2011

Service-based Integration of IT-Innovations in Customer-Bank-Interaction

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ABSTRACT

Numerous information technology (IT)-based innovations from automated teller machines to electronic banking have already changed the customer-bank-interaction. Banks learned that these innovations require close integration with the existing channels, processes and systems in the front as well as in the backend. In view of a still dynamic pace of technological evolution, this research provides an overview of existing innovations in banking which have more recently spread especially in Germany and Switzerland. Based on these examples a framework is developed for vertically and horizontally integrating these innovations in existing architectures in banking.

Keywords

Services, integration, banking, architecture, IT-Innovation, customer-bank-interaction

1. INTRODUCTION

With the emergence of modern IT, the interaction between banks and their customers has changed substantially over the last decades. Among the examples are well-established technologies, such as automatic teller machines (ATMs), online banking (e-banking), and straight trough processing (STP) as well as others which have not (yet) seen adoption on a large scale, such as electronic cash (e-cash) or electronic bill presentment and payment (EBPP). At least the former have made inroads into the entire industry and changed the way how consumers and organizations conduct their financial tasks. However, new technologies, such as multi-touch interfaces, ever increasing bandwidth and cloud computing solutions, many innovations are still evolving and about to change the customer-bank-interaction.

Recent studies have emphasized that the new technological potentials also impact the customer requirements and thus provide new challenges for banks. For example, participants in a study among Swiss private clients explicitly advocated more IT-based advisory in order to ensure dependable quality of services [57]. Increasingly, customers desire hybrid forms of interaction with electronic and mobile communication channels slowly outweighing the importance of branch offices. The emergence of a technologically adept young generation of customers, the so-called 'digital natives', even strengthens this development.

According to another recent study, 67% of financial services professionals expect that electronic channels will gain in importance until 2015 while only 5% of them expect the same for branch offices [3]. New players, such as Fidor Bank in Germany [34] with its community banking approach or ASB Bank in New Zealand, offering a Facebook-based advisory service, force established banks to develop new or adapt existing strategies to these changing market requirements. Beside this, infrastructure developments such as long term evolution (LTE) telephony [39], mobile contactless payments through nearfield communication technology, and new application developments, such as community banking or smartphones equipped with interactive video communication, are still in a premature stage and hardly adopted by banks.

Based on the expectation that new IT-enabled innovations[1] will spread in the financial industry, this research aims to provide a structured model for their integration into the existing architecture of banks. This includes aligning these technologies with the existing customer-facing (downstream) interaction channels on the one hand and integrating them with the value chain processes in the back office and the interbank sector on the other. For this purpose, this research first surveys existing IT-based innovations which have emerged in customer-bank-interaction. Innovations shape industries in certain directions, sometimes on a small scale, sometimes on a larger one. These directions are referred to as trends in this research and derived from the innovation examples. They are used to derive requirements for banking architectures in the third chapter which are used to assess the current state of the art banking architectures in literature and practice and to propose an architecture framework which distinguishes four key integration dimensions. A summary and outlook in the fifth chapter closes this research.

2. INNOVATIONS IN CUSTOMER-BANK-INTERACTION

2.1 Innovations in Customer-Bank-Interaction

Being a service business, banking consists of immaterial products which customers may use via physical as well as virtual channels. Although business models, such as internet banks, have developed which focus on a single channel only, most banks pursue a more or less sophisticated multi channel approach that enables customers (and banks) to select the appropriate interaction channel. Interaction generally means that two or more parties orientate their verbal or non verbal actions towards each other,

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[1] As inventions can quickly become innovations and differentiation often is difficult, we solely use the term 'innovation' in this article, also including 'inventions'.

with actions and reactions being interdependent [23]. In banking, these parties on the customer side are typically retail, private and corporate clients. Banks in turn, interact with these customer segments using various processes and channels. The former are the front office processes which may be divided in the four categories shown in table 1: advisory and sales, payments, investments and financing as well as cross-functional processes, such as financial planning [28]. The latter comprise the established channels in banking, such as banking at the point of sales (POS), such as stores, the branch office, online banking (e.g. in companies and homes), and mobile banking.

