of m-learning are actually critical success factors and in which way they influence the perceived usefulness of m-learning, these factors have been integrated as external variables in the TAM as an extension of the original. The statistical analysis in the form of a multiple regression analysis based on a randomly selected sample of 230 students, show that anywhere and anyway m-learning are critical success factors. However, a connection between anytime m-learning and the perceived usefulness could not be confirmed. The design requirements, from the didactical perspective, as a framework for m-learning applications (e. g. small learning courses up to 20 tasks) were identified in an user study with a randomly selected user study of 150 students. Based on a business model with three partial models, and prior to building the artifact, an expert survey was conducted to identify other relevant factors regarding the technical and economic dimension. It was clear, that an m-learning application could either be developed as a native application or as a web application. According to the economic dimension, and based on the results of the expert study, the revenue models *fee per use* and *mobile advertising* are assumed to be influenced by the perceived usefulness and the perceived ease of use of m-learning services as another critical success factors. Due to this, the willingness to pay was also integrated into the TAM. The revenue sub model “mobile advertising” was represented by the intention to use. The statistical analysis show that an increase of perceived usefulness has a positive impact on both revenue types. A positive influence of perceived ease of use on willingness to pay could not be confirmed. Overall, however, in this multi-stage research process a number of critical success factors were identified and empirically validated.

The research question in the field of “**Technology Readiness in Customers’ Perception and Acceptance: The Example of Mobile Payment**” is:

b) How does TR affect the acceptance of consumers towards m-payment in different countries?

The development or amendment of the TAM by TR and its sub dimensions innovativeness, optimism (drivers of TR) as well as discomfort, insecurity (inhibitors of TR) and the consideration of underlying theories as well as cultural differences makes it possible to examine how TR influences customers’ perception and acceptance of m-payment in an international context. Using multivariate analysis methods, in this particular example the SEM technique, the research model could be validated. Ultimately, the empirical study with 50 participants from Finland, 115 participants from Germany, 52 participants from the USA and 53 participants from Japan shows that TR affects the technology acceptance in the examined countries (Finland, Germany, the USA and Japan) partly in different ways. Taking into account the cultural dimensions of Hofstede (Hofstede G. , 2012; Hofstede G. , 1983) it can be stated that TR was positively associated with all constructs of TAM for each country and that TAM and TR represent overall suitable approaches to evaluate technology acceptance and TR in an international context for m-payment but there are also shown partly significant differences for the four examined countries. Cultures that are more masculine (GER and JPN) will be more technology ready than in less masculine cultures (e. g. FIN) and this in turn influences the intention to use m-payment positive. Overall, it became apparent that TR is an important factor to measure consumer acceptance of m-payment and that there are differences in the way individuals adopt and perceive new technologies due to their cultural background. The study by Guhr, Loi, Wiegard & Breitner (Guhr, Loi, Wiegard, & Breitner, 2013) reveals some features and effects and may be valuable to business organizations in the m-payment sector. As organizations internationalize, there is a growing need to understand how cultural factors might affect the adoption of m-payment.

The research question about “**Information Security Management and Personality Traits: An Empirical Study**” is:

c) Which personality traits of an information security executive have a major influence on technical and non-technical components of information security management?

The answer to the research question in this area a multi-stage research process was carried out which is composed of an (1) extensive literature review, both in the area of information security and personality, inter alia, the specific role of personality in information security research, (2) hypotheses generation, (3) model building, and (4) the empirical analysis via SEM. The literature analysis shows that holistic information security management aims to maximize the number of deterred and prevented security breaches (D'Arcy, Hovav, & Galletta, 2008) by the management an efficient set of one technical component and six non-technical components (strategy, human, organization, compliance economic, and culture). The five broad constructs in the context of personality, based on the FFM, are conscientiousness, agreeableness, extraversion, openness and emotional stability. It was ultimately determined that all five constructs, based on the underlying theory, impact the technical and/or non-technical components (cf. Figure 4-2). It should be noted that only conscientiousness, openness, and emotional stability have an effect on the technical component.

The publications of the individual research papers, including those which have been mentioned explicitly and in detail, serve to solve problems in practice and will also support the debate in the scientific community. Integrate these empirical findings, which are based on existing theory and literature as well as on the design, development, and evaluation of interdisciplinary models, into academic literature, new theory can be currently developed instead making the research only fact finding and implications for practice can be given. In general, theory building should always be based on previous theory, which is a primary foundation for theory-building in science (Wacker, 2008). This is due to the fact that no theory in science is entirely new and combining

or tying existing research or literature with the results of empirical research, makes research papers good theory-building empirical research (Wacker, 2008). When conducting empirical studies, among other things, applying statistical methods, there are certain risks or flaws that must be considered in research (Wacker, 2008).² SEM e. g. is an important tool for researchers in different research fields. SEM are not scary and could be used more frequently in industry and in academia wherever practitioners espouse conceptual models (Iacobucci, 2010). But it should be noted that there is no “one size fits all” approach and the use of SEM in empirical research is not a foregone conclusion and each research has some limitations. If we focus on the remarks or guidelines by Benbasat and Zmud, it can be assumed that all dimensions of relevance in IS research (interesting, applicable, current and accessible) have been met in this thesis (Benbasat & Zmud, 1999).

Furthermore, in addition to the specific limitations of each research (cf. Chapter 2.5, 3.5 and 4.5), some general limitations apply to all research papers. Altogether, limitations must be identified in the various research areas and overcome by further research. The results in the presented research studies cover only excerpts of reality in a specific situational context (Bortz & Döring, 2006). There is a risk that the explored area of research because of the definitions and chosen research methods merely is shortened and thus incomplete or distorted. In such cases, validity of the knowledge or cognitions drawn from the research findings and ultimately the results would be doubtful (Bortz & Döring, 2006). In evaluating the results, the external and internal validity can be distinguished. The research presented in various research papers and in this document are, including their research objects, exactly, traceable and verifiable. The results are thus clearly related to scientific investigation. This is due to the fact that they refer to a specific example. Internal validity can thus be assumed. The external validity in the form of generalizability of the research results cannot be confirmed. Crucial to the assessment of scientific inquiry is whether it helps in expanding knowledge in research. Research should either contribute to basic research or have practical

² An overview of the mentioned flaws or shortcomings and the measures to be taken can be found in the article by (Wacker, 2008).

relevance for decision support (Bortz & Döring, 2006, p. 32 et seqq.). The research objective of this work, empirical studies of technology acceptance on mobile services and information security management, is broad. With an existing focus on specific research topics in the various areas, the overall target is broken down to specific examples (e. g. m-learning and m-payment as well as personality traits in the context of information security management). This widens the knowledge in the entire research area. To evaluate the results of research, their acceptance in the scientific community can also be considered (Bortz & Döring, 2006). The research papers presented here were evaluated by two, sometimes three colleagues ("Peer Reviewing"), at different conferences and recommended for publication. In addition, the work is critically appraised during the presentations at the respective conferences. Using this assessment and the standards applied in the reviewing processes, the quality of publications can be assumed (Bortz & Döring, 2006). The transferability of the results of individual research to other objects and situations should be examined in future research.

