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Mobile Banking and Brokerage Systems) Managing IS Risks in the Beginning 21st Century

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Mobile Banking and Brokerage Systems – Managing IS Risks in the Beginning 21st Century

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Abstract

The beginning 21st century makes high demands on industries dealing with new technologies. Starting from an outline of new challenges of the 21st century, the situation of banks being particularly exposed to these conditions is described. The mobile banking channel is focused as one example of banks´ business processes involving new technology. 24 banks are identified from the list of the 100 largest German banks that offer mobile services and an empirical study is conducted in order to explore their first experiences with mobile banking services. These telephone interviews are the first of a three-step research process. For a more in-depth analysis of banks´ IS risks, face-to-face interviews will be conducted in a second step. The research process will be finished with selected case studies about requirements for new methods and tools of banks´ IS risk management. This paper presents selected results of the first research step.

One of the most important aspects for all their decisions has been the high risk dealing with new technology and a lack of established IS risk management guidelines. Examples of such operational risks are considered and a variety of different existing approaches is discussed and analyzed with respect to their potential to minimize risks, though being not explicitly dedicated to risk management. However, new risk management approaches are treated by the industry with a certain reserve. On the basis of that analysis, suggestions for further research are made to develop a practicable operational IS risk management approach.

1. Challenges and Risks in the Beginning of the 21st Century

With many companies that were engaged in electronic commerce activities coming down from an almost infinite seeming hype leading to irrational investments, the long-term welfare of a company and its stakeholders have been brought into focus again. Concepts for integrative management (Bleicher 1999) and corporate governance guidelines (Berghe 2002, OECD 1999, Post, Lee and Sachs 2002) provide a basis for monitoring and controlling corporate performance. However, that perspective is often limited to mere

financial performance, disregarding losses that can occur due to the way how a company *operates* its business rather than how it *finances* its business.

Traditional companies have increasingly come to realize a certain sustaining value of electronic and mobile business and now put in place the technology and processes to offer mobile services to their customers. Their starting position has been characterized by the advantage of having learned from failures of other companies during the hype while having already a wide experience with system development as well as with a variety of other contact and distribution channels in the context of a multi channel strategy. Much of the learning is simply not transferable to the 21st century experiences; though in fact, traditional companies face many challenges of quite a different nature. What are these challenges in particular?

Coinciding changes of market and business conditions at an accelerating pace

Changing market and business conditions have often been described as a new phenomenon, especially in recent times of globalization; yet they have been shown to be true and perceived as being paradigmatically challenging at every stage of economic and technical progress. However, the particular challenges of the 21st century accrue from the *coincidence* of a variety of different changes; for instance:

- intensified competition on a global as well as on a national level;
- increasing volatility of customer needs; and
- augmenting complexity of technology.

Thus, companies find themselves torn in an "acceleration of improvement paradox" with the demands of accelerating and improving processes simultaneously, i.e. minimizing input while maximizing output at the same time, and all this in an increasingly complex and dynamic environment. Since both are competing objectives, coming along with the pressure of reducing costs and time, there are particular risks inherent in strategic and operative management decisions that can lead to performance reductions and losses.

Businesses increasingly dependent on information systems

In utilizing more and more new technologies, businesses become increasingly dependent on information systems. This makes systems delivery on time and within budget even more important and increases the demands on the practicability and flexibility of project management concepts, methods of software process improvement, and other means of controlling and reducing risks during the development and operation of information systems. Moreover, higher technological complexity leads to increasing interdependencies and interactions in system development and operation on the technical as well as on the organizational-personnel level which hold special sources of error and risks.

Development of information systems becomes more difficult and complex

Technological progress in most cases implies more difficult and complex development procedures. Mobile application systems, for instance, represent a typical and graphic example as they are, within their species, heterogeneous over three dimensions:

- Degree of innovation,
- Speed of development, and
- Risk.

Dependent on their values in these three dimensions mobile systems require different, i.e. project and situation specific, process models and development procedures (Kemper and

Wolf 2002). There are few experiences with user acceptance of the new sort of systems developers can revert to, while customer requirements often cannot be identified in advance and tend to change during the ongoing development project.