table 1: innovations in customer-bank-interaction channels

Front office process areas	Channel	Examples
Advisory and Sales	Branch	Advisory dialogue with interactive touch screen (e.g. multi-touch Surface table at Q110; partly automated document capture and processing (e.g. Digipen)
	Online	Interactive video communication (e.g. WebDesk at Nykredit Bank; finance news subscription; e-loyalty (e.g. studienkredite.de); virtual bank branch (e.g. Second Life); mass customization (e.g. DZ Bank); Community-based advisory (e.g. ASB Bank)
	Mobile	Mobile marketing (e.g. Raiffeisenbank Information Services); finance news subscription
Payments	Point of Sale	Payments institution (e.g. Montrada)
	Online	Virtual credit card (e.g. Wirecard); online payment systems (e.g. PayPal); alternative currency (e.g. Linden Dollars, Facebook); electronic bill processing (e.g. VR-Rechnungs-service, SIX Paynet, PostFinance E-Rechnung)
	Mobile	Multi-banking-capable payment application (e.g. iOutBank); contactless payment via near field communication technology (e.g. coopera-tions Apple/Visa, Nokia/O2 Télefonica); intelligent wallet (e.g. Proverbial Wallet)
Investments and financing	Branch	Multimedia platform with news and videos (e.g. Bloomberg, Thomson Reuters)
	Online	Community banking (e.g. Fidor Bank); bank-less banking (e.g. Smava); credit management (e.g. KM3 of S&N); financial management (e.g. Kontoblick, Thrive, iPlanner)
	Mobile	Mobile financial planning (e.g. iPlanner, Bud-get); mobile brokerage (e.g. Cortal Consors)
Cross-functional	Branch	Financial planning- and risk profiling-application to adjust customer needs and investment strategy in advisory (e.g. FinaMetrica, struktur AG)
	Online	Electronic ID (e.g. BankID); comparison platform (e.g. ciao.de, openforum.com)
	Mobile	SMS-security procedure (e.g. Credit Suisse); smartphone app (e.g. Postbank iBanking, PayPal Mobile App, VR Banken Filialfinder App)

To address the question regarding innovative IT-enabled solutions, more than 60 examples were analyzed and trends for the future 'Point of Banking' (POB) were derived. As table 1 shows, examples may be found for almost every interaction channel, front office process area, and customer segment.

Among the examples in *advisory and sales* are for example interactive touch screen interfaces in branch offices. Together with the customer, the bank advisor collaboratively shows and explains complex issues via visualization and simulation. For example, a structured investment product with leverage, underlying and repayment value could be displayed to clarify the functional correlations to the customer. Devices like the table-like

Microsoft Surface in the Q110-branch of Deutsche Bank can recognize objects (e.g. product brochures) that are applied on them and offer information such as performance indicators that are linked to these objects [59].

An example from the *payments* area is the virtual credit card, such as Wirecard. Unlike a normal credit card, the owner of a virtual credit card only receives data (credit card number, validation code, expiration date) but no physical card. They normally provide no credit and strictly speaking are prepaid / debit cards, but customers may pay in all online shops that accept MasterCard and they avoid financial obligations like annual fees [66].

In the area of *investments and financing*, 'bankless banks' are in essence online market places for peer-to-peer loans either between private persons or between corporations. Smava, for example, gives borrowers the chance to offer investment opportunities to possible lenders and lenders can access externally audited solvency ratings of potential borrowers. Although the business model is called 'bankless', in the case of Smava a bank is still involved in the background [10]. When borrower and lender(s) agree on a deal, BIW Bank hands out a loan to the borrower which is immediately sold to the actual lender. The (non-) bank earns fees, but makes no profit out of interest rate differentials and takes no credit risks. A 'social return' in line with the slogan 'loans from human to human' is a non-monetary incentive to participate.

Among the *cross-functional* innovations are technologies for identification management. These solutions are key to comply with the strict identification rules at the beginning of each customer-bank relationship. For example, the Norwegian BankID system lets Norwegians identify themselves with an electronic identification and signature system online and allows to sign documents digitally. Sweden has developed a BankID system which allows digital signatures that are legally binding in the European Community – a system similar to the one introduced in Germany in November 2010 [67]. BankID is available as chip card and as 'soft certificate' (access data stored on a server) [58].

