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What Influences the Adoption of Electronic Medical Record Systems? An Empirical Study with Healthcare Organizations Executives

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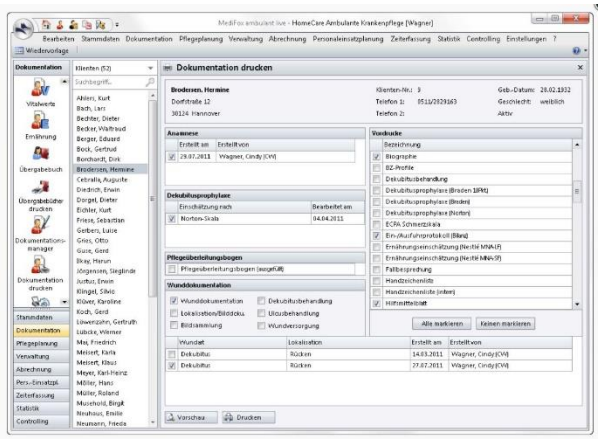

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1 Introduction and Motivation

An aging worldwide population and rising healthcare costs have contributed to the emergence of healthcare as an important area of research (Agarwal et al., 2011). In 2013, the global healthcare information systems (HIS) market was valued at USD 35.2 billion and it is expected to reach an estimated value of USD 53.2 billion in 2019 (Persistence Market Research, 2014). Electronic medical record systems (EMRS) are part of HIS. An EMR is a comprehensive record of patients' health-related electronically maintained medical information (Ludwick and Doucette, 2009; Bates et al., 2003). EMRS provide the opportunity to digitize patient records and enable the creation, storage, and access to healthcare information at the patient level and point of care (Davidson and Chiasson, 2005). A broad adoption of EMRS can improve the quality of care, lead to major health care cost savings and reduce medical errors (Hillestad et al., 2005). However, healthcare executives are often faced with high initial investment costs, uncertain revenues and high initial time investment during the implementation phase (Ford et al., 2006; Miller and Sim, 2004). User resistance and cost-benefit asymmetry reported as major barriers to EMR adoption and success (Fichman et al., 2011; Leidner et al., 2010). Executives might also risk of losing productivity during transition from paper-based records to electronic records (Gans et al., 2005).

In this study, we explore a comprehensive EMRS solution from a leading system and software manufacturer in Germany that is used for different outpatient healthcare services, i.e., elderly care, nursing, intensive care and rehabilitation. The manufacturer reported that in this healthcare sector in Germany most medical records are still stored on paper, but reasons for the rejection of this technology are still largely unexplored (Goh et al., 2011). Many healthcare organizations are lagging behind in the adoption of electronic documentation (Venkatesh et al., 2011). Therefore, the purpose of this paper is, to investigate critical factors affecting the adoption of EMRS for outpatient healthcare organizations in Germany from the executive perspective. In preliminary qualitative interviews, we asked executives from different outpatient healthcare organizations in Germany, who are already using EMRS, about their experiences and particular benefits and failures of different software solutions to identify important success factors. It became apparent that price value and technology readiness might play an important role in measuring IS success in this research context. According to Venkatesh et al. (2012), price value represents the users' cognitive tradeoff between the perceived benefits of the EMRS and the monetary cost of purchase. Technology readiness refers to person's propensity

to adopt and use new technologies to accomplish goals at work and in leisure time (Parasuraman, 2000). In this research, context technology readiness takes an executive's personality traits regarding the tendency to use EMRS into account. Whether an EMRS becomes a meaningful and successful implementation depends on various factors. The research field of IS success measurement is a heterogeneous and complex area that represents different definitions and perspectives of IS success. The central theoretical basis in this field of research is the DeLone and McLean IS success model (DeLone and McLean, 1992).

We examine the IS success of EMRS for outpatient healthcare organizations for several reasons. First, in IS literature, the IS success model has been shown to be an important instrument, because evaluation of the effectiveness or success of IS is a crucial aspect of research and practice (Petter et al., 2012). Given the extensive application of the IS success model to evaluate different types of IS (Petter et al., 2008), it was expected that it would be useful in the healthcare context. A few studies have shed some light on IS success in healthcare (Raghavan et al., 2010; Bossen et al., 2013; Petter and Fruhling, 2011, Win et al. 2008) and critical success factors for the implementation and use of EMRS (Tong and Teo, 2009; Ben-Zion et al., 2014; Fritz et al., 2015; Davidson and Chiasson, 2005). This paper can be seen as a first step towards understanding the influence of IS success and related factors price value and technology readiness on a comprehensive EMRS. Second, because researchers have called for more rigorous empirical research from the perspective of healthcare executives to advance the quality and its impact on user satisfaction of EMRS (Chang et al., 2012; Eysenbach et al., 2002), these factors have been shown to be main predictors of success (Barody and Hansen, 2012). Third, due to the global demographic changes of an aging population, treatment and care in different areas of outpatient healthcare is becoming increasingly important (Singh, 2008). We believe that in this emerging research context a global orientation is beneficial for researchers and practitioners alike.