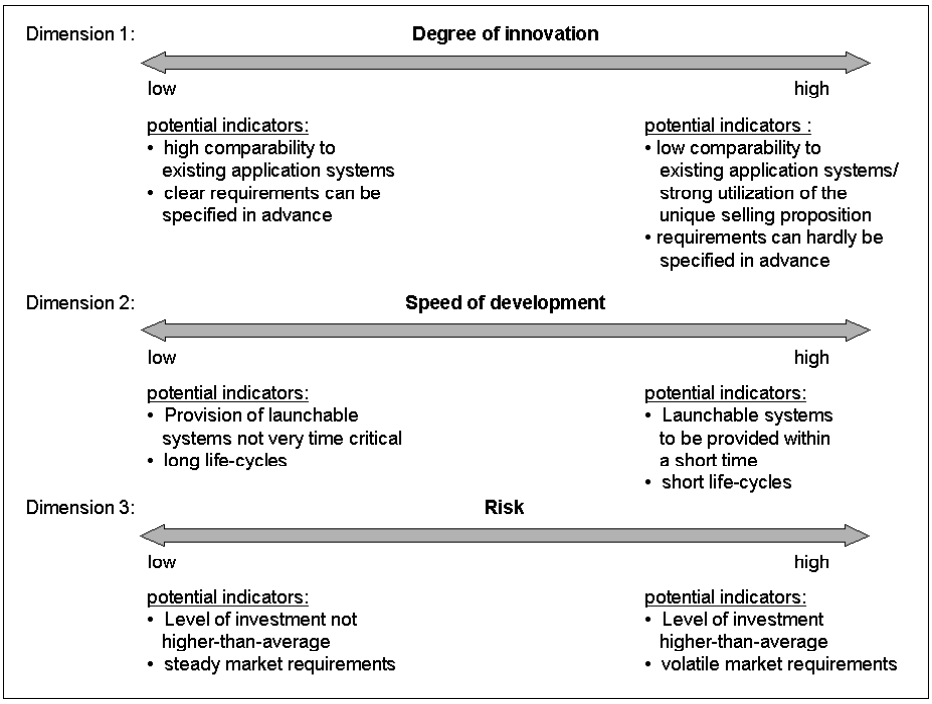

Figure 1: *System Dimensions for the Classification of Mobile Applications (Kemper and Wolf 2002)*

Integration into business processes gains in importance

Information can only evolve into competitive advantage through chain- and cross-linking of its components. With an increasing number of different existing systems in a company, continuously spreading networks, and rapidly changing technologies the compatibility of new systems with the existing infrastructure becomes crucial. Thus, the management of development projects and the development procedures must be more life-cycle oriented, i.e. focus more on the integration into the existing technical and organizational-personnel infrastructure and particularly on the intertwining with the business processes.

With respect to these aspects, much of what has been learned, particularly in terms of knowledge and skills about technologies and processes, is not applicable to the changed conditions. Business processes based on new technologies within an environment of high competition involve extremely high risk. This is particularly true for the banking industry.

2. Banks between Challenges and Risks

Banks are typical examples of traditional companies facing the above mentioned problems.

First, they are particularly exposed to intensified competition on a global as well as on a national level manifesting itself, for instance, by mergers and takeovers, the so-called “Allfinanz” or “one-stop finance concept”, i.e. broadening the set of services far beyond

the conventional scope (European Central Bank 2002), and by near-banks and non-banks offering financial services (European Central Bank 1999).

Secondly, the sales processing of financial products has always been highly dependent on information and communication technology (ICT) in the back-office, but with new contact and distribution channels, inter-organizational collaboration and internationalization, this dependency is increased significantly.

Thirdly, mobile banking application systems are heterogeneous; that is, dependent on the extent to which they avail themselves of unique selling propositions like ubiquity, localization and "always-on".

Finally, traditional companies offer a variety of touch-points to their customers and often embark on a multi-channel-strategy. This is typically true for banks and other financial service providers.