2.2 Trends in Customer-Bank-Interaction

The examples above show that IT-innovations may be found in the important front office processes of banks. On an aggregate level, the following trends may be recognized in these examples:

Trend 1 'Interactive 'Point of Banking' (POB)'. This refers to a more active participation in the value creation processes of banking [5][15][52][64]. Vivid discussions in the web 2.0 platforms of community banking providers, such as Fidor [34], belong to this trend as well as the use of interactive touch screens [59]. Portable devices, e.g. tablet PCs and multi-touch tables or even larger touch-sensitive walls, create an interactive advisory process.

Trend 2 'Mobile POB'. This trend reflects the growing intelligence of mobile devices used by customers. It includes smartphones and mobile PCs [36] as well as intelligent objects, such as physical wallets (e.g. proverbial wallets). The actuators of proverbial wallets are connected to account transactions that trigger vibrations for example when receiving data about account movements [32]. Key in these solutions is the coordination with other customer-bank interaction channels.

Trend 3 'Configurative POB'. Developing individual financial products is part of the third trend. For example, a configurator

could be used to adapt terms, product parameters, personalized printing of credit cards, etc. [63]. Similarly, customers could download applications from alternative banking service providers via app-stores and even configure their own banking environment [13].

Trend 4 'Integrated POB'. This trend is based on the availability of real time information across the entire banking value chain. In principle, customers get access to the same information level as their advisor, which relieves the advisor of being involved in the transactional business. The transparency created through this integration requires a full consolidation of the information which comes from different providers, for instance through business intelligence technologies [42].

Trend 5 'Multifunctional POB'. Converging devices in customer-bank-interaction are shaping this trend. Although there is no 'dominant device' yet, it is imaginable that mobile phones will also work as customer- and credit cards or as a coupon-storage in the field of e-loyalty. Scanners at the POB could read barcodes or two-dimensional codes (e.g. QR-Code, Microsoft Tag) on the displays of mobile devices [49].

Trend 6 'Open POB'. Finally, changes in the industry structure of banking are to be expected. So-called non- or parabanks already capture approximately 10 percent of the total sales volume in financial services today [9]. Examples, such as payment institutions [43] or Smava show that new competitors intrude the banking market with their innovations and that customers no longer require banks for several services that once were thought of as traditional banking services. In the future, community providers, such as Facebook or Xing could also act as financial service providers.

In summary, the changing POB has a number of technological enablers which will fail to yield the possible impact when implemented in isolation from existing parts of a bank's business and system architecture. The named innovations require architectures which consider the trends mentioned above and are able to extend the scope of existing architectures in banks to horizontal and vertical integration dimensions. The following chapter provides an appropriate architecture for integrating IT-supported innovations in customer-bank-interaction.

3. ARCHITECTURE FOR INTEGRATING IT-SUPPORTED INNOVATIONS IN CUSTOMER-BANK-INTERACTION

To elaborate this architecture, the principles of design science were applied. Designing solutions for socio-technical systems belong to the essential research goals within the design- and application oriented discipline of business information systems [7][25][69]. Starting points of design science research in information systems (IS) are postulated performance attributes of an IS (e.g. requirements, such as described in section 3.2). Architectures are design science artefacts and part of the research agenda of business information systems. They are scientifically elaborated if they follow the postulates of originality, abstraction and explanation [20]. The proposed architecture in section 3.4 is original, as it is something new: the application of a proven modelling technique to a new situation. It is abstract as it is not tailored to a specific bank but intended to serve as a blueprint for banks that wish to be prepared to future changes in the field of customer-bank-interaction. The paper combines two restrictions

of design science. First, the architecture should not remain a theoretical construct, but a concept that may be applied and tested. Second, the research result should be relevant to 'real-world problems'. To achieve both goals (construction of artifacts and relevance for practice), the architecture developed in this article is based on a combined concept of 'action research' [27]. This research emerged in the context of a research consortium that consisted of 3 research institutes and 16 partner companies from the financial services value chain in Germany and Switzerland.