This paper makes a theoretical contribution by conceptualizing the adoption of EMRS and that the perceived price value and the technology readiness of healthcare executives play an important role. To evaluate the findings of the preliminary interviews, we conducted an empirical quantitative survey with healthcare executives in Germany based on an adapted IS success model. In this study, we focus on the quality dimensions of the IS success model and the influence on the intention to use and user satisfaction. Therefore, net benefits are not considered in our research model. This is due to the quantitative nature of our model. We explore the following research question:

- Which are important factors affecting the adoption of electronic medical record systems for outpatient healthcare organizations?

This paper is structured as follows: first, we provide a theoretical basis and outline the results of the preliminary qualitative survey with executives from different outpatient healthcare organizations. As a result of the findings of the interviews and perceptions from literature as well, we derive the hypothesis of our conceptual model. After presenting the model development and analysis, we report and discuss the results of our empirical study. Together with findings we obtain from preliminary interviews with executives from outpatient healthcare organizations we give implications for research and practice. Finally, limitations and conclusions are provided.

2 Foundations, Conceptual Basis, and Hypotheses Generation

2.1 Electronic Medical Record

An EMR is a computerized health information system focusing on patients. It is defined as the medical detailed record about patient's information and conditions such as medical history, medications, allergies, intolerances, laboratory test results, vital signs, checkup reports, and patient demographics like age and weight etc. (Ludwick and Doucette, 2009; Bates et al., 2003). EMRs mostly gather, create, and manage data about a patients' treatment process by employees from a single healthcare facility, outpatient environment and clinicians (Bhargava and Mishra, 2014; Garets and Davis, 2006). Healthcare professionals use EMRs to perform operational functions such as order entry, test result reporting, and clinical guidelines practices depending on which functions are implemented in a given healthcare organization (Davidson and Chiasson, 2005). Therefore, EMRS can potentially play an important role in the performance and productivity discourse. Even as the adoption rates of EMRS grow (McInnes, 2006), many healthcare organizations are lagging behind in the adoption of electronic documentation (Venkatesh et al., 2011). Most medical records are still stored on paper, which means that they cannot be used to coordinate care, routinely measure quality, or reduce medical errors (Hillestad et al., 2005). Perry et al. (2014) compared EMR vs paper-based records in emergency departments and found out that electronic recording took longer than paper records and that practitioners were not satisfied with using EMRS. The reasons for the partial rejection of EMRs are still largely unexplored (Goh et al., 2011). EMRS have the potential to reduce the workload of healthcare professionals (Barkhuysen et al., 2014) and a broad adoption of EMR may improve the quality of care (Aron et al., 2011; Devaraj and Kohli, 2003), enhance the efficiency of care delivery (Agarwal et al., 2010; Dranove et al., 2012; Goh et al., 2011), lead to major healthcare cost savings and reduce medical errors (Hillestad et al., 2005). So far, the greatest importance in research articles is attached to measuring and forecasting

the acceptance of EMRS (e.g., Schectman et al., 2005; Kazley and Oz-can, 2007). EMRs can be broadly divided into two categories: first, EMRs allow healthcare professionals to retrieve, review, aggregate, and synthesize information helping them to learn about a patient's conditions and to enable a better and faster decision making. Second, EMRs are used to enter and document patient conditions, diagnoses, treatments, and test results (Bhargava and Mishra, 2014).

In this paper, we investigate an EMRS and software solution for outpatient healthcare organizations from a leading system and software manufacturer in Germany. The software manufacturer has bro-ken down the organizational processes into sub-processes and therefore, the EMR is a part of a HIS. Due to the modular structure, the HIS provides a large number of functionalities for calculation, planning, and quality management. The HIS consists of modules like accounting and administration (e.g., invoice management, interface functions to financial and payroll accounting, and staff administration), personnel planning (e.g., work scheduling and route planning), a management information system (e.g., controlling functions). The EMR forms the core element for different outpatient healthcare services, i.e., elderly care, nursing, intensive care and rehabilitation. All modules are closely interlinked and can be used either separately or as an entire system. The EMR offers a variety of valuable functionalities: e.g., master data management with extensive collections of information; acquisition of medical history and biography respectively structured collection of information (medications, allergies, intolerances, laboratory test results, patient demographics,…) with links to action planning and consultation records; integrated nursing reports; graphical customizable wound documentation with digital camera connection and image archiving, as well as risk assessment.

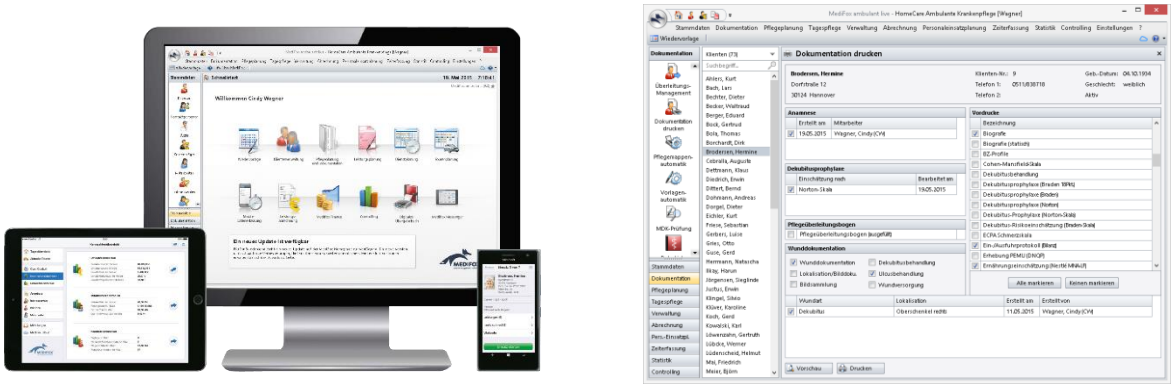

Figure 1. CarePad, Desktop Application and CareMobile EMRS

As shown on the left-hand figure, you can see the EMRS solution CarePad, the desktop application and CareMobile for Smartphones. On the right-hand figure, you can see a snapshot of the EMR.

