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DO RISK PERCEPTIONS INFLUENCE PHYSICIAN'S RESISTANCE TO USE ELECTRONIC MEDICAL RECORDS? AN EXPLORATORY RESEARCH IN GERMAN HOSPITALS

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ABSTRACT

IT in health care can lower the cost of health care delivery, improve the quality of care for patients and reduce medical errors. Given these strong advantages, it is interesting that technology diffusion for process support in hospitals is somewhat slow. The major process of a hospital -delivering patient care- is still supported by traditional paper files in the vast majority of German hospitals.

In this paper, we ask what the barriers towards implementing and using an electronic medical record (EMR) -the electronic patient file- might be. Technology resistance theories indicate that perceived risks are a major inhibitor towards systems acceptance. In the absence of thorough empirical studies, we start our investigation by conducting exploratory research into the risks hospital-based physicians associate with using an EMR. A list of possible risks was derived from the literature and 10 physicians were interviewed to gather their assessment. Our findings show that, indeed, physicians associate several risks with adopting EMRs, thereby suggesting these risks will need to be mitigated to enable proper user acceptance.

KEYWORDS

Perceived Risk, Electronic Medical Record, Health Care, Adoption, Resistance.

INTRODUCTION

More than 10% of Germany's gross domestic product is spent on health related services every year, €263bn in 2008 (Destatis, 2010). A large proportion of these funds is invested into information technology (IT). Although solid empirical data on the allocation of these funds is scarce, the available studies offer interesting insights into the importance of IT in German health care. Healthcare IT and administrative IT account for an estimated 2.9-3.7% of hospitals overall budget (VHitG, 2010) and for an estimated ~14% of hospital investments (Blum and Schilz, 2005).

IT in health care is used to lower the cost of health care delivery, to improve the quality of care for patients, to reduce medical errors and adverse patient events, thus improving health and well-being for the population (Devaraj and Kohli, 2000). These outcomes are particularly salient in the current context of rising health care costs. IT can support efforts to increase both efficiency, e.g. in hospital processes by freeing up scarce human resources from administrative task, and effectiveness, e.g. by providing means to improve the quality of care. However, health care presents a particularly difficult context for leveraging investments in IT with highly decentralized structures, localized processes, and specialized roles and skills becoming barriers to successfully deriving value from IT investments. Anecdotal evidence from expert discussions almost unanimously underlines a big potential to increase the value of IT, often quoting inefficient usage of the deployed systems. This implies that even if the IT systems are "the right ones" (i.e. effective), the degree of usage is often suboptimal (i.e. inefficient). The role of IT usage as critical factor for leveraging IT investments has been shown in previous studies. In the context of hospitals, Doll and Torkzadeh (1998) and Devaraj and Kohli (2003) -building on usage concepts of DeLone and McLean (1992)- identified IT usage as the missing link between investment into IT and performance effects.

If users refrain from using the provided IT systems[1] correctly as planned, inefficiencies are inevitable. The main concern in this kind of environment is that the actions of few have a big impact on the whole group of users mainly due to unavailability, inconsistency and incompleteness of data. In patient care, incomplete or inconsistent data can pose a threat and thus becomes virtually useless.

Information systems (IS) research has investigated the factors influencing usage behavior in great detail. A large number of studies investigated usage behavior based on the Technology Acceptance Model (TAM) and its derivatives (DeLone and McLean, 1992; DeLone and McLean, 2003). Lately, the TAM and similar research models were consolidated, extended, and reformulated as Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh, Morris et al. (2003). However, these studies were predominantly conducted in contexts other than health care. We believe that health care, and especially hospitals, justify this targeted research domain due to the following arguments:

a) The object in the productive chain of a hospital is a human being. Therefore all errors and mistakes may have a harmful, and sometimes lethal, impact.

b) Hospitals have an extremely hierarchical organizational structure within the physicians' ranks. Additionally, they tend to be relatively independent from the administrative organization. Therefore it is often impossible for the hospital's head of IT to give direct orders to the physicians.

In this context it is important to understand that in hospitals which employ an electronic medical record, it is compulsory for physicians' use. However, the degree of usage, data quality, and existence of secondary systems (paper file, notes, verbal communication) impacts the effectiveness of the EMR. Physicians cannot choose whether to adopt the systems, but they can show resistance in doing so. For instance, Bhattacharjee and Hikmet (2007) reported a case where physicians of a 870-bed hospital forced the withdrawal of a computerized physician order entry (CPOE) system.