Based on the findings, results and limitations, recommendations for further research arise. Mobile services are considered in various areas of the economy as a driver of innovation and also gain in importance economically. This is promoted among others by the rapid technological developments in the market for mobile devices and the development of mobile networks and it is expected that the market situation of mobile hardware and software remains incompatible and dynamic the next years. These developments change the user behavior and their technology acceptance. Because of this, research in this area needs to be continued. The same applies to the research field of information security management. IS are a globally significant economic factor (Schryen, 2010) and therefore information security is a highly relevant topic both in research and in practice. At the same time, empirical research in this area is sparse. In the future, researchers should give further attention to interdisciplinary models and to the use of appropriate statistical analysis methods. For further research, the following suggestions can be made:

- One object for further research in the context of m-learning could be to find out if it is possible to observe significant correlations between perceived usefulness and anytime learning in different samples (e. g. executives, professionals or politicians).
- Another object for further research could be the evaluation of critical economic factors in different samples of participants, to show if there are different characteristics of their willingness to pay for an m-learning service.
- In the field of m-payment further research has to note socio-cultural difference, because this field has not been considered sufficiently. In addition, the study presented here, considers the adjustment of users in Germany, Finland, the USA and Japan, but other countries (e. g. developing countries like Kenya) might demonstrate notable differences for cultural and economic reasons. Furthermore, similar to here made in the field of information security management, personality traits can be included in the study (FFM model).
- The study in the field of m-payment furthermore did not directly measure cultural dimensions. This could be considered in further research.
- While it was already found out that TAM consistently explains about 50 % of the variance in technology usage and behavior (Venkatesh & Davis, 2000; Dillon, 2001; King & He, 2006), it could be furthermore checked, whether the TAM has practical relevance.
- Qualitative investigations could be made to explore consumer behaviors that cannot be directly measured by quantitative research.
- In the research field of information security management cultural and legal differences should be considered. This is also due to the fact that Hofstede and McCrae (Hofstede & McCrae, 2004) found cross-national differences in personality traits. The study conducted here includes only German-speaking countries.

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Task Sharing

Paper 1 (Appendix 1): Microlearning mit UbiLearn

The author of this thesis wrote the majority of this research paper (Chapters 1, 2, 4, 6, and Sections 5.1, 5.3, 5.4). Dr. Claudia M. König wrote Chapter 3. Cornelius Köpp wrote Chapter 5.2 and Chapter 5.5. Dr. Claudia M. König and Cornelius Köpp were consultants throughout the writing of this article and have contributed to the final revision.

Paper 2 (Appendix 2): Szenarioanalyse und Technologiefolgenabschätzung

This paper was written in equal parts by Cornelius Köpp and the author of this thesis.

Paper 3 (Appendix 3): Microlearning in der berufsbegleitenden Fort- und Weiterbildung – Mit Wissenshäppchen zum Lernen verführen

The author of this thesis created the majority of this research paper. Dr. Claudia M. König and Cornelius Köpp were consultants throughout the writing of the article and have also contributed to the final revision.

Paper 4 (Appendix 4): Towards a Sustainable Business Model for Mobile Learning

All authors prepared Chapter 1, 3 and 4. Dr. Philipp Maske performed the majority of the literature review (Chapter 2). Dr. Philipp Maske and the author of this thesis conducted the empirical studies (Chapter 3). The author of this thesis designed the m-learning course. All authors made the creation of the model, the statistical analysis as well as the interpretation of the results.

Paper 5 (Appendix 5): Technologieakzeptanz mobiler Applikationen für Campus Management Systeme

Both authors prepared Chapters 1, 5 as well as Chapter 3 whereas a majority of Chapter 3.3 was written by Jan Bührig. Jan Bührig prepared Chapter 2.1. The author of this thesis wrote Chapters 2.2 as well as Chapter 4.

Paper 6 (Appendix 6): Investigating Technology Acceptance of Mobile Payment in Germany and the USA

All authors prepared Chapter 1 – 3 whereas a majority of the Chapter 2 was written by Rouven Wiegard and Tai Loi and Chapter 3 by Rouven Wiegard and the author of this thesis. Chapter 4 as well as the research model were prepared by the author of this thesis. Chapter 5 has been largely written together, whereas the majority was prepared by Rouven Wiegard and the author of this thesis.

Paper 7 (Appendix 7): Das Mobiltelefon als Geldbörse – Technologieakzeptanz von Mobile Payment in den USA und Deutschland

The paper was written together, whereas Tai Loi and Rouven Wiegard prepared the majority.

Paper 8 (Appendix 8): Personality Traits and Information Security Management: An Empirical Study of Information Security Executives

Jörg Uffen and the author of this thesis wrote this paper in equal parts. Jörg Uffen prepared the majority of the first part whereas the author of this thesis prepared the majority of the second part.

Paper 9 (Appendix 9): Technology Readiness in Customers' Perception and Acceptance of M(obile)-Payment: An Empirical Study in Finland, Germany, the USA and Japan

All authors prepared Chapter 1 whereas Tai Loi prepared the majority of the Chapter 1.2 and 1.3. The author of this thesis wrote Chapter 2 and Chapter 3. All authors wrote Chapter 4 and Chapter 5 whereas the majority was prepared by Rouven Wiegard and the author of this thesis.

Paper 10 (Appendix 11): Influence of E-Trust on Direct Online-Bookings of Sail-Cruises in Turkey

Rouven Wiegard and the author of this thesis wrote this research paper in equal parts.

Paper 11 (Appendix 10): A Specific Technology Acceptance Model for Mobile Services in the Cruise Sector

Rouven Wiegard and the author of this thesis wrote this research paper in equal parts.

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Appendix 1: Microlearning mit UbiLearn^{®3}

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Philipp Maske*

IN: HOHENSTEIN, A.; WILBERS, K. (Eds.): Handbuch E-Learning - Expertenwissen aus Wissenschaft und Praxis – Strategien, Instrumente, Fallstudien 2010, 33. Erg.-Lfg. Juli 2010, 8.41, Wolters Kluwer Verlag, Köln, pp. 1-24.