The European Central Bank (2002) characterizes the structure in the banking sector in its Annual Report 2001 by the following five aspects:

1. a banking consolidation process, indicated by substantially increasing aggregated values of banking mergers and the average size of the transactions since 1990 (see **Table 1**),

Table 1: *Merger and Acquisition Activity Involving EU Banks (see European Central Bank 2002)*

		1990 - 1997	1998 - 2001	1990 - 2001
Total value (EUR millions)		201,739	333,664	535,403
(% of total)		38	62	100
	(of which %)			
	Domestic/ within industry	61	66	64
	Domestic/ cross-industry	17	14	15
	Cross-border/ within industry	8	13	12
	Cross-border/ cross-industry	14	7	9
Average Size (EUR millions)		412.6	1,174.9	729.8
	Domestic/ within industry	475.8	1,345.9	861.6
	Domestic/ cross-industry	310.5	1,131.1	549.1
	Cross-border/ within industry	246.9	1,064.2	606.5
	Cross-border/ cross-industry	58.1	605.0	570.4

Source: Thomson Financial Securities Services

Notes: Domestic/ cross-border is determined on the basis of the target firm. Cross-industry means deals of banks with non-bank financial institutions. The data cover all deals involving large and medium sized firms (Thomson definitions).

2. a process of internationalization, linked to increasing domestic competition and more favourable growth aspects in foreign markets,
3. financial conglomerates, with a significant share of cross industry deals and banks increasingly merging with security firms,
4. the blurring of traditional borders between banking, insurance and asset management, resulting in increasingly "hybrid" financial products, and
5. an increasing use of alternative distribution channels, like independent intermediaries or franchise systems, with banks developing a multi-channel strategy, combining the traditional branch network with the internet (see **Figure 2**).

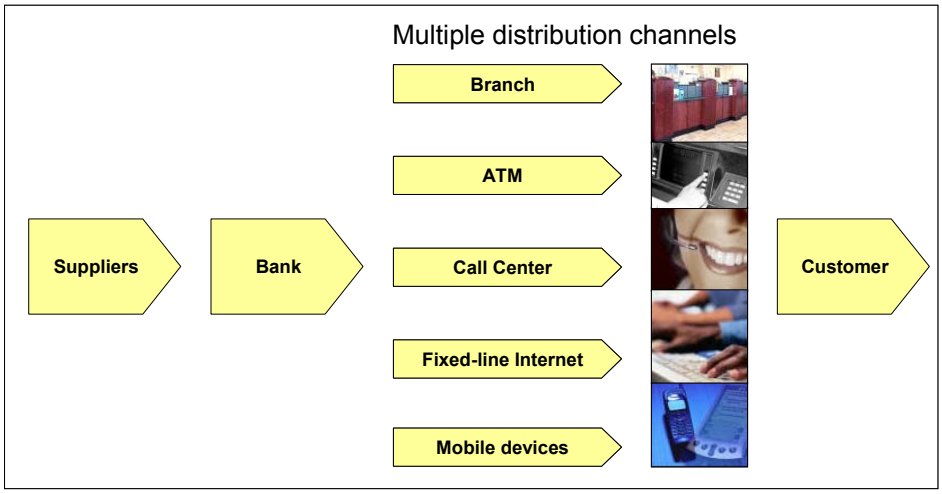

Figure 2: *Multi-channel Strategy*

All of the five current developments are mainly enabled and supported by information and communication technology (ICT). That confirms and underlines the assumption of an increasing dependency on information systems that is made in Section 0. But, as Gupta, Czernik and Sharma (2001, p. 781) point out: "Bankers must realize that technology in and of itself will not provide the competitive advantage. Banking has been a staid industry for a very long time. Competition is something new that a lot of bankers are trying to counter by throwing money at technology. The successful banks will be the ones that will recognize the potential of operations as a strategic weapon".

Thus, banks are strategically caught in a difficult situation which is to be decided without losing time and being left behind. On the one hand, "consumers […] will demand true anywhere, anytime access, and the most successful players in retail banking will offer wireless Internet banking facilities as part of an integrated financial service distribution system." (Wright 2002).

On the other hand, it is essential that ICT development is consistently incorporated into banks´ overall strategies, and technology investments require a well-designed strategy that needs to be effective against high strategic risks like

- "excessive investment in particular products/services that are not accepted by customers or in technical solutions which become rapidly outdated;
- an unexpectedly long time-lag to generate the planned returns on ICT investments; and
- excessive competition for the most profitable consumer segment, as many banks may concentrate – when promoting the remote channels – on the same group of customers".
  (European Central Bank, 1999, p. 34).