To increase the effectiveness of IT usage, and thus the overall health care delivery process, it is crucial to gain a better understanding of the factors that drive resistance to IT system adoption hospitals. As this topic is largely under-researched, it seems necessary to start with an exploratory research layout. As perceived risks/threats play an important role in adoption and resistance research, we ask: **What are the subjective risks physicians in German hospitals associate with using the Electronic Medical Record?**

To answer this question we compiled a thorough literature review within the IS literature, as well as in related fields (medical informatics, public health, etc.). The analysis of the papers brought up an extensive list of possible items which have been structured by applying Perceived Risk Theory (Bauer, 1967). These items were framed into a semi-formal interview guide and discussed with 10 physicians of varying ranks in different hospitals.

[1] This research focuses on the electronic medical record (EMR) which supports the major business process of a hospital (providing patient care). Specialized systems and inter-organizational systems are not in scope.

We show the findings of the literature review, discuss our conceptual framework, and present our interview results which should serve for further research.

SCOPE OF RESEARCH AND LITERATURE REVIEW

Physician's use of EMR in German Hospitals

The IT-system chosen for this study is the Electronic Medical Record (EMR). EMRs are "*computerized medical information systems that collect, store, and display patient information. They are a means to create legible and organized recordings and to access clinical information about individual patients*" (Boonstra and Broekhuis, 2010, p. 1). This information was traditionally stored on paper ("the patient file") (Dick, Steen, and Detmer, 1997), but long term intentions are to replace paper-based records by an EMR (Leiner, 2006). There is a diversity of terminology around electronic patient files in the literature (Haas, 2005). Generally, two types need to be distinguished: Electronic Health Records (EHRs) which are inter-institutional data sets, designed to share information between several participants in the health care sector (Hayrinen, Saraonto, and Nykanen, 2008; Jähn and Nagel, 2004) and the EMR which is an intra-institutional records, containing patient's clinical information from a particular hospital or department (ISO/DTR 20514, 2004).

Hospitals in Germany have a strict hierarchical structure amongst physicians. The **medical director** is a member of the board and usually the head physician of a department. The department is ultimately responsible for the patient. Medical directors are authorized to issue directives to all underling physicians. **Senior physicians** report directly to the medical directors and are responsible to enforce and control the decisions in their department. (Hurlebaus, 2004) In contrast, **ward physicians**, physician assistants, and medical students are in direct contact with patients, responsible for case management and for a substantial part of the administrative and organizational work. Each supervisor has substantial influence over the careers of subordinate physicians, as they are highly dependent on the recommendation of their supervisors (Vogd, 2004).

Regardless of hierarchical structure and without regard to their position, the individual physicians remain fully responsible for all their decisions (Vogd, 2004). In this regard "*the medical record is a fundamental, constitutive element of medical practice*" (Berg, 1996): it is the medical record where the central course of trajectory is established and responsibility for medical decision is recorded. The nursing staff plays a minor role in the medical decision-making process as they are mainly responsible for clinical and administrative tasks (Berg, 1996), and when in doubt, can always refer to the physician responsible for the patient (Vogd, 2004). Therefore, this study examines the risk perception of physicians on EMRs at all levels but excludes nursing staff.

User Resistance

Despite high expectations, the adoption rate of EMRs in Germany is relatively low. A survey of 2,178 German hospitals found only 10.3% of German hospitals to have fully-functional EMR systems implemented (Hübner, Sellemann, Egbert, Liebe, Flemming, and Frey, 2010). This finding is confirmed by a study which concludes that paper and fax are the preferred means of communicating results within German hospitals (Jha, Doolan, Grandt, Scott, and Bates, 2008). If EMRs are implemented, electronic documentation is usually used in addition to paper-based records (Roukema, 2006; Stausberg, Koch, Ingenerf, and Betzler, 2003). This indicates a twofold problem: low adoption rates in addition to high resistance (i.e. opposition to fully using the system).

While technology acceptance has been widely studied in IS research (Williams, Dwivedi, Lal, and Schwarz, 2009), individuals' resistance to technology and their respective use received little attention (Cenfetelli, 2004; Kim and Kankanhalli, 2009; Lapointe and Rivard, 2005). Researchers analyzing IT implementation have identified user resistance and factors leading to resistance as critical variables for successful implementations (Keen, 1981; Markus, 1983). According to technology acceptance literature, adoption behaviors (e.g. usage or non-usage) are based on the intention to adopt. If the outcome related to the evaluated acceptance and resistance arguments is positive, users will adopt the technology. If the outcome is negative, users would resist using it (Joshi, 1991). While acceptance is a behavior, resistance is not a behavior but a cognitive force preluding potential behavior (Lewin, 1947). *"Resistance is not quite equivalent to non-usage, because non-usage may imply potential adopters are simply unaware of new IT or are still evaluating the IT prior to its adoption, while resistance implies that the IT has been considered and rejected by these people"* (Bhattacherjee and Hikmet, 2007, p. 726).