Abstract: In unserer immer mobiler und dynamischer werdenden Gesellschaft, in der mehr und mehr in fragmentierten Formen kommuniziert wird, ergeben sich zunehmend neue Anforderungen an herkömmliche Aus-, Fort- und Weiterbildungsangebote: Situatives Lernen direkt »am Puls des Geschehens« erfordert angepasste Lerninhalte, die den Nutzer in seiner aktuellen Situation unmittelbar weiterbringen, z. B. am Arbeitsplatz, auf Reisen etc. Vom Lernenden soll nicht mehr verlangt werden, seinen aktuellen Tätigkeitskontext unnötig lang zu unterbrechen, denn Zeit ist ein kostbares Gut und der schonende Umgang mit den immateriellen Ressourcen ist in der heutigen Zeit von erheblicher Bedeutung. Vielmehr soll der Nutzen, d. h. der aktuelle Lernfortschritt, unmittelbar und direkt durch die Nutzung von Leer- und Nischenzeiten als Lernzeiten erfolgen. Aus diesen Anforderungen ergibt sich, dass mobiles Lernen eine ideale Grundlage für Microlearning darstellt, auch wenn Microlearning nicht zwangsläufig mobiles Lernen voraussetzt. In diesem Kontext stellt UbiLearn[®] als marktfähiges, praxisbewährtes und innovatives Lernsystem, welches durch seine Flexibilität, Kundenorientierung und Erweiterbarkeit sowohl stationäres als auch mobiles Lernen unterstützt, eine Lösung dar und wird im Folgenden anhand konkreter Beispiele aus der Praxis vorgestellt.

³ (Breitner, Guhr, König, Köpp, & Maske, 2010)

Appendix 2: Szenarioanalyse und Technologiefolgenabschätzung⁴

Nadine Guhr, Cornelius Köpp

IN: BREITNER ET AL. (Eds.): Aspekte der Wirtschaftsinformatikforschung 2010. IWI Discussion Paper # 45. Institut für Wirtschaftsinformatik der Leibniz Universität Hannover, pp. 59-104.

⁴ (Guhr & Köpp, 2010)

Appendix 3:

Microlearning in der berufsbegleitenden Fort- und Weiterbildung – Mit Wissenshäppchen zum Lernen verführen⁵

*Michael H. Breitner, Nadine Guhr, Claudia M. König, Cornelius Köpp,
Philipp Maske*

IN: DEUTSCHE GESELLSCHAFT FÜR PERSONALFÜHRUNG E.V.:
(DGFP) (Ed.): Personalführung – Für alle die Personalverantwortung tragen
2/2011, pp. 40-48.

Abstract: Das Lernen anhand von kurzen Lernsequenzen ist im Vergleich zu traditionellen Lehr- und Lernmethoden ein vergleichsweise neues Phänomen. Möglich und befördert wurde es durch die Verbreitung leistungsfähiger mobiler Endgeräte. Vertreter der jüngeren Generation sowie Informations- und Wissensarbeiter müssen kaum Hemmschwellen überwinden, um diese Medien auch für Lernzwecke zu nutzen. Weiterbildner und Medienpädagogen wiederum sehen in den ‚Wissenshäppchen‘ eine Chance, Hemmschwellen gegenüber Lernprozessen niedrig zu halten. Der Artikel gibt einen Überblick über einen noch jungen Ansatz, der zahlreiche verschiedene Lernaktivitäten und Lernmodelle umfasst.

⁵ (Breitner, Guhr, König, Köpp, & Maske, 2011)

Appendix 4: Towards a Sustainable Business Model for Mobile Learning Services⁶

Philipp Maske, Nadine Guhr, Cornelius Köpp

IN: PROCEEDINGS of the 19th EUROPEAN CONFERENCE ON INFORMATION SYSTEMS (ECIS), 09. – 11.06.2011, Aalto University School of Economics, Paper 245.

Link: <http://aisel.aisnet.org/ecis2011/245/>

Abstract: In today`s mobile world, people demand access to learning materials and courses anytime and anywhere. There is a high market potential for m(obile)-learning services, but the mere existence of such services does not mean market readiness. Added values of m-learning services are necessary to attract new users. Mobile technologies both expand and constrain the practicability of value-based m-learning. Existing evaluation systems primarily focus a didactical or a technical point of view. This study utilizes the design science paradigm to address the design of an m-learning application that meets the needs of users and augments their willingness-to-pay so that suppliers can bring it to market sustainability. The results of an extended technology acceptance model (TAM) based evaluation shows that user acceptance and willingness-to-pay for m-learning is driven by the special exploitation of didactic added value of m-learning content and a technologically adopted implementation of m-learning applications.

⁶ (Maske, Guhr, Köpp, & Breitner, 2011)

Appendix 5: Technologieakzeptanz mobiler Applikationen für Campus-Management-Systeme⁷

Jan Bührig, Nadine Guhr, Michael H. Breitner

IN: HEISS, H.-U.; PEPPER, P.; SCHLINGLOFF, H.; SCHNEIDER, J. (Eds.): INFORMATIK 2011 – Informatik schafft Communities, Beiträge der 41. Jahrestagung der Gesellschaft für Informatik e.V. (GI), 04. – 07.10.2011, Band P192.

Abstract: Deutsche Hochschulen erweitern ihr Angebot an browserbasierten Selbstbedienungsfunktionen als Service für die Studierenden stetig. Mobile Applikationen haben aber noch keinen Einzug in den Hochschulalltag gehalten, obwohl bereits fast alle Studierenden mobil telefonieren und mobile Endgeräte darüber hinaus nicht nur zur Kommunikation nutzen, sondern multifunktional als intelligenten, persönlichen Assistenten einsetzen. In diesem Aufsatz wird anhand einer quantitativ empirischen Studie unter Einsatz eines angepassten Technologie-Akzeptanz-Modells (TAM) die Forschungsfrage beantwortet, wann, unter welchen Bedingungen und wie eine mobile Applikation ein sinnvolles Zusatzangebot für Studierende an Hochschulen darstellen kann.

⁷ (Bührig, Guhr, & Breitner, 2011)

Appendix 6: Investigating Technology Acceptance of Mobile Payment in Germany and the USA⁸

Rouven Wiegard, Nadine Guhr, Tai Loi, Michael H. Breitner

IN: MATTFELD, D. C.; ROBRA-BISSANTZ, S. (Eds.): Multikonferenz Wirtschaftsinformatik 2012 – Tagungsband der MKWI 2012, pp. 407-418.