2.2 Preliminary Qualitative Survey and Hypothesis Generation

To gain a deeper insight into the different experiences and particular benefits and failures of different software solutions, we interviewed seven executives from different outpatient healthcare organizations to identify important success factors. Those interviewed executives already use the above-described EMR system and have an in-depth knowledge of it. The goal was to obtain a comprehensive assessment of the EMR. The analysis of the seven interviews led to a variety of 41 different improvement suggestions. We reduced the answers provided down to four categories (information, system features, cost-benefit-ratio and attitude towards new technologies) without having a previously developed theory or concept. The first category refers to retrievable information and is closely linked to the system features. Some respondents were missing individual information and entry forms for specific queries and some were missing entire functional areas. Overall, the quality of the information and the quality of the system itself were important points. Furthermore, many executives believed that the price of the EMR system is too high, in particular for the comparison of effort and benefit. Some executives had to exempt employees for data entry and additional costs for training so that employees would be able to work properly with the system. For some executives, implementing the EMR was difficult and time-consuming. Executives reported that at the beginning, the new technology was a big challenge to many of their employees. In the development of our conceptual structure model for measuring the adoption and success of EMR systems, the IS success model includes an effective basis regarding the insights gained from the qualitative interviews. The first two categories we obtained from the interviews fit to the quality dimensions of the IS success model. The other two dimensions can be represented by price value and technology readiness.

Categories	**Exemplary answers**
Information Quality	Missing diagnostic information; Missing monthly statement of time recording for all employees; System is not able to represent individual functions, assessments, and illustrations
System Quality	Partially missing patient data analysis and input options for physicians; Detail functions and system enhancements (e.g., resource-based-planning); Insufficient medication administration, especially according to the Narcotics law
Price Value	Software much too expensive compared to the competitors; Disproportion between benefits and costs; Personnel costs (exemption of employees for data entry, training, etc.); Added value compared to previous system cannot be represented in monetary terms
Technology Readiness	Already had bad experiences with the introduction of a computerized documentation in the past; Transition to the new system was cumbersome; Difficulties in the use of the EMRS

Table 1. Preliminary Interviews.

We present the four main categories and a brief extract of some given recommendations in Table 1.

The scientific rigor of the IS success model has been comprehensively analyzed (Petter et al., 2008). Building on Mason's (1978) modifications of communication theory, DeLone and McLean (1992) note that most of the success measurements can be classified into six categories, which do not represent independent criteria for success, but instead are coherent and interdependent variables: information quality, system quality, use, user satisfaction, individual impact, and organizational influence. Based on empirical studies of the model in different contexts, the IS success model has evolved. The latter is made up of the intended and actual use as it interacts with user satisfaction (DeLone and McLean, 2003). The net benefit results from the user perspective, which combines the individual and organizational benefits. Several studies examine single variables of the IS success model for HIS and focus on information quality (Hyppönen et al., 2014; Thambusamy and Palvia, 2011; Apkon and Singhaviranon, 2001; Hu et al., 2002) and system quality (Ammenwerth et al., 2001; Pyper et al., 2004), on user satisfaction (e.g., Mettler, 2012; Porter and Kohane, 2001), use (Gray et al., 2003), organizational impact (Menke et al., 2001), and these variables especially on EMRS (Chang et al., 2012; Makoul et al., 2001; Wagner and Hogan, 1996). A comprehensive over-view of research studies focusing on different variables and factors, as well as data collection methods, was done by Lau et al. (2010) and Häyrinen et al. (2008). The IS success model has become an important basis of IS success research due to its simplicity and clarity, and the empirical validity, for example in the context of IS success in healthcare (Raghavan et al., 2010; Bossen et al., 2013; Petter and Fruhling, 2011; Win et al., 2008).

Based on an adapted DeLone and McLean IS success model, we propose a conceptual structure model by investigating the role of information quality (IQ), system quality (SysQ) and user satisfaction (USAT), in addition to Price Value (PV) and Technology Readiness (TR), in EMR software adoption. The IS success model assumes that the quality of an IS positively affects other variables of IS success. Specifically, the types of quality include the quality of the output provided by the information system (IQ) the technical quality of the system (SysQ), and the quality of the support pro-vided to the users for the information system (Service Quality). Due to the given answers of the preliminary conducted interviews and our research focus on EMRS adoption and usage, service quality was not considered in our conceptual model design. Information Quality captures the EMRS con-tent, such as the degree to which it is complete, up to date, and structured. System Quality identifies the user 's opinions of the performance distinctiveness of the EMRS, such as the degree to which it is reliable in the execution of tasks, flexible enough to meet a variety of needs and adjust to new demands,

and how quickly it responds to requests. For this reason, existing constructs and measuring indicators were used from Delone and McLean (2003), Wixom and Todd (2005), and Xu et al. (2013). According to Xu et al. (2013) we expect that users think that a useful system is essential to obtain useful information. When we asked executives from outpatient healthcare organizations to evaluate IQ, they will consider SysQ too. The relationship between IQ and SysQ would be formed in an executives' mind and they will not only access the relevant dimensions of IQ (completeness, accuracy, format, currency), but they will also access their perception of SysQ (reliability, flexibility, timeliness). Thus, we propose the following hypothesis:

H1: System Quality is positively associated with Information Quality.