There are few major resistance theories and approaches in IS literature (Cenfetelli, 2004; Joshi, 1991; Lapointe and Rivard, 2005; Markus, 1983). Bhattacherjee and Hikmet (2007) present a theoretical model on physicians' resistance towards health IT by integrating technology acceptance and resistance-to-change literature. The authors base their explanation on why people reject technologies not in the technology itself, but in the change caused by the introduction of IS in the workplace. This model is based on Lewin's (1947) idea of opposing forces and the dual factor model of IT usage (Cenfetelli, 2004).

Hence the model proposes perceived threats as a predictor of resistance to change. Thus, we conclude that perceived risk is a crucial antecedent for adoption.

Individual Risk Perception Theories

Risk comes in different categories. In Rational Decision Theory, the concept of risk reflects the variation in the distribution of possible outcomes, their likelihood, and their subjective values (Knight, 1921). This implies that alternatives are assessed on the basis of their expected probability distributions in conjunction with subjective values of the expected outcomes (March and Shapira, 1987), which have to be precisely calculated (Kaplan and Garrick, 1981). Rational Decision Theory suggests that decision-makers deal with decisions under uncertainty in a rational way, i.e., by computing different alternatives and selecting the option that best suits their personal risk-return profile, which is generally risk-averse (Yates, 1992). However, empirical studies indicate that this theoretical view is not consistent with how people deal with risky choices in reality. Several studies have shown that they follow a less precise calculus, not using accurate probability calculations (Boholm, 1998; March and Shapira, 1987). Instead, they deploy a magnitude of undesired outcome concept (Bell, 1985), showing a loss-averse manner rather than rational decision-making (Lyytinen, Mathiassen, and Ropponen, 1998). To account for this issue, we theoretically ground the focus of this study in Perceived Risk Theory (PRT) (Bauer, 1967). PRT analyzes the risk a person subjectively associates with the consequences of a decision and its impact on the intention to perform a behavior. PRT implies that, as long as the perceived benefits outweigh the perceived risks, one has a positive attitude towards the particular decision. The degree of subjective certainty is solely based on the certainty felt by the individual and does not necessarily have to be in line with any other possibly more objectively measured degree of certainty (Cunningham, 1967).

Barriers to the Acceptance of EMR

Subsequently, the question arises **what are the risks that physicians associate with using an EMR?** Published research examining the barriers to acceptance of EMRs by physicians in hospitals is scarce. Rind and Safran (1993) realized the importance of distinguishing real and imagined barriers to EMRs. For instance, they observed that predicted barriers to EMRs in a hospital context (like physicians' typing capabilities) are less significant than physicians' concern about security and privacy issues. Tonnesen, LeMaistre et al. (1999) described implementation barriers encountered during implementation of an EMR system from a general point of view, but did not focus on physicians' perceptions. However, they agree that alongside managerial, technical, and training issues, non-physician-centered systems as well as security as and privacy issues are the main barriers to successful EMR implementation. Miller and Sim (2004), Russell and Spooner (2004) and Anderson (2007) identified barriers to physicians' use of EMRs in primary care. Though barriers like high initial financial costs and slow and uncertain payoffs are relevant for physicians in ambulatory practices, these barriers were not used for our research.

Boonstra and Broekhuis (2010) conducted a systematic literature review on the barriers to the acceptance of EMRs by physicians. This study covers a wide spectrum of EMR usage in primary, secondary, and tertiary care. Although not directly focused on EMRs in hospital environments, it reveals interesting insights to a broad spectrum of barriers that physicians may face. As a large portion of the 22 studies included in the review deals with physicians in their own practice, not all findings are applicable to the context of our research. However, several factors are applicable, especially the ones classified as "*secondary barriers:* [i.e. the] *subconscious, beneath the surface, and not so immediately mentioned*" barriers (Boonstra and Broekhuis, 2010, p. 13). They include psychological, social, legal, organizational, and change-process related barriers. Specifically, the first three barriers mentioned are applicable to our research as they deal with the individual' perception of negative consequences when using the EMR, which is close enough to our definition of perceived risks. We included these risk factors in our study and will elaborate further when we discuss the findings.

Conceptual Framework

The fundamental hypothesis of this research is that risk perceptions have a considerable impact on physicians' attitude towards the usage of EMRs. Consequently perceived risks lower their intention to adopt or increase their resistance towards using the system. It is important to note, that the decision-making authority of physicians, embedded in a hospital organization, is limited. They are generally not the ones who are responsible to select a software system. This decision is made by hospital management or IT department and physicians have to work with the given system. This is an important segregation towards self-employed physicians outside the hospital.