The European Central Bank points out that the latter risk could affect particularly second mover banks which make the related ICT investments later than their competitors, so that the gap between successful and unsuccessful banks in this field might widen in the longer term. Facing digitalization and cannibalization as the biggest strategic challenges, building alliances is the most important strategic task for the "old economy" (Arnold, Eßig and Kemper 2001) like banks and most financial service providers.

Due to these strategic implications, the decision about ICT investments and their realizations might determine the rise or demise of a bank. All the more important it is,

therefore, to acquire knowledge about the new technologies like mobile application systems, and to gain insight into the risks of their development and operation. Yet, in addition, in a sector characterized by ongoing concentration processes and internationalization, the management of risks is a forever growing prerequisite for sustaining the long-term welfare of the company and its stakeholders.

3. Mobile Banking and Brokerage Systems - Empirical Results

Mobile devices provide banks a new touch point and distribution channel to offer anytime, anywhere banking and brokerage services to their customers. This is one of the few kinds of mobile applications that enjoy a rather high acceptance (Seibt, Ingerfeld and Lee 2002[1]). Thus, banks have gained early experience with the development and operation of mobile information systems.

Since the field of mobile banking has not yet been scrutinized in depth, standardized quantitative methods are not appropriate for investigations. Instead, an early exploration needs a qualitative methodological approach; in this particular case, telephone interviews have been conducted to acquire first knowledge about banks´ experiences with mobile services as one example of business processes enabled by new technology and involving high IS risks. For a more in-depth analysis of banks´ IS risks, face-to-face interviews will be conducted in a second step. The research project will be completed with selected case studies about requirements for new methods and tools of banks´ IS risk management. In the following, selected results of the series of telephone interviews are presented.

On the basis of an internet research of the websites of the 100 largest German banks and financial service providers[2], 24 banks have been identified that offered mobile services to their customers (see Table 2). The main results of the telephone interviews revolve round the aspects

- Features,
- Objectives,
- Main requirements,
- Problems and weaknesses, and
- Planning and prospects

of the mobile banking services.

[1] For the proceedings of the M-Business Conference 2002 see MobiCom 2002

[2] In the following all of them are called “banks”.

Table 2: *Banks Offering Mobile Services (Data from Die Bank 7/2002, 8/2001)*

Ranking 2001/2000	Bank	Total Assets 2001 (EUR)	Number of Employees 2001
44/ 47	Baden-Württembergische Bank AG	25.402	2.684
11/ 10	Bankgesellschaft Berlin AG	189.163	16.485
2/ 2	Bayerische Hypo- und Vereinsbank AG	728.170	69.520
34/ 34	Berlin-Hannoversche Hypothekenbank AG	42.996	592
36/ 35	BfG Bank AG/ SEB AG	38.719	4.732
4/ 4	Commerzbank AG	501.312	39.481
31/ 32	Deutsche Bank 24	50.562	15.402
1/ 1	Deutsche Bank AG	918.222	94.782
20/ 18	DGZ DekaBank	81.371	3.199
3/ 3	Dresdner Bank AG	506.683	49.968
52/ 57	Frankfurter Sparkasse 1822direkt	16.300	2.318
39/ 40	Hamburger Sparkasse	32.434	5.072
55/ 59	Kreissparkasse Köln	15.155	2.473
8/ 7	Landesbank Baden-Württemberg	302.020	10.393
56/ 62	Nassauische Sparkasse	15.143	2.747
10/ 11	Norddeutsche Landesbank Girozentrale	199.855	8.137
74/ 77	Oldenburgische Landesbank AG	8.657	2.569
14/ 23	Postbank AG	139.820	10.400
94/ 99	Sparkasse Krefeld	5.858	1.406
85/ 88	Stadt- und Kreissparkasse Leipzig	6.765	1.545
91/ 93	Stadtsparkasse Dortmund	6.342	1.521
59/ 64	Stadtsparkasse München	13.400	2.773
75/ 98	Sparkasse Nürnberg	8.378	2.382
43/ 67	Volkswagen Financial Services AG	26.839	1.600

Table 3: *Features of Mobile Services Offered by 24 of the 100 Largest German Banks*