3.1 General Requirements

Architecture is defined as: "the fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution" ([30], 3) by ANSI/ IEEE. Architectures must not be merely technical or applied in the information technology domain. Therefore, Lankhorst speaks of enterprise architectures as "a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure" ([35], 3). The core utility of the explicating enterprise architectures is documentation and therefore transparency of the design object [1]. Winter and Fischer [65] argue that the most common layers and design objects of enterprise architecture are represented as the following:

- Strategic layer: Product / services, market segments, strategic company goals, strategic plans / projects, interaction with clients and suppliers

- Organizational layer: Sales channels, business processes, organizational units, roles / responsibilities, information flows, sites

- Integration layer: Applications, application domains, business services, IS functionalities, information objects, interfaces

- Software layer: software components, data structures

- IT infrastructure layer: hardware components, network components, software platforms

Through the integration of different layers, architectures are especially helpful when it comes to transformations. "Transformation means to restructure existing companies or create new ones", in order for e.g. the adaption of strategies to changing requirements ([48], 7). Changes in customer needs and therefore in customer behavior are named as a trigger for company transformations [47][62]. Transformations of banks which redefine their strategies are often too complex and significant to realize them uncoordinatedly, intuitively, and without methods [48]. An architecture, combined with repeatable transformation procedures and techniques, enables an engineering-like construction of enterprises and makes transformations manageable [48][50].

3.2 Banking-Specific Requirements

Based on existing approaches from business engineering and integrated application systems, this section suggests four architecture requirements which are more specific for the 'future POB' (see table 2).

table 2: POB trends and architecture requirements

Trends	Architecture requirements

	Customer process orientation	Horizontal integration	Vertical integration	Service orientation
Trend 1 'Interactive Point of Banking (POB)'	Tighter integration of customers in banking processes, e,g, via collaborative design (co-creation) of solutions	Integration into back-end processes, banking software that uses the potentials of interactive devices	Suitable across all channels, but especially in personal advisory sessions, e.g. using Microsoft Surface technology	Service-oriented integration, re-use of services
Trend 2 'Mobile POB'	Mobile accessability of services, exploitation of location-based services and mobile payment methods	Integration of mobile channel into mid- and / or back-end processes and systems. Collaboration with "mobile" providers like telcos, software developers, content creators, mobile payments experts	Integration of mobile channel with other channels, applications that run both online and on smartphones, like vanilla.ch	Service-based channel design, service contracts with providers
Trend 3 'Configurative POB'	Personalized products and processes / systems, configurators for mass-customized products	Standardized products and services e.g. via service catalogues, modularization	Homogeneous and personalized view across different channels for appropriate devices	Service-oriented design of products and services
Trend 4 'Integrated POB'	Personalized (near) real-time information	Integrated (near) real-time information across the entire value chain	Integrated (near) real-time information across all channels, standardized interfaces	Service-oriented reporting, integration of legacy systems with SOA
Trend 5 'Multifunctional POB'	Customer process-oriented design of applications, exploiting the full potential of different devices	Support of device independent services throughout the value chain	Device independent services on a variety of devices	Multifunctional service design, use of meta layers
Trend 6 'Open POB'	Customer-oriented design of service portfolio	Integration of internal and external services / providers like Smava or community platforms	Integration of channel-oriented services (e.g. external call center)	Service orientation as basis for integration of externals

3.2.1 Customer Process Orientation

Customer processes are those steps that customers take to satisfy a desire or to solve a problem, comprising all steps until the need is satisfied or the problem is solved [8].

table 3: examples for customer processes according to customer segments [12][16][31]

Retail	Private	Corporate
Retirement and pension	Entrepreneurship (e.g. family owned company, private equity, venture capital)	Sourcing and purchasing management
Housing	Generation-spanning processes, e.g. management succession	Production and materials management
Asset building	Liquidity management	Order management and quality assurance
Buying, leasing, maintaining vehicles	Societal activities (arts, sports, philanthropy)	Marketing, sales, and after sales management
Buying, maintaining long-living consumer goods and IT	International tax optimization and privacy protection	Human resources and infrastructure management
Travel planning	Aggregated view on personal assets and those that are bound in entrepreneurial ventures	Controlling and financial management
Education	Concierge and other family office processes	Corporate planning and diagnosis

Customer process orientation imposes high flexibility requirements on a bank and its architecture: The three classical segments retail, private, and corporate banking differ regarding customer behavior and services, but should base on similar application support in order to be efficient [5]. The reason for banks to live up to these requirements is that customer process orientation advances their abilities to solve customers' problems. A tighter integration of customers in banking processes, for example via collaborative advisory sessions, eventually leaves them with higher trust in the co-designed solution. Customer process orientation may also create value added if entire customer processes with all-in-one solutions are offered to customers [64]. Doing so, banks have the possibility to act as an integrator of various specialist providers [56]. Therefore, the requirement of customer process orientation is strongly interlinked with the requirement of horizontal integration of specialist providers.