Perceived Risk Theory is used to explain individual's behavior and has been applied to a wide area such as adoption of e-services (Featherman and Pavlou, 2003), internet banking (Lee, 2009), and online applications (Lu, Hsu, and Hsu, 2005). However, it has not yet been applied to the health care context. Therefore, the original defined risk facets have to be adjusted to frame the specific context of physicians in hospitals.

Cunningham (1967) identifies six dimensions of perceived risk: performance, financial, psychological, social, safety, and opportunity/time. In IS research, safety risk (measuring possible threat to the research object's life) is generally not applicable. One could argue that due to insufficient or inadequate decision support algorithms or inadequate representation of information, the use of EMRs poses a risk to the patient. This is generally true and as such incorporated into the performance risk facet. This risk measures the possibility, that the physician harms the patient due to e.g. inadequate information and therefore wrong decision. As the physician herself/himself is not the target of the consequences, safety risk in its original meaning does not apply.

To account for users' security concerns, Featherman and Pavlou (2003, p. 455) introduced privacy risk, defined as a *"potential loss of control over personal information",* to substitute for safety risks. While Featherman and Pavlou (2003) analyze the potential data loss of an individual when concluding a transaction, we consider the potential loss of confidential patient data in an EMR. Therefore we incorporate privacy risk, defined as the potential loss of confidential patient data.

In contrast to general practitioners or physicians in small practices, physicians in hospitals do not make individual decisions whether to buy an EMR system. In hospitals, the purchase decision is an organizational decision. As such, an individual hospital-based physician is neither exposed to financial risks nor to potential time-loss *"when making a bad purchasing decision by wasting time researching*" (Featherman and Pavlou, 2003). Therefore, measures of financial risk and time risk were not included in this study.

Following the arguments given above four risk facets are proposed for the health care context and incorporated into our conceptual model. Risks deduced from the literature have been framed in our research model displayed in figure 2. Please note that the scope of this research is limited to finding the antecedents of the perceived risk facet and we are not (yet) analyzing the impact of perceived risk on resistance towards the system.

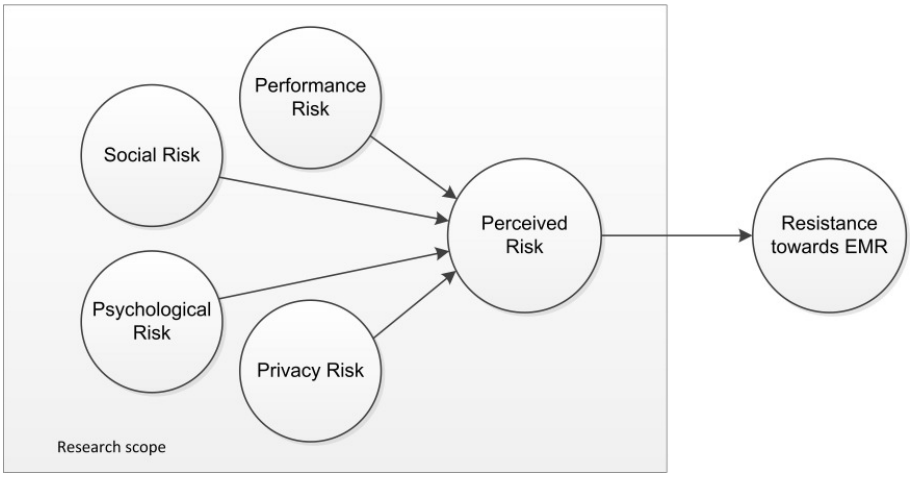

Figure 1: Conceptual Research Model

The original facets of perceived risk were adapted to the EMR / hospital context (see Table 1). The associated measurement items are given in Table 2.

Risk Facet	Definition in literature	Definition in EMR context
Performance Risk	The possibility of the product malfunctioning and not performing as it was designed and advertised and Therefore failing to deliver the desired benefits (Grewal, Gotlieb, and Marmorstein, 1994)	The risk that using EMRs does not deliver the benefits promises as it may complicate or yet constrain clinicians' workflow and therefore increase rather than decrease medical errors.
Social Risk	Potential loss of status in one's social group as a result of adopting a product or service (Featherman and Pavlou, 2003).	The risk that using EMRs may have negative impact on the opinions of reference groups.

Psychological Risk	The risk that the selection or performance of the producer will have a negative effect on the consumer's peace of mind or self-perception (Mitchell, 1992).	The risk that using EMRs may cause psychological discomfort and tension due to the fact that it may have negative effect on clinicians' self-perception.
Privacy Risk	Potential loss of control over personal information, such as when information about you is used without your knowledge or permission (Featherman and Fuller, 2003; Featherman and Pavlou, 2003).	The risk that using EMRs will have negative effects on the security of confidential health information.