Abstract: In today`s mobile world there is a high potential for M(obile)-payment services, but the mere existence of such services does not mean market readiness. Added values of M-payment are necessary to attract new users. The aim of this work is to investigate whether M-payment is or can be accepted by the consumers. We will determine the technology acceptance of consumers, face to face with the M-payment for Germany and the USA. For this purpose, we will carry out a technology acceptance analysis using a structural equation modeling technique. The constructs of the research model arise from the findings of an explorative study and a literature review. The results of an extended technology acceptance model (TAM) based evaluation shows, that user acceptance of M-payment, especially the influence of the constructs, perceived ease of use and willingness-to-pay differ to the intention to use.

⁸ (Wiegard, Guhr, Loi, & Breitner, 2012)

Appendix 7:
Das Mobiltelefon als Geldbörse – Technologieakzeptanz von Mobile Payment in den USA und Deutschland⁹

Michael H. Breitner, Nadine Guhr, Tai Loi, Rouven Wiegard

IN: Banking and Information Technology (BIT) 2/2012, pp. 42-49.

⁹ (Breitner, Guhr, Loi, & Wiegard, 2012)

Appendix 8:

Personality Traits and Information Security Management: An Empirical Study of Information Security Executives¹⁰

Jörg Uffen, Nadine Guhr, Michael H. Breitner

IN: PROCEEDINGS of the 33rd INTERNATIONAL CONFERENCE ON INFORMATION SYSTEMS (ICIS), 16. – 19.12.2012, Orlando, Florida (USA)

Link: <http://aisel.aisnet.org/icis2012/proceedings/ISSecurity/5/>

Abstract: Executives' behavior causes potential information security management risks and has a direct influence on the security level of information systems and management. This behavior depends on personality traits and other cognitive factors. First, a comprehensive literature review and a status quo analysis are presented. We consider the constructs of the Five Factor Model (FFM) as influence factors for attitudes towards technical and non-technical dimensions of information security management. Then, the hypothesized relationships are validated using empirical data from 174 information security executives. The results suggest that multiple facets of an information security executive's personality have a significant effect on his or her attitude towards selected information security management activities. For example, conscientiousness is positively related to a person's attitude towards the technical and organizational activities of information security. From these findings, theoretical and practical implications and recommendations are discussed.

¹⁰ (Uffen, Guhr, & Breitner, 2012)

Appendix 9:

Technology Readiness in Customers' Perception and Acceptance of M(obile) Payment: An Empirical Study in Finland, Germany, USA and Japan¹¹

Nadine Guhr, Tai Loi, Rouven Wiegard, Michael H. Breitner

IN: ALT, R.; FRANCIZYK, B. (Eds.): Proceedings of the 11th International Conference on Wirtschaftsinformatik (WI2013), pp. 119-135.

Abstract: In today's mobile world there is a high potential for m(obile)-payment services, but the mere existence of such services does not mean that the market is ready for them. M-payment services must add value to attract new users. After years of research regarding technology acceptance (TA) of m-payment, the aim of this paper is to examine how technology readiness (TR) influences customers' perception and acceptance of m-payment. TA of consumers in combination with TR is investigated for m-payment in Finland, Germany, the USA and Japan. We conduct an online survey to collect data in those four countries. We use that data to carry out a TA analysis using a structural equation model (SEM). The research model arises from the findings of a priori explorative study and a comprehensive literature review. Evaluation results based on an extended TA model (TAM) show that user acceptance of m-payment differs influenced by constructs.

¹¹ (Guhr, Loi, Wiegard, & Breitner, 2013)

Appendix 10: A Specific Technology Acceptance Model for Mobile Services in the Cruise Sector¹²

Rouven Wiegard, Nadine Guhr, Michael H. Breitner

IN: PAPATHANASSIS, A.; LUKOVIC, T.; VOGEL, M. (Eds.): Cruise Tourism and Society – A Socio-economic Perspective (ICC3 - International Cruise Conference Proceedings), pp. 127-140.

Abstract: In few years only mobile devices have evolved from a utility object for voice communication to smart phones capable of a variety of tasks. Research on mobile technologies has received increasing attention and technology adoption has been studied from a variety of perspectives. Researchers from different research areas have come up with various models incorporating factors and phases to predict adoption through technology acceptance that, in turn, will lead to persistent use and user satisfaction. In tourism research there is a lack of such technology acceptance models (TAM) as the focus of research lies on the evaluation and development of mobile tourism applications and on general tourist needs and behavior. With increasing popularity of mobile devices this is an opportunity for a development of innovative mobile tourism services, depending on technology acceptance. There is much research on the evaluation and development of mobile services for the tourism sector as a whole but for the cruise sector mobile technologies and services are widely assumed to play a minor role. Currently several TAM exist which are helpful to increase understanding of the different critical success factors (CSF) on user acceptance, but they are not suitable to support the development of mobile services in a highly competitive tourism sector like the cruise sector. The paper will investigate the technology acceptance of mobile services on cruise ships. We will carry out a TAM analysis using a structural equation modeling (SEM) technique. The results of an extended TAM based

¹² (Wiegard, Guhr, & Breitner, 2012)

evaluation shows, that users can be grouped into three different clusters: enthusiastic mobile technology users, normal mobile technology users and mobile technology critics. After presenting the results of the quantitative study, important CSF for mobile services on cruise ships aligned with a generic business model are discussed. This paper about technology acceptance of cruise passengers addresses researchers, designers and decision-makers on technology adoption.

Appendix 11: Influence of E-Trust on Direct Online-Bookings of Sail-Cruises in Turkey¹³

Nadine Guhr, Rouven Wiegard, Michael H. Breitner

¹³ (Guhr, Wiegard, & Breitner, 2012)

Influence of E-Trust on Direct Online-Bookings of Sail-Cruises in Turkey

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Abstract:

The Internet has become deeply rooted in our daily life and is affecting the way people behave and the way they behave in their environment. As transaction through the internet continue to increase, success will largely depend on customers' trust in the company. Trust is important to all marketing transactions, yet few studies have examined the phenomenon in an online environment for travel products. There is evidence that consumers are still reluctant to use online transaction due to various factors. As changes and developments within this industry were noticed, the question where the trend is heading to in the future seemed to be an interesting issue that influenced the preparation of this paper. The growing significance of the internet, concerning the marketing of goods and services with its given opportunities for both - suppliers as well as consumers - has been recognized as being a major factor for future growth of the tourism industry. Analyzing and valuing factors influencing the actions and interactions of these two seemed to be an interesting and instructive issue. Analysis of problems causing this issue could support companies in overcoming current limitations when constructing and implementing new websites.

Thus, the present paper is primarily concerned with the merchandising of touristic services, especially sail-cruises on the Internet. For this purpose factors such as the advancement in the tourism industry, the internet usage for gathering information and processing of bookings as well as the configuration of websites will be analyzed and valued. A single case study, as a common way to do qualitative inquiry, has been conducted to get scientific information on how a sail-cruise vendor's website is able to build up e(-lectronic) trust, which could lead to a higher online booking rate.