User satisfaction and system usage reflect the interaction of IS with the users. Both are frequently used as substitutes for evaluating IS success and both have occupied a central role in IS implementation research (Igbaria and Tan, 1997). IQ and SysQ are posited to positively influence the user satisfaction that users have with the IS. We assume that an implementation of the EMR generally requires satisfaction on the part of employees. Users who believe that the EMR has higher levels of Information Quality and System Quality will also have higher levels of satisfaction with the EMR.

H2: Information Quality is positively associated with User Satisfaction.

H3: System Quality is positively associated with User Satisfaction.

Based on the updated Delone and McLean model (2003) and according to Petter and Fruhling (2011) and Win et al. (2008) it is suggested that the different types of information and system quality will influence how likely users intend to use the EMR in the future. Given that the examined EMR is already implemented, a user's intention to decide again for this EMR software in the future is neces-sary to measure when evaluating the success of the system. Therefore, the following hypotheses are proposed.

H4: Information Quality is positively associated with Intention to Use.

H5: System Quality is positively associated with Intention to Use.

In the previously conducted interviews many executives talked about high investment costs in soft-ware, hardware and training and especially put the cost-benefit-ratio into question. They complained about loss of productivity during the EMR implementation and further personnel costs, because their employees had to learn how to use the EMR and were therefore usually longer than expected busy with data entry. DesRoches et al. (2008) determined that financing barriers have the greatest effect on decisions about the adoption of EHRs. These barriers to

the adoption of EMRs have also been identified in surveys of U.S. physicians among physician practices (Reardon and Davidson, 2007). In an action research project to investigate the barriers to adoption of EHRs in small physician practices the interviewed physicians expressed concerns that investment costs would be too high and that healthcare professionals typically are also less productive in patient visits while learning how to use an EHR. (Davidson and Heslinga, 2006). According to Zeithaml (1988), the perceived value of an EMR is defined as the executives' overall assessment of the utility of an EMR, based on perceptions of what was required to be given for it and what the user got for it. Cronin et al (2000) and Oh (2000) suggested that perceived value might be a better predictor of repurchase intentions than either satisfaction or quality. Summing up the executives' statements regarding the price and cost-benefit-ratio, we add price value as a critical factor into the conceptual structure model. Price value represents the users 'cognitive tradeoff between the perceived benefits of the EMR and the monetary cost of purchase, implementation and operational expenses (i.e. personnel costs) (Dodds et al, 1991; Venkatesh et al., 2012). Knowing that the cost-benefit asymmetry is one of the unique barriers to EHR adoption (Ben-Zion et al. 2014) and conforming to Venkatesh (2012), we believe that the cost and pricing structure may have a significant impact on consumers' technology use. If the benefits of using the EMR are perceived to be higher than the monetary cost, price value is positive and therefore has a positive impact on intention to use.

H6: Price Value is positively associated with Intention to Use.

The results from Woodruff (1997) provide theoretical support that users' perception of value is related to their overall satisfaction. They indicate that there is a strong and positive relationship between perceived value and satisfaction. Perceived value and user satisfaction cannot be substitutes but should complement each other and need to be measured simultaneously together (Eggert and Ulaga, 2002). As stated in Kim et al. (2013) perceived value and analog price value positively influences satisfaction.

H7: Price Value is positively associated with User Satisfaction.

The results of the preliminary conducted qualitative survey show that the majority of executives had difficulties with the transition from paper-based records to EMR. Furthermore, the executives were unsure if they and their employees could handle the new system. This may depend on their techno-logical personality associated to EMR acceptance. According to the TAM, perceived ease of use and perceived usefulness of the technology are the antecedents for technology adoption and intention to use (Davis, 1989). In this research context, technology readiness represents executives' personality traits regarding the tendency

to use EMRs into account. Technology readiness refers to a person's propensity to adopt and use new technologies to accomplish goals at work and in leisure time (Parasuraman, 2000). The overall construct of technology readiness can be regarded as a mental state resulting from both mental drivers and inhibitors that together determine a person's tendency to use new technologies. The technology readiness index (TRI) is comprised of 36 items and consists of four sub-dimensions: (1) optimism or "positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives", (2) innovativeness or "a tendency to be a technology pioneer and thought leader", (3) discomfort or " a perceived lack of control over technology and a feeling of being overwhelmed by it", and (4) insecurity or "distrust of technology and skepticism about its ability to work properly" (Parasuraman 2000). Optimism and innovativeness are drivers of technology readiness, whereas discomfort and insecurity are inhibitors. While TAM examines a particular system, "system-specific" technology readiness is used for general technology beliefs and therefore "individual specific" (Lin et al., 2007). Due to complex regulations and relation-ships, the healthcare context is rather more complex than other industries (Goldschmidt PG, 2005) and therefore just a few studies examined the construct of technology readiness (i.e., Kuo et al., 2013). Regarding technology readiness, several studies confirmed the construct as an influencing factor on intention to use (e.g., Lin and Chang, 2011; Lin et al., 2007). According to Parasuraman (2000), we assume that the intention to use EMRs heavily depends on executives' technology readiness.