Table 1: Perceived Risk Facets in EMR / Hospital Context

Risk Facet	**Measurement item**	**Declaration: Physicians' concerns about…**	**Included risks (see figure 2)**
Performance Risk	Insufficient technical infrastructure	… obstructions of data entry, caused by insufficient hardware.	[1]
	Increasing workload	… increasing effort required to enter and analyze a patient's data.	[2], [3], [4], , [5], [6], [14]
	Insufficient data quality	… functional limitations of the EMRs, insufficient technical infrastructure and increasing workload which could lead to insufficient data entry and hence in threats to a patient's life.	[7], [8], [9], [10],[11]
	Insufficient Reliability	… the temporary loss of access to patient records in case of system failures.	[12]
Psychological Risk	Impacts on work procedures	… inefficient changes in their working style, forced by the EMR system.	[13], [14]
	Loss of professional autonomy	… the chance of stronger administrative control through higher transparency of physician productivity and concerns about a higher dependency on IT-specialist.	[15], [16], [17], [18]
	Legal consequences	… a higher risk of being punished for mal-practice. (EMRs provide full transparency and records cannot be changed without trace.)	[19], [7]
Social Risk	Physician-patient relationship	… interaction problems between them and patients using EMRs.	[20]
	Colleagues beliefs	… their reputation suffering among colleagues who oppose the EMRs.	[21]
	Supervisors beliefs	… their reputation suffering among supervisors who oppose the EMRs.	[22]
	Nursing staff beliefs	… their reputation suffering among nursing staff who oppose the EMRs.	[24]
	Management beliefs	… their reputation suffering among the management.	[23]
Privacy Risk	Privacy and security	… unauthorised access and use of confidential medical information.	[25], [26]
	Data integrity	… malicious or non-malicious manipulation of electronic health records, with reference to the accountability of the entries.	[27]

Table 2: Measurement Items

RESEARCH APPROACH

Although some interesting cases have been reported, the literature available does not yet provide sufficient insight to explain the low degree of usage of EMRs by physicians in hospitals. Although the research available quotes individual risk perceptions as one recurring argument, we aim to segregate these and dig deeper into the individual risk perceptions of physicians in selected German hospitals. We feel that exploratory research is necessary to provide a set of meaningful risks to be empirically validated in further research.

Data collection was carried out through interviews with ten physicians of four ranks in nine different German hospitals. The range of positions covers the entire medical hospital hierarchy, except the medical director. Five physicians were assistant physicians, two were ward physicians, one was a senior physician and one was a head physician. The hospitals ranged from teaching to non-teaching hospitals, from small hospitals (less than 200 beds) to big hospitals (more than 500 beds) and from community to private ownership. Only one interviewee's hospital has implemented a fully functional EMR system, and while nine are still using paper records, all of these were in addition to existing hospital IT systems.

We selected a comprehensive list of possible risks derived from literature, including those that could affect the personal risk perception. This subset was framed in a semi-structured questionnaire to assess physicians' risk perception. The interviews presenting the risks lasted between 45 and 90 minutes. We requested the physicians to evaluate whether they regarded the stated risks as influencing their own risk perception towards EMRs or not. Each interview ended with an open question asking whether there were additional risks which were not addressed yet, and we recorded these separately.

FINDINGS

This exploratory study confirms that physicians indeed associate risks with the usage of an EMR.

Figure 2 presents the outcome of the interviews graphically, stating the number of interviewees who agreed with the stated risk (description of the measurement items is given in Table 2).