Features \ Bank	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23	Bank 24	Sum
Check account balance, account statement		X		X	X	X	X	X	X	X	X	X			X	X				X		X			14
Stock price enquiries	X	X			X	X	X	X	X	X	X	X	X	X					X						13
Funds transfers to other accounts		X			X	X	X		X			X			X	X									8
Enquire stock balance		X	X		X	X	X				X	X				X									8
Buy and sell stock/ securities, amend and cancel orders		X	X	X	X	X	X			X		X													8
News (general economic or corporate)	X		X					X			X		X	X							X				7
Enquire the list and status of orders		X	X	X		X	X			X		X													7
Enquire indices	X		X		X						X		X												5
Stock market news	X							X						X					X						4
SMS Limit Alerts, Watchlists				X					X	X							X								4
Check virtual stock balance		X		X				X	X																4
Contact information of the bank (Phone numbers for telephone banking, credit card service, call center)			X										X	X											3
Overview about all accounts					X		X								X										3
Change of deposit/ portfolio for securities		X	X			X																			3
Information about new issues (in case of consortium affiliation)	X			X							X														3
SMS confirmation of transacted orders					X												X	X							3
Fund price enquiries	X		X					X																	3
Terms and conditions, information about interest rates													X										X		2
Currency/ Exchange rate enquiry	X							X																	2
General information through SMS																		X							1
Bank-specific WAP-Journal	X																								1
Check standing orders									X																1
Call money account postings																								X	1
Security identification number enquiry										X															1
Top and flop list of an index	X																								1
Stock charts	X																								1
Subscribe for new issues				X																					1
New funds of the bank	X																								1
Selection of investment companies and their funds	X																								1
Fonds charts	X																								1
Buy and sell funds				X																					1
News about currency/ exchange rates	X																								1
European Central Bank reference prices/ rates	X																								1
Euro exchange rate fixing	X																								1
Special interest rates (EURIBOR, LIBOR USD and LIBOR GBP)	X																								1
Currency calculator	X																								1
Sum (features per bank)	**18**	**8**	**8**	**8**	**8**	**7**	**7**	**7**	**6**	**6**	**6**	**6**	**5**	**4**	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**121**

Table 4: Most *Important Objectives for Offering a Mobile Service*

Most important objectives \ Bank	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 20	Bank 22	Bank 23	Bank 24	Sum
Implementing a multi-channel strategy	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X		18
Improving customer relations/ CRM	X	X				X	X		X		X	X	X	X	X	X	X	X	X	X		15
Developing special technical Know-how	X	X	X	X	X	X	X			X	X	X	X									11
Reacting to activities of competitors								X	X			X			X	X		X	X	X	X	9
Merely a first attempt to estimate customer acceptance of such a service			X	X				X					X								X	5
Reducing the number of branches																						0

As has been pointed out in Section 0 most banks adopt multi channel strategies. Thus, offering a mobile service was primarily aimed at facilitating that multi channel strategy and improving customer relations (see

Table **4**). Since only few banks have their own development teams, the issue of developing special technical know-how has been slightly less important. All interviewees seem to have had realistic expectations about the lack of a critical mass of customers that could have helped to reduce the number of branches.

Table 5: *Main Requirements in the Beginning of Mobile Banking Projects*

Bank / Main requirements	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 20	Bank 22	Bank 23	Bank 24	Sum
High speed of development/ Short time-to-market		X		X	X				X	X	X	X	X			X	X	X	X	X	X	14
Minimal development costs	X				X	X	X	X	X	X			X	X			X	X	X	X	X	14
High compatibility with the existing architecture in respect of the systems integration		X	X	X		X	X	X	X		X	X			X	X			X		X	13
Minimal system life cycle costs	X					X		X		X	X			X				X			X	8
Product differentiation in comparison to the products of competitors		X			X												X					3
High level of functionality/ broad functional range						X																1

Regarding the facts that the initiatives were triggered by the electronic and mobile commerce hype and competition in the banking industry is increasing (see Section 0), a rapid time-to-market was the most important requirement (**Table 5**). The scope of features was planned to be as wide as possible, including even transaction services that require back-office system integration. But due to high uncertainty about the technological progress and the feasibility of requirements regarding the available resources (particularly know-how), development costs were planned (but did not always turn out) to be minimal.