H8: Technology Readiness is positively associated with Intention to Use.

3 Research Design and Method

To collect empirical data, we conducted a survey of healthcare facility executives who are customers of an EMR system provider in Germany. The questionnaire was provided in German in order to re-duce bias. Prior to the main test, the questionnaire was adjusted in collaboration with the EMR system provider to assess the conciseness and clarity of the survey questions and instructions. Then, the EMR system provider sent a newsletter via email to 4,451 customers with an invitation to participate in an online survey. A total of 334 participants produced usable data. Most of the participants were female (57.1%), at the age of 50-59 (36.1%), working in a healthcare facility with 16-25 employees (21.5%). Table 2 lists the profiles of the survey participants. Closed-ended questions were chosen with a five-point Likert scale, which ranged from "strongly disagree" to "strongly agree."

Gender			**Employees**		
Female	117	57.1%	≤ 5	8	3.9%

Male	88	42.9%	6-10	35	17.1%
Not specified	129		11-15	40	19.5%
Age			16-25	44	21.5%
≤ 19	2	1.0%	26-49	36	17.6%
20-29	10	4.9%	≥ 50	42	20.5%
30-39	36	17.6%	Not specified	129	
40-49	66	32.2%			
50-59	74	36.1%			
≥ 60	17	8.3%			
Not specified	129				

Table 2. Profiles of Responding Participants (N=334)

In this study, all measurement items were adapted from prior research studies to test causal relation-ships between variables in a causal model (see Appendix, Table 3 for Survey Instrument). As the objective of this study is to analyze determinants of IS success in the context of EMR systems, it is important to operationalize IS success constructs for measurement and instrumentation. According to DeLone and McLean (1992), the use of IS and user satisfaction are major dimensions of IS success. Given the difficulties in interpreting the multidimensional aspects of use, DeLone and McLean suggest that intention "may be a worthwhile alternative measure in some contexts" (DeLone and McLean 2003, p. 23). Regarding the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), intention influences a performing behavior. Outcomes associated with the behavior are influenced by external variables. Further major dimensions of IS success are information quality and system quality, which measure semantic and technical success. Completeness, accuracy, format, and cur-rency form antecedents to information quality, and reliability, flexibility, and timeliness are predic-tors of system quality. The constructs were measured by items adapted from Wixom and Todd (2005) and Xu et al. (2013). Based upon the findings of our preliminary qualitative survey with healthcare facility executives, influencing relationships of price value and technology readiness in the context of the IS success model are hypothesized. The impact of price value on user satisfaction and intention has been reported in prior research studies (e.g., Chen, 2008; Kim et al., 2013). Regarding technology readiness, several studies confirmed the construct as an influencing factor on intention (e.g., Lin and Chang, 2011; Lin et al., 2007). The construct price value was measured by items adapted from Venkatesh et al. (2012), while technology readiness, which is represented by optimism, innovativeness, discomfort, and insecurity, was measured by items adapted from Parasuraman (2000). For adequate convergent and discriminant validity, the average variance extracted (AVE) of the constructs was analyzed (ranging from 0.78 to 0.93), which are above the recommended lower limit of 0.50 (Fornell and Larcker, 1981), and the square roots of the AVE exceed the inter-construct

correlations (Wixom and Todd, 2005; Xu et al., 2013). The internal consistency of the scales was examined with the analysis of Cronbach's alpha (CA) (ranging from 0.86 to 0.96) and composite reliability (CR) (ranging from 0.91 to 0.97), which are above the recommended value of 0.70 (Gefen et al., 2000). Factor loadings and cross loadings were also analyzed and one item was dropped due to an insufficient factor loading (below 0.40). All other factor loadings are ranging from 0.78 to 0.97 and no item is loading stronger on any other construct than the own construct. According to Chin (1998), factor loadings should be "at least 0.60 and ideally at 0.70 or above indicating that each measure is accounting for 50 percent or more of the variance of the underlying latent variable". Considering common method variance (CMV) in survey research, ex ante and ex post controls were implemented in order to reduce CMV. In the research design stage, the measures for the con-structs were compiled from various sources ex ante (Chang et al., 2010). Furthermore, the survey questions were displayed in a random order with the result that participants could not easily com-bine related indicators to cognitively create the correlation needed to produce a CMV-biased pattern of responses (Murray et al., 2005). Anonymity and confidentiality of the study were also guaranteed in order to reduce the probability that respondents provided answers they believe were expected. Ex post, Harman's single-factor test was conducted in order to examine common method bias (Lowry and Gaskin, 2014; Podsakoff et al., 2003). All items from all of the constructs were included into an unrotated EFA to determine whether the majority of the variance could be ascribed to one general factor. Harman's single-factor test in this study produced 62 distinct factors, the largest of which explained only 38.36% of the variance of the model. This suggested that the data did not suffer from common method bias.