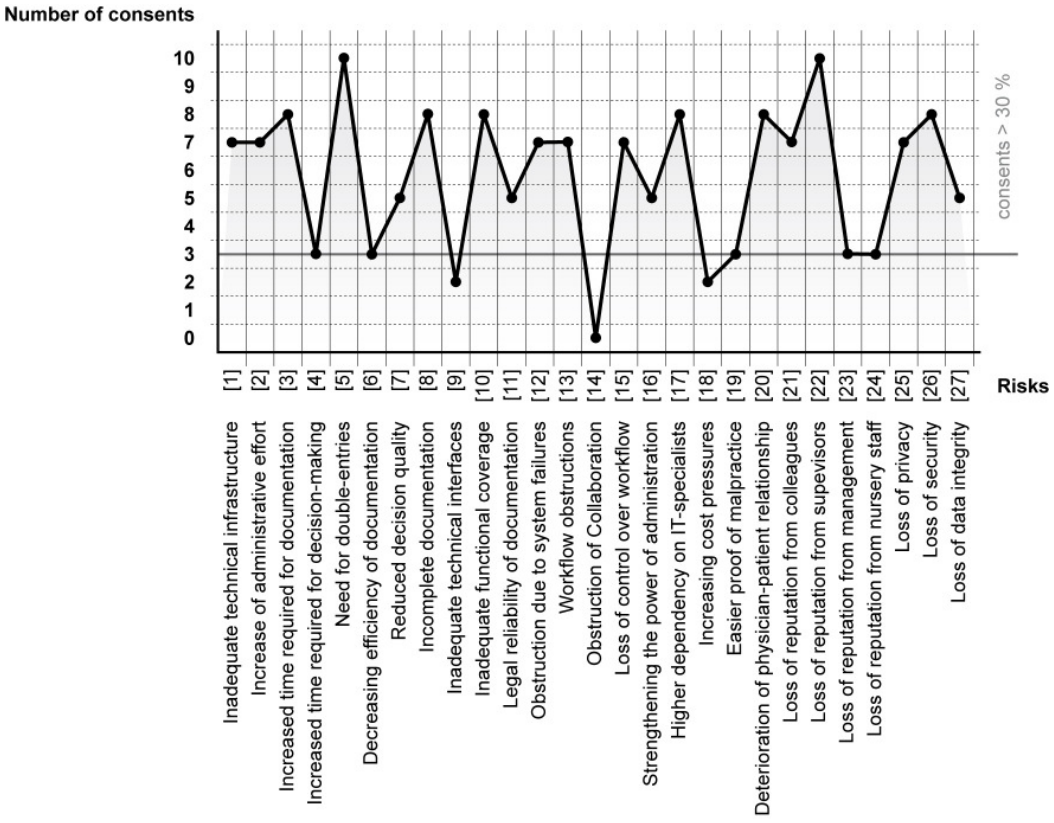

Figure 2: Findings of the Exploratory Study: Interviewees' Consent with Suggested Risks

We saw that all but one risk is perceived by at least two of our interview partners. If we set a cut off line at 30% consensus we still see that ~2/3 of the proposed risks are shared by the physicians interviewed.

For this exploratory research design, we have decided not to drop any specific risk for further analysis. On the contrary, we see that physicians associate risk with the usage of EMRs and that almost 50% these risks are seen by at least 7 of the 10 physicians interviewed.

Boonstra and Broekhuis (2010) mention perceived risks as a major barrier to EMR implementation and call for further research. Our findings underline this call. Our initial work shows the "social" risk facet conveys mixed results. This may be due to the strict hierarchy in hospitals and the independence towards administration. However, this area calls for deeper investigation.

Anecdotal evidence shows that resistance to EMRs increases when physicians perceive encroachments in their individual working styles. Whenever a system is believed to interfere with the autonomous working style of a physician, the fear seems to be that this style will be lost. This is an important message for systems implementation and change management.

We also heard anecdotal evidence that physicians fear the loss of ability to change or complete the records at a later point in time if necessary. This becomes important in cases of malpractice lawsuits. No interviewee stated this openly, but it became evident that risk #19 (proof of malpractice) may justify deeper investigation.

LIMITATIONS AND FURTHER RESEARCH

This research adds to previous research on EMR acceptance by investigating physicians' risk perceptions towards EMR usage in the context of German hospitals. The findings of this paper are the result of an exploratory research design and further research is necessary to empirically and examine the validity of the conceptual framework on the impact of physician's risk perceptions towards usage of EMRs on their resistance to change.

There is also need for further research to examine the risk perception in regard with reference to differences in physician positions and organizational and departmental variation. In addition, further research is needed to examine the risk perception of using EMRs for professional groups in German hospitals such as the nursing staff and management. Also, specifically, the social risk facet needs deeper investigation as do the risks associated with malpractice cases.

Our initial findings are obviously limited due to the exploratory research layout. We interviewed a small number of physicians which is not representative of the whole population. As it was our aim to pave the way for further studies elaborating on this topic, we would welcome additional rigorous and possibly quantitative studies, specifically confirming the actual influence of risk perceptions towards adoption/resistance of EMRs.

Finally it needs to be taken into account that our findings apply only to hospital based physicians. General practitioners or self-employed physicians face additional risks, namely financial risk and time risk need to be incorporated. Also, the specific cultural and legal background of our research objects limits generalization into a wider than the German hospital context.

CONCLUSION

Our research confirmed that there are indeed risks associated with the use of an EMR by physicians in hospitals. We tested 27 risks and all but one had at least some consensus with our interview partners. Judging from the percentage of consensus, we see clear evidence which justifies further research in this area.

We hope that our findings encourage fellow researchers to dig deeper into the matter of EMR acceptance by hospital physicians, as we see great potential for IS research to apply theories to this research domain and add to our understanding of EMR systems adoption and resistance in this specific context.