The results shows, that some branches of the tourism industry have not yet fully profited from the available chances to increase direct bookings. Nowadays mainly accommodations and flights are booked via internet while recreational activities such as sail-cruises are still lacking in online bookings. The major reason for this issue has been identified to be the lack of e-trust towards these touristic vendors. However, e-trust is not the only factor that influences the intention of customers to purchase sail-cruises over the internet, it is obviously an important one.

This paper makes a contribution to understand that e-trust in the context of tourism is a specific issue which sail-cruise vendors should carefully consider to increase their profits

through e(-lectronic) commerce. Therefore it is advisable for touristic vendors to keep an eye on developments induced by the internet and react and adjust in a flexible way.

1 Introduction

Since the beginning of the 90's when IT and internet have emerged and gained influence they changed every single aspect of live. People obtained the ability to work, shop, communicate or simply gather information ubiquitously and used these opportunities with increasing interest and casualness. In Germany, 70% of the population over 14 years of age is connected to the internet and the number will keep rising in the next few years (FUR, 2010). This development highlights the importance of being online not only for individuals for private use but also for companies to pursue online business. Thereby, businesses have the opportunity to enhance their profits and competitiveness. One of the industries which is most strongly influenced by the internet is the tourism industry. In Germany, tourism is one of the most favored leisure activities proved by the fact that 75,7% of the population over 14 years have at least traveled once in 2009 (FUR, 2010). A trend which has been quite stable in the last years and forecasts predict no changes of process. And when it comes to the purchase of goods and services, consumer decisions which are influenced deepest by the internet are services related to touristic activities as figure 1 illustrates.

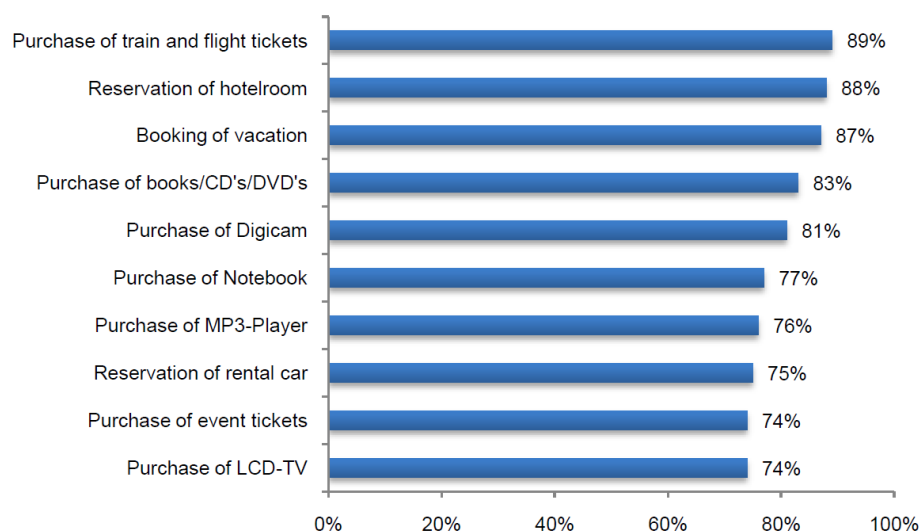


Figure 1: Consumer decisions which are influenced through the internet

Source: Own representation according to Fleischmann, Hillard (2008), p.13.

Thereby, the tourism industry is still not fully profiting from increased use of the internet. Although flights and hotels are increasingly booked online smaller vendors often struggle to set up online commerce. One of the main reasons for this deficit is the lack of trust, due to the anonymous character of the internet. The perceived risk of dealing with an unknown supplier that might be untrustworthy appears to be a major issue in conducting electronic business. To increase online commerce it is therefore vital to identify and analyze factors that influence and support e-trust on a touristic website with the goal to attain direct bookings from this site. As sources that affect trust this paper expands on online reputation, website characteristics and institution-based trust factors which have a major ascendancy on this issue. The growing significance of the internet, concerning the marketing of goods and

services with its given opportunities for both - suppliers as well as consumers - has been recognized as being a major factor for future growth of the tourism industry. As changes and developments within this industry were noticed, the question where the trend is heading to in the future seemed to be an interesting issue and influenced the preparation of this paper. The fundamental research question is:

“How can e-trust be created for direct online bookings of recreational activities?”

The practical value arises from a single case study which will be conducted. To keep the matter and give a frame to the topic, the website a Turkish vendor which offers recreational activities will be examined and the impact of e-trust onto this site will be viewed and weaknesses of e-trust will be revealed and demonstrated. Suggestions made in this paper will be implemented and findings will be generalized.

The present paper is primarily concerned with the merchandising of touristic services on the internet. For this purpose factors such as the advancement in the tourism industry, the internet usage for gathering information and processing of bookings as well as the configuration of websites will be analyzed and valued. Based on a case study practical suggestions will be pointed out and implementations shall be rated.

2 Determinants of E-Trust

2.1 E-Trust

Trust in online environments is more difficult to build up and more critical than in business environments with personal face-to-face contact. Business transactions that are more frequently initiated and concluded over the internet have therefore lost its personal touch. In comparison to brick-to-mortar environments, the trust relationship is established between two parties who have never met and probably will never meet. According to that, virtual transactions are more risk afflicted because they are more anonymous and automated than offline transactions (Chang et al., 2006). “This dehumanization of business relation is also accompanied by an increase in the technical means and opportunity for fraud and abuse” (Head and Hassanein, 2002). This paper follows Corritore et al. (2003) who define online trust for an individual towards a specific transactional or informational website as “an attitude of confident expectation in an online situation of risk that one’s vulnerabilities will not be exploited.” Corritore et al. (2003) distinguishes online trust in three stages. In the developmental stage where the trustor acts in a trusting manner at a risky situation in which there is not much personal information required and in which there is a recognized system of rewards and punishment. At the intermediate stage the trustor has already gathered some experience with a website and therefore in situations of risk, trust can be assigned through knowledge. The last stage is the developed level of trust, which is also the deepest level. At this stage the trustor expects that one’s interests will be respected and pursued so there is no need to calculate the level of risk anymore.

2.2 Factors affecting E-Trust

Online trust appears to be the major requirement to successfully interact with consumers via internet. It helps the provider to lower transactional costs and gather personal information of the user. Consumers are unlikely to patronize websites that fail to generate trust. Therefore,

continued growth in e-commerce is at least partly linked to the development of trust between suppliers and consumers. Head and Hassanein (2002) distinguish in this context between “hard” and “soft” trust. “Hard trust” centers on technical solutions provide secure interactions whereas “soft trust” expands on privacy issues and the vendor’s website quality. The present paper dismisses “hard trust” technical solutions to generate trust, because these technical issues are more likely related to safety. Instead the paper focuses on “soft trust” issues such as trust in a specific transactional or informational website, but not in the internet as a medium will be regarded.