Table 6: *Problems and Weaknesses*

Bank / Weaknesses	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 20	Bank 22	Bank 23	Bank 24	Sum
Risk of acceptance	X		X	X		X			X	X	X		X		X	X	X		X	X		13
Usability (Speed of data transfer, display size, WAP navigation)		X			X	X	X	X	X		X		X	X			X	X		X		12
Technical problems (encryption, different standards of devices/ configuration problems, interface problems/ complexity, display/ GUI problems)	X	X	X	X		X		X			X			X	X				X	X	X	12
Delay of technological development (standardization, digital signatures, UMTS, lack of an overall standard)	X	X		X			X				X					X						6
Cost risks	X	X								X	X					X					X	6
no profound analysis of costs and benefits, no market analysis, no risk analysis		X	X	X							X					X				X		6
High costs for users (particularly with UMTS in the future)							X		X	X			X									4
Start with a narrow scope of features due to risks, service not attractive							X					X				X	X					4
Restrictions of SMS (content)																		X				1
Outsourcing problems								X														1
Time-consuming maintenance										X												1

The problems and weaknesses (**Table 6**) illustrate the main risk aspects the banks had to face, i.e. market (acceptance), technology (usability, technological development) and finally incalculable costs because of the high uncertainty about technology and resources. With the lack of profound analyses regarding costs and benefits as well as market potential that made cross-subsidizing between channels necessary, the interviewees give emphasis to the demand for an overall channel spanning risk management.

Planning and Prospects

Eighteen of the twenty-two banks said that there are no concrete projects on schedule for the time being. They intend to concentrate on maintenance and support of the developed services and to observe the market for further signals. One bank had planned to close the service. Only four banks (Bank 1, 4, 12, 22) had planned to launch new releases with an extended scope of features.

The main reasons that were given for not engaging in further activities are the risks due to the uncertainty of market and technological development on the one hand, facing high technological dependency and the lack of a critical mass of customers on the other.

4. The Need for an Operational IS Risk Management

Our empirical study revealed that, despite the multiplicity of features that were intended at the beginning of the projects, banks had to cope with enormous risks after having decided to offer mobile banking and brokerage services to their customers, especially when the new systems had to be technically and organizationally integrated into existing back-office transaction systems. That is why most banks tried to keep investments low and finally offered only a small range of features. Examples of these IS risks are outlined in Table 7.

Table 7: *Examples of IS Risks*

Risks	Internal risks			External risks
Main relevance	**System risks**	**Process risks**	**Personnel risks**	
System development	Clarity of system requirements, comparability to existing systems	Clarity of business processes that shall be supported by the system	Specialty of know-how required for system development	Development of technological standards (incompatible with the applied technology)
	Number and size of modules	Choice of process model/ development procedure	Availability of personnel, labour turnover rate	Competitor activities
	Number and quality of interfaces with the exinsting infrastructure	Time-to-market	Degree of outsourcing for system development	Volatility of customer needs
System operation	Damages through programming bugs, viruses, infections	Inappropriate or unproved/ new operational procedures	Dependency on external personnel for maintenance, quality of service level agreements (SLA's)	Network damages, power breakdown
	Backup failure, loss of data	Unauthorized use (beyond defined responsibilities)	Insufficient organizational-personnel embedding	Unauthorized access, destructive hacks
	Shortcomings/ defects of human-machine-interfaces	Workflow interdependencies during transaction processing	User error (intentionally or unintentionally)	Fraud
Complete life-cycle	Dependency on new technology, path dependency	Strategic relevance of product and market entry	User know-how	Market potential, market dynamics
	Compatibility with existing systems	Estimated life-cycle	Communication structures, conflicts of interests	Legal and regulatory changes
	Availability and quality of data	Project size, time and budget restrictions	Quality and scope of required change for organizational-personnel implementation, lack of user acceptance	Theft, natural disasters

Regarding these risks, there are several current approaches coming into consideration that can contribute to a minimization or help to cope with them, such as process models, project management concepts, software process and quality improvement approaches and controlling aspects of IS management. But taking a closer look at these existing approaches, the crucial point is that each of them covers only some risk aspects. Even if

all the approaches would be applied simultaneously, they have different perspectives and the activities would not necessarily complement each another. At the worst, the effects of risk minimizing attempts from different perspectives can foil and cancel out each other and even produce new risks. Sometimes discussions even revolve round the question, "Does risk management increase risk?" (The Economist 1999). With respect to the present situation described in Section 0, the need for an overall management of IS risks becomes evident.