REFERENCES

1. Anderson, J. (2007). Social, Ethical and Legal Barriers to E-Health. International Journal of Medical Informatics, 76 (5-6), 480–483.
2. Bauer, R. (1967). Consumer Behavior as Risk Taking. In Risk Taking and Information Handling in Consumer Behavior (D.F. Cox Ed., pp. 21-33, Harvard University Press, Cambridge, USA.
3. Bell, D.E. (1985). Disappointment in Decision Making under Uncertainty. Operations Research, 33 (1), 1-27.
4. Berg, M. (1996). Practices of Reading and Writing: The Constitutive Role of the Patient Record in Medical Work. Sociology of Health and Illness, 18 (4), 499–524.
5. Bhattacherjee, A. and Hikmet, N. (2007). Physicians? Resistance toward Healthcare Information Technologies: A Dual-Factor Model. Hawaii International Conference on System Sciences, 0 141b.
6. Blum, K. and Schilz, P. "Krankenhaus Barometer 2005," Deutsches Krankenhaus Institut, 2005.
7. Boholm, A. (1998). Comparative Studies of Risk Perception: A Review of Twenty Years of Research. Journal of Risk Research, 1 (2), 135-163.
8. Boonstra, A. and Broekhuis, M. (2010). Barriers to the Acceptance of Electronic Medical Records by Physicians from Systematic Review to Taxonomy and Interventions. BMC Health Services Research, 10 (1), 231.
9. Cenfetelli, R.T. (2004). Inhibitors and Enablers as Dual Factor Concepts in Technology Usage. Journal of the Association for Information Systems, 5 (11),
10. Cunningham, S.M. (1967). The Major Dimensions of Perceived Risk. In Risk Taking and Information Handling in Consumer Behaviour (D.F. Cox Ed., pp. 82-108, Harvard University Press, Boston, MA, USA.
11. DeLone, W.H. and McLean, E.R. (1992). Information Systems Success: The Quest for the Dependent Variable. Information Systems Research, 3 (1), 60-95.
12. DeLone, W.H. and McLean, E.R. (2003). The Delone and Mclean Model of Information System Success: A Ten-Year Update. Journal of Management Information Systems, 19 (4), 9-30.
13. Destatis "2008: 263 Milliarden Euro Für Gesundheit Ausgegeben," Press Release Nr.126, 2010.
14. Devaraj, S. and Kohli, R. (2000). Information Technology Payoff in the Health-Care Industry: A Longitudinal Study. Journal of Management Information Systems, 16 (4), 41-67.
15. Devaraj, S. and Kohli, R. (2003). Performance Impacts of Information Technology: Is Actual Usage the Missing Link? Management Science, 49 (3), 273-289.
16. Dick, R.S., Steen, E.B., and Detmer, D.E. (1997). The Computer-Based Patient Record: An Essential Technology for Health Care. Rev. National Academy Press, Washington, D.C.
17. Doll, W.J. and Torkzadeh, G. (1998). Developing a Multidimensional Measure of System-Use in an Organizational Context. Information & Management, 33 (4), 171-185.
18. Featherman, M.S. and Fuller, M. (2003). Applying Tam to E-Service Adoption: The Moderating Role of Perceived Risk. In Thirty-Sixth Hawaii International Conference on System Sciences, Hawaii.
19. Featherman, M.S. and Pavlou, P.A. (2003). Predicting E-Services Adoption: A Perceived Risk Facets Perspective. International Journal of Human-Computer Studies, 59 451-474.
20. Grewal, D., Gotlieb, J., and Marmorstein, H. (1994). The Moderating Effects of Message Framing and Source Credibility on the Price-Perceived Risk Relationship. Journal of Consumer Research, 21 (1), 145.
21. Haas, P. (2005). Medizinische Informationssysteme Und Elektronische Krankenakten: Mit 22 Tabellen. Springer, Berlin [u.a.].
22. Hayrinen, K., Saraonto, K., and Nykanen, P. (2008). Definition, Structure, Content, Use and Impacts of Electronic Health Records: A Review of the Research Literature. International Journal of Medical Informatics, 77 (5), 291–304.
23. Hübner, U., Sellemann, B., Egbert, N., Liebe, J.-D., Flemming, D., and Frey, A. (2010). It-Report Gesundheitswesen Schwerpunkt Vernetzte Versorgung. Hanover.
24. Hurlebaus, T. (2004). Strategiekonforme Organisationsgestaltung Von Krankenhäusern: Eine Theoretische Und Empirische Analyse. 1. Dt. Univ.-Verl., Wiesbaden.
25. ISO/DTR 20514 (2004). Health Informatics - Electronic Health Record - Definition, Scope and Context.
26. Jähn, K. and Nagel, E. (2004). E-Health. Springer-Verlag, Berlin.
27. Jha, A., Doolan, D., Grandt, D., Scott, T., and Bates, D. (2008). The Use of Health Information Technology in Seven Nations. International Journal of Medical Informatics, 77 (12), 848–854.
28. Joshi, K. (1991). A Model of Users‘ Perspective on Change: The Case of Information Systems Technology Implementation. MIS Q, 15 229-242.
29. Kaplan, S. and Garrick, B.J. (1981). On the Quantitative Definition of Risk. Risk Analysis, 1 (1), 11-27.
30. Keen, P.G.W. (1981). Information Systems and Organizational Change. Commun. ACM, 24 24-33.