3.2.2 Horizontal (Value Chain) Integration

Besides a consideration of customer processes, it is important to deal with the question which services are offered to the customer by the bank itself and which ones in cooperation with partners of the bank [38].

Horizontal integration [41] refers to forming a value chain of customers, banks, the service providers of banks, and the interbank sector. It can also be understood as the coordination of two parts: On the one hand, customer processes need to be aligned with the front office processes of banks which in turn need to be executed effectively and efficiently. Therefore, on the other hand, they have to be coordinated with back office processes, and moreover with partners in the value chain [14][68], like for example specialist providers or central banks. This kind of cooperation is also denoted as business networking, networked enterprise architecture [64], open finance [64] or finance network [14]. In the context of the observed innovations it is especially relevant for banks to decide if and how to collaborate with the emerging non-bank organization (e.g. Smava, montrada) at the front end and how to seamlessly change affected processes in the backend.

Horizontal integration can be motivated by the demand to support complex customer processes efficiently as the single point of contact to the customer while focusing on core competencies. Being the single point of contact throughout the whole customer process can be advantageous for banks because such an intense interaction might lead to cross-selling opportunities and higher customer retention [31]. Examples are real estate valuation service of Hypotheken Management GmbH to the VR-Group in Germany or securities processing offerings of Vontobel, a Swiss private bank. In Switzerland alone, three financial networks were initiated by cantonal banks, grouped around Avaloq, Finnova and Real-Time-Center, all three being software providers for core-banking applications [6]. The current emergence and redesign of financial networks requires adequate architectures to manage the growing complexity [33].

For European banks, a central challenge to horizontal integration is that for decades they have been working with proprietary applications, resulting in complex, heterogeneous and monolithic application landscapes with numerous proprietary interfaces and an increased total cost of ownership [29]. To deal with this challenge, bank representatives stated that they aim at introducing standardized application architectures which may be maintained on a modular basis from a third party [33]. As costs may be shared over all participants, integrating new channels becomes more economical in such constellations.

3.2.3 Vertical Integration across Different Banking Channels

Another challenge is to combine horizontal integration with vertical integration. The latter refers to integrate across different banking channels like online, mobile or at a branch office. It belongs to the area of multi channel management. Multi channel management regularly takes a sales perspective, posing the question "which products and services with which features are to be distributed via which via which points at contact at which price to which customers or customer segments"([55], 15). This sales-oriented question implies managerial decisions whereas our aim is to provide a good basis for such decisions. Therefore within multi channel management, this research focus on vertical integration as one part of it.

Integrating different channels of interaction should be a priority for banks as the possibility to switch channels and to seamlessly continue a process on another channel could be desirable for customers [5]. Due to their life cycle phase, most of the innovations are still isolated from each other and not adequately integrated yet. Very often this leads to the following challenges for banks:

- customers perceive the same product differently if it is displayed differently on different channels,

- advisors in branch office cannot access the same information that customers can access in online banking, and

- customers use branch offices for standard issues that they can do more efficiently and comfortably from home.

Recognizing that customer-bank interaction increasingly becomes hybrid and electronic and mobile channels gain importance (albeit they still do not fully substitute classical channels), a chance for differentiation emerges. Forrester Research for example expects a significant overlap of channels in Germany [46]. The key would be vertical integration on the same technological platform, especially between online banking, mobile banking, self-service, and branch office applications [2].

Whereas horizontal integration requires conceptual planning in the sense of a systematic identification of value added and a differentiation of customer interaction regarding its elements [23], the central challenge with both, vertical and horizontal integration is to consider them combined. Differentiation at the frontend needs to be combined with integration at the backend [2].