As for banks, the Basel Committee for Banking Supervision has already established the requirement of a minimum capital charge for operational risks within Pillar 1 of the New Capital Accord (Basel Committee on Banking Supervision 1999, 2001). It defines operational risk as "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events" (Basel Committee on Banking Supervision 2001, p. 2) (see also the categories of IS risks in Table 7). Figure 3 shows the need for an operational IS risk management with respect to that definition.

A closer look at the first group of existing approaches "process models and project management" (see Figure 3) supports the statement about the shortcomings of existing approaches with regard to risk management.

Karlsson (2000) tries to throw some light on the confusing multitude of new process models that have been invented to overcome the restrictions of sequential/ phase models, while focusing on incremental development. Boehm (1995) suggests to solve that problem with three key life cycle milestones, i.e. Life Cycle Objectives, Life Cycle Architecture, and Initial Operational Capability, that can serve as anchor points for the software development process and thus offers a "riskdriven mix of flexibility and discipline" (Boehm 1995, p. 24). However, in recent times, several models have been developed that are summarized as "agile methods", of which the best known are Extreme Programming (XP) (Beck 2000), Scrum (Beedle et al. 2000), Dynamic Systems Development Method (DSDM) (Stapleton 1997) Crystal Methodologies (Crystal Methodologies 2003). Empirical findings show that agile methods prove to be particularly appropriate under certain conditions (Lindvall et al. 2002), whereas other models fit better for other software development settings.

Thus, it is argued that, even with the options of tailoring, there is no software development model that fits for most situations. A model, in fact, needs to be selected separately for each project according to specific aspects (Harmsen, Lubbers & Wijers 1995, Kemper & Wolf 2002).

Risk management has always been a matter to software project management. Boehm published already in 1989 a risk management concept for software projects consisting of two steps (Boehm 1989, p.2):

- Risk assessment: risk identification, analysis and prioritization
- Risk control: risk management planning, risk resolution and monitoring.

Though he emphasizes life-cycle orientation, the risks that are considered evolve from the development process. The "Top ten list of software risk items" ranges from "personnel shortfalls" and "unrealistic schedules and budgets" to "straining computer science capabilities" (Boehm 1989, p. 99).

All these approaches are not primarily dedicated to risk management; in fact, they consider risks under their specific perspectives.

The Basel Committee stated in its Consultation Document (2001, p. 18) on the basis of an empirical study conducted by the Risk Management Group (RMG): "For most banks the

tracking of risk indicators appears to be in its infancy, and a large number are not tracking indicators of any kind".

This is not only true for the IS risks in banks. Looking for overall risk management approaches covering IS risks there is one by the Software Engineering Institute at Carnegie Mellon University (SEI) focusing explicitly on software development projects and encompassing the activities "Identify, Analyze, Plan, Track, Control, Communicate" (Dorofee et al. 1996) and one by the Central Computer and Telecommunication Agency (CCTA) suggesting a cycle of the activities "Identify the risks and define a framework, assign risk ownership, evaluate the risks, set acceptable levels of risk (tolerance/'appetite'), identify suitable responses to risk, gain assurances about effectiveness, embed and review" (CCTA 2001).