31. Kim, H.-W. and Kankanhalli, A. (2009). Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective. Management Information Systems Quarterly, 33 (3), 567–582.
32. Knight, F.H. (1921). Risk, Uncertainty and Profit. Chicago.
33. Lapointe, L. and Rivard, S. (2005). A Multilevel Model of Resistance to Information Technology Implementation. MIS Quarterly, 29 (3), 461–491.
34. Lee, M.-C. (2009). Factors Influencing the Adoption of Internet Banking: An Integration of Tam and Tpb with Perceived Risk and Perceived Benefit. Electronic Commerce Research and Applications, 8 (3), 130–141.
35. Leiner, F. (2006). Medizinische Dokumentation: Grundlagen Einer Qualitätsgesicherten Integrierten Krankenversorgung ; Lehrbuch Und Leitfaden. 5., aktualisierte Aufl. Schattauer, Stuttgart.
36. Lewin, K. (1947). Frontiers in Group Dynamics: Concept, Method and Reality in Social Science; Social Equilibria and Social Change. Human Relations, 1 (1), 5–41.
37. Lu, H.-P., Hsu, C.-L., and Hsu, H.-Y. (2005). An Empirical Study of the Effect of Perceived Risk Upon Intention to Use Online Applications. Information Management & Computer Security, 13 (2), 106–120.
38. Lyytinen, K., Mathiassen, L., and Ropponen, J. (1998). Attention Shaping and Software Risk - a Categorical Analysis of Four Classical Risk Management Approaches. Information Systems Research, 9 (3), 233-255.
39. March, J.G. and Shapira, Z. (1987). Managerial Perspectives on Risk and Risk Taking. Management Science, 33 (11), 1404-1418.
40. Markus, L.M. (1983). Power, Politics, and Mis Implementation. Commun. ACM, 26 (6), 430-444.
41. Miller, R.H. and Sim, I. (2004). Physicians' Use of Electronic Medical Records: Barriers and Solutions. Health Affairs, 23 (2), 116–126.
42. Mitchell, V.-W. (1992). Understanding Consumer's Behaviour: Can Perceived Risk Theory Help? Management Decision, 30 (3), 26-31.
43. Rind, D.M. and Safran, C. (1993). Real and Imagined Barriers to an Electronic Medical Record. In Annu Symp Comput Appl Med Care,
44. Roukema, J. (2006). Paper Versus Computer: Feasibility of an Electronic Medical Record in General Pediatrics. PEDIATRICS, 117 (1), 15–21.
45. Russell, S.C. and Spooner, S.A. (2004). Barriers to Emr Adoption in Internal Medicine and Pediatric Outpatient Practices. Tennessee medicine : journal of the Tennessee Medical Association, 97 (10), 457–460.
46. Stausberg, J., Koch, D., Ingenerf, J., and Betzler, M. (2003). Comparing Paper-Based with Electronic Patient Records: Lessons Learned During a Study on Diagnosis and Procedure Codes. J Am Med Inform Assoc, 10 (5), 470-477.
47. Tonnesen, A.S., LeMaistre, A., and Tucker, D. (1999). Electronic Medical Record Implementation Barriers Encountered During Implementation. Proceedings / AMIA, 624–626.
48. Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27 (3), 425-478.
49. VHitG "Branchenbarometer 2010: Markterhebung Zur Bewertung Und Verteilung Von It in Deutschen Gesundheitseinrichtungen."
50. Vogd, W. (2004). Ärztliche Entscheidungsprozesse Des Krankenhauses Im Spannungsfeld Von System- Und Zweckrationalität: Eine Qualitativ Rekonstruierte Studie Unter Dem Besonderen Blickwinkel Von Rahmen ("Frames") Und Rahmungsprozessen. 1. VWF, Berlin.
51. Williams, M.D., Dwivedi, Y.K., Lal, B., and Schwarz, A. (2009). Contemporary Trends and Issues in It Adoption and Diffusion Research. Journal of Information Technology, 24 (1), 1–10.
52. Yates, J.F. (ed.) *Risk-Taking Behavior*. Wiley, Chichester, UK, 1992.