To test the causal-effect relations among the latent variables, the collected empirical data was analyzed by means of partial least squares structural equation modeling (PLS-SEM), which integrates the measurement and the structural model (hypothesized causal paths) into a simultaneous assessment (Gefen et al., 2011). Figure 2 shows the estimates of the path

coefficients.

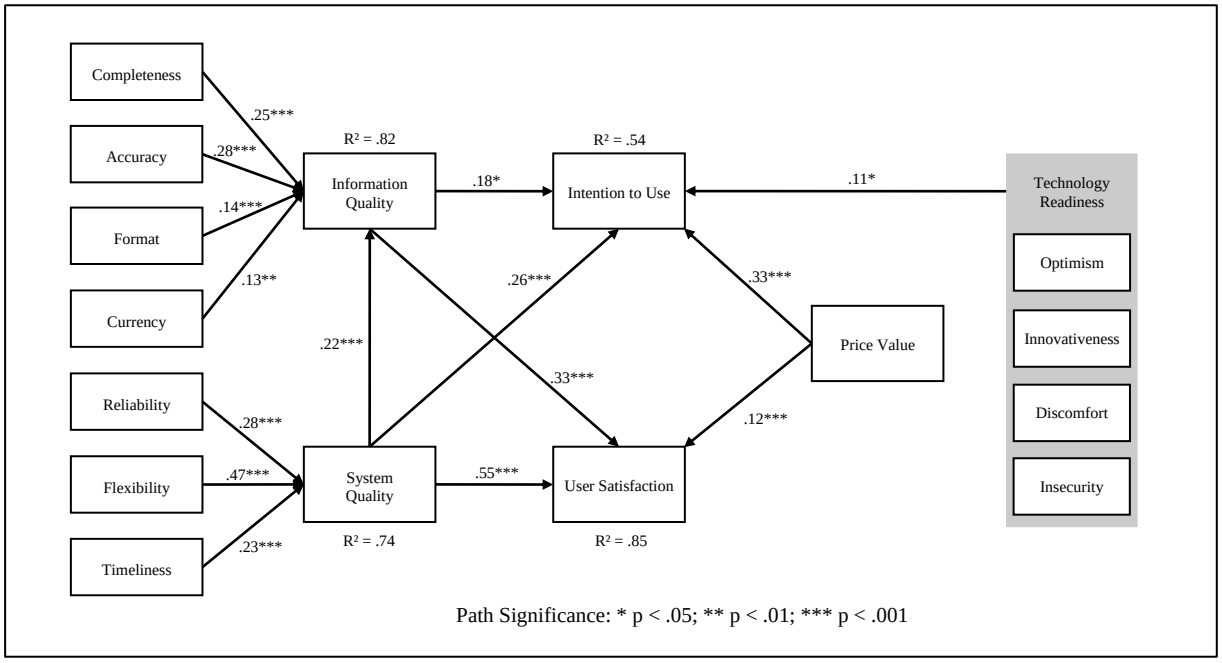

Figure 2. Results of Structural Equation Modeling.

According to Chin (1998), "SEM provides the researcher with the flexibility to model relationships among multiple predictor and criterion variables, construct unobservable latent variables, model errors in measurements for observed variables, and statistically test a priori substantive/theoretical and measurement assumptions against empirical data." To test the causal model in this study, SmartPLS version 2.0.M3 (Ringle et al., 2005) was used to conduct SEM. A bootstrap with 1,000 samples has been conducted to test the causal relationships between the constructs (Efron and Tibshirani, 1993).

4 Discussion and Recommendations

4.1 Discussion of Findings

Given the extensive application of the IS success model to evaluate different types of IS (Petter et al. 2008), it was expected that it would be useful in the healthcare context. As assumed, the IS success model is an effective framework to evaluate an EMRS from the healthcare executive perspective. Our quantitative study extends the Delone and McLean IS success model by including the con-structs of Price Value and Technology Readiness and its relationships with the intention to use EMRS for outpatient healthcare services in Germany. We found generally similar results in terms of R^2 and the significance of path coefficients to studies of IS success research. The findings of our study indicate a strong statistical significance ($p < 0.001$) of SysQ and PV as main predictors of a healthcare executives 'intention to use. IQ and

TR do not that strongly influence the intention to use ($p<0.05$), but still have an effect. Moreover, the results show that the user satisfaction with the EMRS is strongly influenced by IQ, SysQ and PV ($p < 0.001$). Interestingly, the perceived PV influences the intention to use ($t=5.346$) the EMRS more than IQ ($t=2.476$) or SysQ ($t=3.720$) does. Furthermore, our findings show that the quality dimension in this context differ. IQ concerns whether the data in the EMRS are complete, accurate, structured, current, and provide an adequate overview of outpatient healthcare work. SysQ addresses whether the EMRS has the required functionality to support the work. SysQ involves issues such as reliability, flexibility and timeliness. In our study SysQ has a greater influence on USAT and on the intention to use EMRS than IQ. The difference in the effects could be explained as followed: healthcare executives might have different requirements and demands on EMRS in contrast to healthcare professionals. While healthcare professionals have to manage medical records carefully and conscientiously (entry and maintenance of the data) executives also have to manage the healthcare organization (e.g., negotiations with health insurances, controlling, marketing, strategic development). Executives make the investment to address a business requirement or opportunity and therefore are more interested in practical applicability. Hence, system quality seems to be a very important factor in this context. In particular, the flexibility of the system is an important factor to the executives. The higher the executives perceive the overall system quality, the higher is their intention to use EMRS ($\beta = 0.263$; $t= 3.720$). Regarding technology readiness, the results fit to the preliminary interview statements as well and confirmed the construct as an influencing factor on intention to use EMRS. We hypothesized that executives' personality traits towards new technologies are positively associated with the adoption and intention to use. As shown by previous studies for several technologies (e.g., Lin and Chang 2011; Lin et al. 2007), our empirical results show technology readiness as an influencing factor on intention to use in the con-text of healthcare IS ($\beta = 0.11$; $t=2.461$).