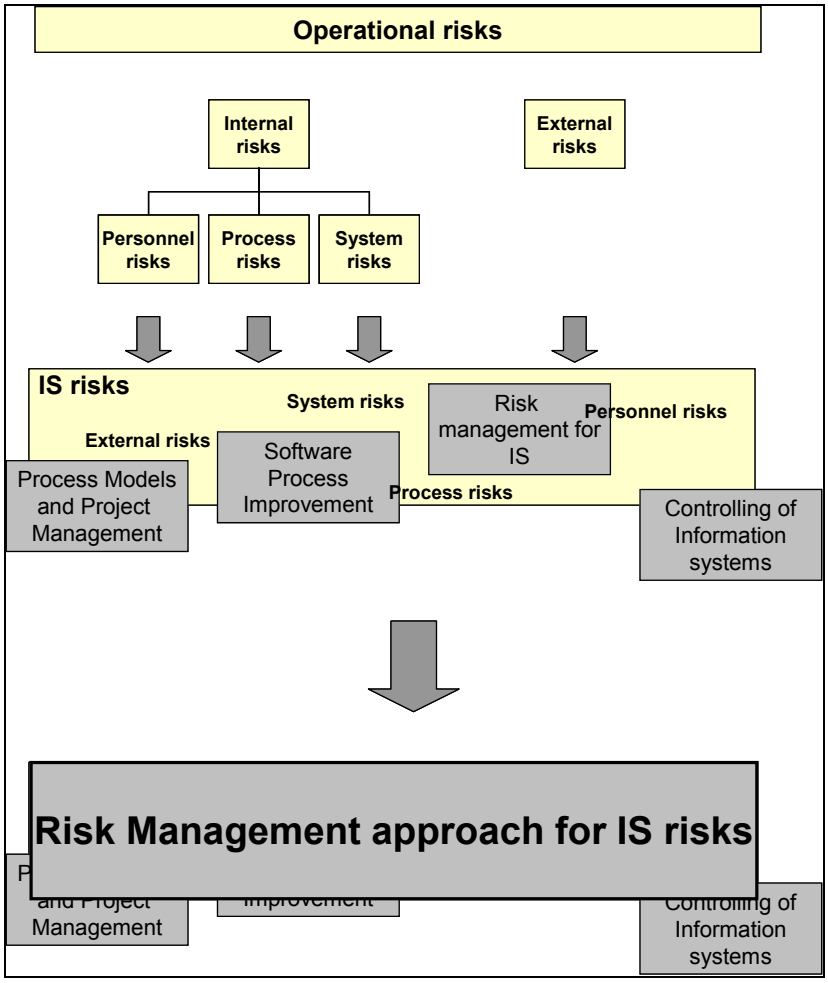

Figure 3: *The need for an Operational IS Risk Management*

In recent times risk management attracts increasing attention, regarding the number of publications, not only in the banking field. As main risk management activities there can be summarized

- Identification,
- Measurement and analysis,
- Mitigation,

- Monitoring and controlling.

Many ideas are based on check lists (Gaulke 2002) but there are also ideas based on stochastic modelling (Cruz 2002) and causal modelling (King 2001). Yet, only few approaches are implemented in practice. “However, in reviewing the progress of the industry in the measurement of operational risk, the Committee is aware that causal measurement and modelling of operational risk remains at the earliest stages.” (Basel Committee on Banking Supervision 2001, p. 2).

One of the reasons for the industry to treat these ideas with reserve can be the huge effort that is needed to generate a data base in order to set up reference values. Such reference values can hardly be valid for a multitude of companies or even a whole industry sector but needs to be built on the companies´ organization-specific experiences.

Another reason can be that analytical models are too complex and prove to be far too rigid, so that the effort to apply them in practice is inadequate with regard to the benefits. That impression can also be biased because the benefits of a successful risk management are not visible or at least not clearly assignable to certain activities. If analytical models prove to be too rigid because of their prerequisites, simulation models could be the method of choice because they are flexible enough to be adjusted to real processes (Liebl 1995).

These aspects mentioned above already show that the requirements for risk management in practice first have to be explored and scrutinized in detail. Only on that basis a risk management approach that can be applied and be useful in practice.

5. Summary and Outlook

This paper deals with the need of operational IS risk management in the beginning 21st century with reference to mobile systems in the banking industry. It presents

- an outline of new challenges of the 21st century,
- a description of the situation of banks being particularly exposed to these conditions
- selected results of a series of telephone interviews as the first of a three-step research process.

The empirical results, together with a theoretical investigation of existing approaches that are not explicitly dedicated, but have the potential to contribute to the minimization, of and coping with IS risks, span the space for further research steps. Current approaches, like process models, project management concepts, software process and quality improvement approaches and controlling aspects of IS management are considered to contribute to risk minimization but do not cover the whole field of IS risks; in fact, they discuss risk only from their specific perspective. Recent ideas for managing operational risk based on stochastic or causal modelling are not common in the industry. Reasons that can be relevant for the reserve of the industry are considered and lead to the conclusion that the industries´ requirements need to be assessed first. Thus, for a more in-depth analysis of banks´ IS risks, face-to-face interviews will be conducted with executives of banks´ IS department and executives in charge of companywide operational risk management in a second step. The research process will be finished with selected case studies about requirements for new methods and tools of banks´ IS risk management.

Having scrutinized the concrete requirements in practice, a new risk management model will be developed; that can be, for instance, a simulation model that is flexible enough to be aligned to changing conditions in reality and highly customizable is developed and tested and consolidated in a pilot project.

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