A number of studies and surveys have identified several antecedents to online trust that have been explored conceptually and /or empirically. A great variety of these studies focus on specific factors that have influence on online trust. Chen (2006) names five relatively exclusive sources of trust: Consumer characteristic-based trust, website characteristic-based trust, calculus-based trust, institution-based trust, and knowledge-based trust. These sources lead to consumer overall online trust and the trust leads to behavioral intentions and behavior of the consumer. The framework shows consumer trust in online travel site.

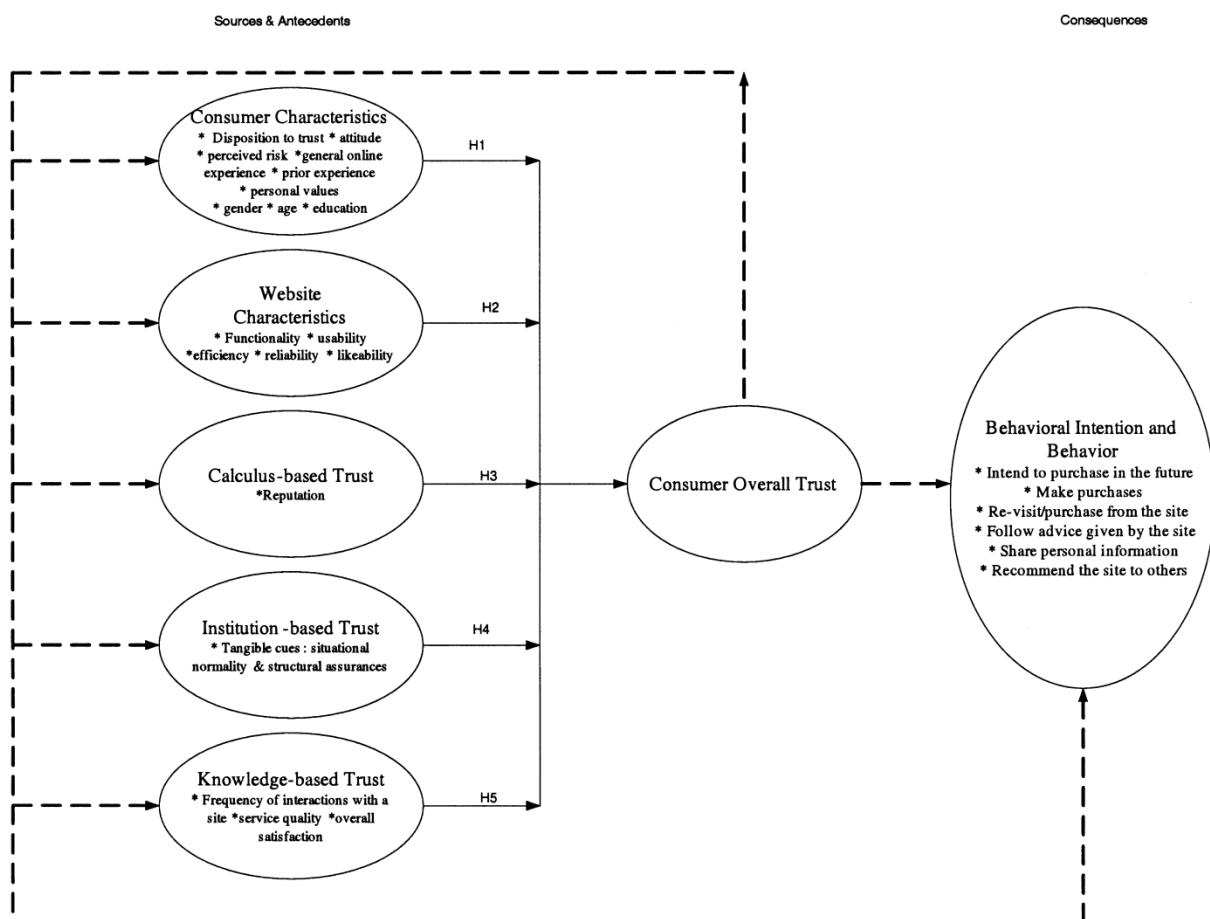


Figure 2: A framework of consumer trust in an online travel site

Source: Chen (2006), p.199.

In the following explanation the paper will focus on three sources that impact online trust. It will be shown how calculus-based trust, website characteristics and institution-based trust influence consumers overall online trust. The other two sources for online trust, consumer characteristics and knowledge-based trust will be left aside as it is difficult to judge about the

influence e.g. of nationality or online experience on the perceived trust and because of a lack of figures for this assumption.

3 Research Methodology

3.1 Case study research

The choice of which method to employ is depend upon the nature of the research problem and derives from the nature of the social phenomena to be explored (Morgan and Smircich, 1980). The case study has been conducted to get scientific information on how a touristic vendor's website is able to build up e-trust, which could lead to a higher online booking rate. There is no universal definition of a case study. We will draw our definition from those represented by Bonoma (1985), Benbasat (1985), Kaplan (1985), Stone (1978), Yin (2003), Benbasat et al. (1987). Benbasat et al. (1987) defines a case study as a study which "...examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations)." Furthermore Neale et al. (2006) argued that a case study is appropriate "when there is unique or interesting story to be told." Case research has been proposed respectively recommended (e. g., Eisenhardt, 1989) and is largely used and accepted as development tool and theory in IS research (Radeke, 2010). Concerning the case research, there are numerous research methodologies in the IS field (e. g., Paré, 2004; Yin, 2003; Benbasast et al., 1987; Lee, 1989).

Even though some authors argue that case studies lack of scientific rigour and results cannot be generalized, it is considered being appropriate when dealing with a process or a real-life activity in great depth (Baharanein, 2008). Theoretical sampling of single cases is straightforward and they are chosen because single cases are extreme exemplars, are unusually revelatory, or opportunities for unusual research access (Yin, 1994; Eisenhardt and Graebner, 2007). But single cases like this pilot case can enable the creation of more complicated theories than multiple cases. This is due to the fact that single cases can enable the creation of more complicated theories than multiple cases. Single case researchers can fit their theory precise to the details of a specific case (Eisenhardt and Graebner, 2007).

Furthermore, there are three types of case studies: research, exploratory, and descriptive (Yin, 2003). In this paper an explanatory approach to conduct the research will be used. Using a single case study as research method is suitable because the website's of small touristic vendors have only low online traffic, making it difficult to find attendants for a quantitative research. Therefore a qualitative research is conducted.