4.2 Implications for Research and Practice

The findings have theoretical and practical implications. IS success is an important issue in IS re-search (Petter et al., 2012) and has been shown to be an important aspect in the specific context of healthcare IS. Prior research has focused on single variables information quality, system quality, user satisfaction, intention, and organizational impacts (e.g., Chang et al. 2012; Makoul et al. 2001). Few studies have focused the IS success factors and how these factors impact the healthcare IS (Raghavan et al., 2010; Bossen et al., 2013; Petter and Fruhling, 2011; Win et al., 2008). This paper can be seen as a first step towards a theoretical contribution by conceptualizing the adoption of EMRS and that the perceived price value and the technology

readiness of healthcare executives play an important role. We investigated the quality dimensions of IS success and the influence on the intention to use and user satisfaction. We recommend further qualitative research in order to measure net benefits referring to the success of EMRS. In this regard, net benefits could refer to reduced workloads for employees and the management, time and cost savings, a higher productivity and a higher professionalism. From the patient's perspective should further net benefits considered, like improved quality of care, improved communication with the patient or a reduced waiting time. However, user resistance and cost-benefit asymmetry reported as major barriers to EMRS adoption and success (Fichman et al. 2011, Leidner et al. 2010). The findings of our preliminary qualitative survey and the results of our empirical study show evidence for these barriers. First, due to the significant path coefficients of the influence of Price Value on user satisfaction and intention to use, we call for a deeper examination of this dimension. To respond to the call for research investigating antecedents and consequences of Price Value (Venkatesh et al. 2012), we recommend to consider the constructs of the IS success quality dimensions along with further constructs such as utilitarian motivation (Kim et al. 2013), expectation, and perceived performance (Chen 2008). Thus, a comprehension of healthcare executives 'perceived price value could be further enhanced. Second, further research is also needed to explore in particular the relationship between the quality dimensions of IS success and intention to use in the healthcare context. Regarding our results, system quality and in particular flexibility are important factors for the adoption and further success of the EMRS. But there might be differences regarding the point of view. It could be that for employees, and thus users of the EMRS, the information they need for their daily work, is more important than the system quality. Executives must ensure that the system works properly and the organization is working economically. Third, a more in-depth research for technology readiness is needed to examine which factors affect this construct. Even if the path coefficients of technology readiness are significant, there might be more influencing factors (e.g., demographics). Likewise, a comparison with other disciplines could provide further insight into the results.

In order to get a better insight from a practical angle, we conducted the preliminary interviews. Healthcare work, with its diverse professional disciplines, healthcare delivery processes, and treatment options is complex and unpredictable (Fichman et al., 2011; Niazkhani et al., 2010). In practice, healthcare professionals are constantly confronted with new situations and need to adapt to the needs of patients. This demanded flexibility has to be met by the EMRS as well. Each healthcare organization has its own standards in care processes and quality management. The EMRS has to support standardized healthcare processes, but also has to provide the opportunity to support individual tailored healthcare processes to the respective

organization. The EMRS manufacturer reports that there is a tendency to large outpatient healthcare organizations as opposed to several small ones, which changes the requirements on EMRS. In large organizations, coordination of multidisciplinary care could play a more important role. To adapt the EMRS to these changing requirements is a major challenge (Oborn et al. 2011). As the results of our empirical study show, the EMRS has to fulfill certain quality criteria considering the cost-benefit ratio. The higher the executives perceive price value, the higher their intention to use. According to Dodds et al. (1991) it is essential that the EMRS manufacturer communicates the high quality of the product to address and increase the perceived value. In this regard, it is of decisive importance to support the transition process. As the preliminary interviews revealed, the majority of executives had difficulties with the transition from paper-based records to the EMRS. The empirical research results further show that the intention to use is significantly influenced by technology readiness. According to this, it is mandatory to support the executives to implement the EMRS in their organizations. Additionally, there is still a need for specific and targeted employee training seminars to push through this adoption barrier. For executives, it is substantial to include the employees in the decision-making process and therefore they should not pursue a top-down-approach. Satisfied healthcare professionals might be an important factor for an enduring success of an EMRS. Furthermore, it might be a good strategy of an EMRS manufacturer to offer solutions suitable for any size of organization. If the application is too complex and the transition from a paper-based to an IT-based documentation system too difficult, partial solutions could help both, organization and manufacturer.