Information and data are collected from different sources. Interviews with the companies owners were one of the main source to get information about the available services and of the processes within the company. Also personal experiences and knowledge about the company is added to the analysis. In addition, website related statistics were gathered from the domain provider. The research will start by analysing the question if the company has build up any online reputation at all. After that the company's website itself will be analyzed in an objective manner to look at website characteristics that provide e-trust. Finally the institution-based trust will be viewed. After the weaknesses are pointed out and implications are made in order to raise the perceived trust of consumer's in the website. Finally generalized suggestions will be given.

3.2 The case

The company “Sollare Sailing School” was established in 2008 and is located in Marmaris, Turkey. The company’s main service is a weekly sailing trip with skipper-training lessons onboard of the company’s yachts. Customers can also book sailing lessons on their own boat. The company is International Yacht Training (IYT) certified which means after a practical and theoretical examination the sailing school is authorized to hand out international recognized sailing licenses which allows to charter boats around the globe. The sailing school distributes its services directly, without any interference of travel agencies or tour operators. Services can be booked directly onboard, by telephone, or via e-mailing. For reservations, customers have to pay 50% of the price in advance to a Turkish or German bank account. The remaining amount is paid either cash or via bank transfer right before the beginning of the trip. The annual turnover did not exceed 100.000€ in 2010 and the expenditures on the boats were 12.000€ for each. Commercial and advertisement costs were valued with about 5.000€ in 2010. This budget was spent on commercials in sail magazines, boat fairs, prospects and giveaway´s. The company did not spend additional budget on internet advertisement nor on its own website. The majority of the customers are Turkish citizens from Istanbul. Regularly the customers can be characterized mid- to upper class who have studied at universities, are well employed and are able to spend money for their hobbies. In average these customers are between 35 and 60 years of age. In 2010 there were about 80 repeatcustomers and only 20% new-subscribers. In average only 20% of all customers who participate to sailing trips are foreign. Of these foreign customers just 25% are German, which is only 5% German customers in total.

3.3 The current Setting

The website of “Sollare Sailing School” has been accessed 4.483 times in the first six month of 2011. 12.995 site views have been completed in total. 2,96 sites have been viewed in average during each visit. 78% of the visitors have accessed the site directly, 15% over cross-references and only 7% via search engines. Statistics also show that almost exclusively Google has been used to find the website.

The table below illustrates the evaluation of the websites reputation. (-) indicates that there is no content found at all. (-) means that content is difficult to find. (+) content is found but lacks of in quality and (+ +) is indicating that good content can easily be found on the internet.

Online Reputation	Evaluation of the websites reputation
Search engine	(-)
Blogs	(- -)
Micro blogging	(- -)
Virtual community	(+)
Feedback portals	(- -)
Video/photo sharing	(- -)

Table 1: Evaluation of the websites online reputation

The websites overall usability fails to provide e-trust. The site’s weaknesses are listed on the table below. (- -) indicates that the websites characteristics are not supporting a good usability at all. (-) means that website characteristics are not supportive for good usability. (+)

website characteristics partly support a good usability. (+ +) the website characteristics fully support a good usability.

Website characteristics	Evaluation of website characteristics
Design	(- -)
Navigation	(-)
Graphical design	(- -)
Content design	(- -)

Table 2: Evaluation of the websites usability

Contrary to the non-existence of assurances for direct-bookings the company enacts over the IYT certification. To most sailors this international operating association is well known as a reliable authority. On the webpage itself the visitor searches unavailingly for a seal of the association, only the content informs readers that licenses of IYT are available. There are no further certifications of other known authorities.

Structural assurances	Evaluation of assurances
Trusted-Third-Party	(- -)
E-payment	(- -)
Technical Control Board	(-)

Table 3: Evaluation of assurances

Overall, the website is not able to build up online trust due to the reasons highlighted in this chapter. The online reputations of services have not been achieved. The major reason is that the sailing school is difficult to find over search engines and there are no feedbacks or blogs found on the internet. The website has met none of the requirements of a well usable website.

The “Sollare Sailing School” could benefit from the improvement of trust or reputation gathering through a redesign of the website. Therefore, management implications that increase the e-trust on the website will be given in the following. First, implications for the increase of calculus-based trust will be named. Following that, implications for the website’s characteristics will be given. Finally, some implications on how to increase institutional-based trust on the site will be highlighted.

4 Management Recommendations

4.1 Increase of Calculus-based Trust

Even though the company faces a shortage of time, it is essential to increase its online reputation. By achieving a high reputation, the website could attract more customers and direct bookings could be enhanced. Therefore the company should start to be more active over social media channels. Customers are increasingly searching for recommendations, evaluations or feedbacks over the internet. Therefore the importance of being active on-line keeps growing. To achieve a good online reputation the company must optimize the search over google.com, so that more results appear. It was also recommended to construct a blog.

The sailing school is in position of enough information and experiences to fill a blog with interesting stories. In addition, it is recommended that the sailing school signs up for twitter and is more active in using Facebook. Services can be promoted effectively and efficiently over these channels. Reputation on feedback portals should also be build up, by indicating such websites to customers. The upload of videos is another recommended way to increase reputation. Table 4 lists the applications and systems which have been shown to increase online reputation and views the importance of the implications.

Online reputation	Management recommendations
Search engine	(+ +)
Weblog	(+)
Micro-blogging	(+)
Virtual community	(+ +)
Feedback portals	(+ +)
Video/Photo-sharing	(+)

Table 4: Management implications to increase online reputation

4.2 Improvement of Website Characteristics

As it was shown earlier in this paper the company's website is unprofessionally constructed and hence misses to provide e-trust. The goal is to explain in detail how the website should be set up to enlarge the perceived e-trust. In the case of the sailing school a completely new website should be constructed instead of upgrading the current website.

The new website requires a more professional design which provides a clearer and brighter picture of the company and its services. The reconstructed website should be lucid and the ease of use must be increased. Pictures and contents have to be categorized in a comprehensible manner so that new visitors easily find the information they are searching for with pictures that match with the content. The site should also include links to related services as well as the opportunity to view the website in three languages, Turkish, English and German. If the owners decide to use social media networks such as Facebook and Twitter, the site needs to include links to them.

The construction of a newly designed website is more than necessary to increase traffic and bookings. The company should structure the site as it has been mentioned and focus on an easy-to-use and comprehensible navigation menu. The graphical design and the content design should be specifically designed according to the implications mentioned above. The graphical as well as the content design are subjective characteristics which are often bound to the visitor's opinion. The company should consider this fact and design its website according to its corporate identity.

4.3 Suggestions for Institution-based Trust

The main differences between e-commerce and traditional brick-and-mortar purchase of touristic services are that the vendor is faceless and sensible customer information is provided without really knowing who is behind the screen. Since the purchase and the consumption of the service are not conducted simultaneously, one site has to take on the risk that is associated with an electronically conducted business (Wiedmann et al., 2009). Therefore it is important to provide a trustworthy booking mechanism which lowers the risk associated with the transaction. The company does not yet provide a direct booking

mechanism. Until now bookings are processed without any assurances via e-mail contact or by telephone. The down payment of 50% is paid at the time of reservation and the rest in cash before the trip sets off. This way of handling transactions rather provides distrust as the perceived risk for consumers is high. To include a trustable payment system structural assurances should be provided so the consumer feels save about providing personal information to the company. To assure the responsible use of personal information the company could provide the logo of a trusted-third-party or seal-of-approval. As surveys have found out, third parties are able to increase perceived trustworthiness as the consumer feels more confident to interact with these sites. Recommendations suggest to provide a third party logo on the site. Even though the service is not free of charge the company could profit from it as online bookings appear to be safer. Consumers trust is strengthened and their will to book directly could be enlarged. Since there are a great number of online certifications the company should use the one that is most commonly used when conducting online business. It is important that visitors recognize the certification so that an advantage is achieved. Besides the increase of e-trust through the use of trusted-third-parties the company should consider the use of e-payments, because the critical factor of success for every company that operates electronically is to implement an online payment mechanism. There are several Payment Service Providers (PSP) which offer the ability to have all payment services managed by a single vendor for a monthly charge. The option to pay directly via a particular payment service could increase online bookings as statistics have shown. In this case it is not recommended to the company to get all e-payment services that are available. Many of these e-payment services are generally specified on the retail dealer. Also the charge paid to the PSP stresses the company's budget without strongly influencing business. Additionally, the availability of too many payment services could confuse consumers as well as the company's owners because terms-of-trade vary by service. Though the consultation of a PSP is not recommended the company should not necessarily reject e-payments. The availability of a few e-payment services is generally recommended but the company should focus on specific payment services to not lose track of the payments. It is implicated that Paypal should be used, because the service can be used internationally and for many consumers the service is familiar. Furthermore, the availability of credit card payments and the traditional cash-transfer is recommended to be provided. The ability to transfer the money to a bank account of a German bank is viewed as being safer and more trustworthy then the transfer to a Turkish bank. Due to the fact that the school is certified by International Yacht Training (IYT), the logo of this authority should be visibly posted on the page. This would connote that the skippers are well trained and qualified to examine sailors and hand out licenses. The sailing school should also try to get a certification by a German authority such as the Deutsche Segel Verband (DSV). This could enhance the trustworthiness towards customers from Germany. The decision about which certificates are worth applying for, the company needs to consider budget and benefits of being certified by specific vendors.

5 Conclusion, Limitations and Further Research

5.1 Conclusion

The internet offers touristic vendors great abilities to enhance their online trustworthiness. Through web 2.0 and social media companies can directly profit from reviews, feedbacks and contents that are spread over the internet. The decreasing prices for programming a

professional website, and the availability of a large number of certification authorities and payment services helps to make online commerce conductible for every touristic company. Though e-trust is not the only factor that influences the intention of customers to purchase services over the internet, it is obviously an important one. Since e-tourism is forecasted to keep growing in the future, recreational vendors have the ability to enhance their profits derived from online business by improving their online trustworthiness. For vendors who are used to distribute their services over intermediaries, the availability of e-commerce could make them reconsider their business structure. If more resources are spent to achieve a higher online booking rate, the vendor could lower its bonds to tour operators and travel agencies and thus decrease commission payments. Recreational companies which do not distribute services over intermediaries but through WOM, the internet could support not only the completion of online bookings but also the promotion over social media can be enhanced and be a supportive factor for advertisement. However, the investment into a professional website with all requirements for e-trustworthiness is not recommended to all recreational vendors. Vendors which offer activities which are performed within one day will expectably most likely not be successful by implementing a professional website, as tourists often do these activities instinctively without gathering information beforehand.

5.2 Limitations and Further Research

The generalizability and abstractability of this study concerning the influence of e-trust on direct online-booking of recreational activities in turkey is limited due to the following reasons. Firstly, this study considered the influence of e-trust on direct online-booking of recreational activities only in Turkey, but different countries have notable differences caused by cultural and economic differences. Further research is required to further test and validate the findings of this study worldwide. The development of a website that meets all requirements of e-trust is usually expensive to design and can be time intensive to keep up to date. This could be a challenging task for the company as the owners are usually busy with sailing and handling the sailing yachts. The firm's financial and human resources could therefore be overused and negative effects on the quality of the services could result. To keep the website up to date and guarantee that web 2.0 tools are not abused e.g. by competitors who leave negative feedbacks and comments, money and time have to be invested. Systems or programs that track the company's reputation are not costless as well. The risk of receiving negative feedbacks or comments from customers could increase the pressure on the owners and lead to less bookings in the future. On the other hand positive feedbacks could lead to too high expectations by the customers. This could result in dissatisfaction and frustration. Generally it is unclear if customers will post comments, leave feedback, or upload videos and pictures. But non-participation of previous customers could create the image of having no customers at all or of offering low quality services. This could influence potential customers in a negative manner and so might lead to fewer bookings. It is also not clear how customers will use the direct booking availability on the website. Even though several services such as accommodations are increasingly booked directly over the internet, the booking of services at an unknown small touristic vendor often appears to be unsecure. The fact that the use of third party seals and payment systems is not for free might influence the company when deciding on whether or not to offer a direct online booking function. If the money that is invested to use these systems cannot be taken-in then the online booking function will not be favored by the owners. Another issue that could accrue is that the owners do not accept the

more intense use of the internet due to personal reasons. Personal limitations in the use of computers or the rejection of web 2.0 tools and applications are potential reasons for non-participation. Another fact that could hinder the company from implementing a direct booking availability is that it lowers the flexibility with which the company operates. Switching routes or boats could be difficult to explain to customers who have booked in advance a certain route with a specific yacht. What also becomes to a problem is that many bays the sailing school is harboring over night have no access to the internet. During this time the website respectively the schedule cannot be updated manually. If the free available dates are not constantly updated and e-mails are not processed it could lead to over bookings if the direct booking system does not automatically change the schedule which is an additional financial and work intensive process.

All implications and suggestions that are mentioned in this case study have not been tested and therefore an empirical research must be conducted to prove the scientific rigor. Furthermore, a single case used for exploration may be followed by a multiple-case study.

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