5 Limitations and Conclusion

This study is subject to the following limitations, which offer perspectives for further research. First, considering the focus of the study, one limitation refers to the context of the EMRS, which was chosen for the survey. The EMRS of choice is being applied in outpatient healthcare organizations in Germany. Other application forms of EMRS might present different results. Further research is recommended to repeat this study with healthcare executives from other healthcare services in order to gain further insights for IS healthcare research in general. Second, the data was collected through an online survey, which was sent to healthcare executives with an email newsletter of the EMRS manufacturer. Hence, it must be taken into consideration that online surveys are considered to be liable to a self-selection bias (Kim et al., 2002). Third, with regard to generalizability, another limitation relates to cultural and regulatory differences between distinct countries and regions, which is not part of this study.

The respondents of the survey are customers of the specific EMRS manufacturer in Germany, distributing products and services to German healthcare organizations. Therefore, measures in other countries and regions may lead to different results. Further research should be conducted in other countries to generate insights into the context of cultural and regulatory differences in terms of the examination of adoption and success factors of EMRS.

In this paper, we analyze adoption and success factors of electronic medical records by surveying healthcare executives. For this reason, the DeLone and McLean IS success model is extended by the factors price value as well as technology readiness and tested within a healthcare context with a focus on outpatient healthcare organizations in Germany. The role of price value and technology readiness for IS success is identified by conducting preliminary qualitative interviews with outpatient healthcare executives. To address the research question, hypothesized relationships of the proposed causal model are tested to analyze collected data using structural equation modelling. We find out that price value and technology readiness are significant determinants of intention to use and further indicate that system quality is a stronger predictor of user satisfaction and the intention to use than information quality from the perspectives of healthcare executives.

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Appendix

Construct	Items
Completeness	The EMR software provides me with a complete set of information for the medical record process.
	The EMR software produces comprehensive information for the medical record process.
	The EMR software provides me with all the information I need for the medical record process.
Accuracy	The EMR software produces correct information for the medical record process.
	The information I obtain from the EMR software for the medical record process is error-free.
	The information provided by the EMR software is accurate for the medical record process.
Format	The information provided by the EMR software is well formatted for the medical record process.
	The information provided by the EMR software is well laid out for the medical record process.
	The information provided by the EMR software is clearly presented for the medical record process.
Currency	The EMR software provides me with the most recent information for the medical record process.
	The EMR software produces the most current information for the medical record process.
	The information from the EMR software is always up to date for the medical record process.
	Overall, I would give the information from the EMR software high marks for the medical record process.

Information Quality	Overall, I would give the information provided by the EMR software a high rating in terms of quality for the medical record process.
	In general, the EMR software provides me with high-quality information for the medical record process.
Reliability	The EMR software system operates reliably for the medical record process.
	The EMR software system performs reliably for the medical record process.
	The operation of the EMR software system is dependable for the medical record process.
Flexibility	The EMR software system is able to be adapted to meet a variety of needs during the medical record process.
	The EMR software system is able to flexibly adjust to new demands or conditions during the medical record process.
	The EMR software system is flexible in addressing needs as they arise during the medical record process.
Timeliness	It takes too long for the EMR software system to respond to my requests during the medical record process. (reverse scored) (dropped)
	The EMR software system responds in a timely fashion during the medical record process.
	The EMR software system answers my requests quickly during the medical record process.
System Quality	In terms of system quality, I would rate the EMR software highly for the medical record process.
	Overall, the EMR software system that I use is of high quality for the medical record process.
	Overall, I would give the quality of the EMR software system a high rating for the medical record process.
User Satisfaction	Overall, the EMR software is very satisfying for the medical record process.
	I am very satisfied with the EMR software for the medical record process.
	In terms of the medical record process, the EMR software is very satisfying.
	The EMR software meets the needs for the medical record process.
Intention to Use	If I needed to decide again, I would choose the same EMR software for the medical record process.
	In terms of the medical record process, I would decide again for this EMR software.
	I would use the EMR software in the future for the medical record process, if I needed to decide again.
Price Value	The EMR software is reasonably priced.
	The EMR software is a good value for the money.
	At the current price, the EMR software provides a good value.
Optimism	You prefer to use the most advanced technology available.
	You like computer programs that allow you to tailor things to fit your own needs.
	Products and services that use the newest technologies are much more convenient to use.
	Technology gives you more freedom of mobility.
	You feel confident that machines will follow through with what you instructed them to do.
Innovativeness	Other people come to you for advice on new technologies.
	It seems your friends are learning more about the newest technologies than you are. (reverse scored)
	In general, you are among the first in your circle of friends to acquire new technology when it appears.
	You can usually figure out new high-tech products and services without help from others.
	You keep up with the latest technological developments in your areas of interest.
	You enjoy the challenge of figuring out high-tech gadgets.
Discomfort	Sometimes, you think that technology systems are not designed for use by ordinary people.
	There is no such thing as a manual for a high-tech product or service that's written in plain language.
	Computers do not scare me at all. (reverse scored)
	New technology is often too complicated to be useful.
	Technology always seems to fail at the worst possible time.
Insecurity	You do not consider it safe giving out information over a computer.
	You do not consider it safe to do any kind of online documentation.
	If you provide information to a machine or over the Internet, you can never be sure it really gets to the right place.

	Revolutionary new technology is usually a lot safer than critics lead people to believe. (reverse scored)
	Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes.
	Technological innovation always seems to hurt a lot of people by making their skills obsolete.

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