3.2.4 Service orientation

"Service orientation is the basis for horizontal and vertical integration" ([2], 9) is a recent statement of a managing director at Deutsche Bank Private and Business Clients IT. It calls for the ability of banks to flexibly implement new and change existing business processes [37] and enables banks to render services in a consistently high quality and functionality regardless of which process or channel is preferred by clients.

Within discussions on architectures, service orientation takes a prominent role. Service-oriented architecture (SOA) promises the integration of heterogeneous application environments from a technological view. From a business view it promises a more flexible allocation of business activities, represented as services, among business partners in a value chain [33]. Steen et al. claim that SOA "provides better handles for architectural alignment and business and IT alignment, in particular" ([62], 132).

Reusability is an important attribute of services. Future scenarios expect a much stronger overlap of processes in different channels than it is the case today [46], requiring appropriate and synchronised information in different channels.

3.3 Analysis of Current Banking Architectures

Coverage analysis across several layers is an established form for the analysis of enterprise architectures. It is used to identify gaps or redundancies in architectures [1]. To assess whether current architectures cover the innovations, trends, and requirements mentioned in chapter 2 and 3, a variety of banking architectures from literature and practice were analyzed. This article only considers architectures that have a significant potential to meet the requirements mentioned above. Excluded for example is a publication that gives a snapshot of German banking IT architectures in the year 2001 [40] or authors/ institutions that receive significant attention in the community but only focus on few of the requirements. This includes e.g. Heutschi delivering a detailed case study on SOA at Credit Suisse [26]), Peppard focusing on CRM for banking [51], ibi research GmbH focusing on retail banking sales, FIM Augsburg focusing on customer management and the E-Finance Lab which has done substantial work on banking IT but did not yet publicly consolidate this knowledge into the required architecture.

3.3.1 Banking Architectures in Research

The competence center Banking Architectures in the Information Age (CC BAI) at the Institute of Information Management in St. Gallen has developed an architecture comprising the design layers business, processes, and applications [38]. It covers essential aspects of a modern banking architecture like customer process orientation [19][23][24], horizontal integration [64] and vertical integration [23]. However, it was developed almost a decade ago and does not consider the integration of the latest IT-supported

innovations and trends in customer-bank-interaction or service orientation.

The Competence Center Sourcing in the Financial Industry (CCS) used the foundation laid by BAI and the business engineering framework but has focused on the topics of horizontal integration (e.g. [6] and [14]) and service orientation (e.g. [33]) for the last years. Thereby, CCS had rather chosen back office and outsourcing topics than client-bank-interaction, vertical integration, and customer process orientation. Although if in some of its latest works [2][3][5] it has put attention to the three until then omitted topics, it has not yet published a corresponding banking architecture.

The works of the ProcessLab at the Frankfurt School of Finance & Management heavily incorporate customer process orientation [11][12][21][22]. They consider mobile banking [13] as well as process portals [21] and banking websites [31]. Furthermore, they share ideas with CC BAI and CCS regarding horizontal integration [44]. But their architecture shows only weak links to service orientation and banking innovations as perceived here.

3.3.2 Banking Architectures in Practice

Banking architectures that fulfill most requirements and are published by banks could not be found in public sources. This might be explained either by a lack of motivation of banks to publicize their architectures or by a lack of appropriate architectures. IS providers are much more willing to publish architectures as they are part of their sales offerings. Therefore, the offerings of two providers, one Germany-based and one Swiss-based, will be discussed in the following. Since these architectures are implemented by banks, they at least indirectly give sight on how contemporary banking architectures look like.

SAP delivers modularized standard software to banks. The enterprise services architecture (ESA) which SAP markets, claims to be a business-driven software framework that offers a broad spectrum of web-based services that can modified and combined to produce the business logic banks need. According to a SAP Solution Brief [54], the ESA is delivered by the SAP NetWeaver platform and builds on basic SOA functionality. It says that due to cleanly defined web services, judicious outsourcing could further trim costs while limiting compliance cost and risk. Regarding customer bank-interaction, this ESA lures with standardized interfaces between a bank and its corporate clients. Provided that the necessary agreements exist, the bank could interface with its corporate customers, thereby gaining the possibility to provide information for participants on both sides of a trade. This can result in profits from interest-rate arbitrage and reduction in fraud and credit risk. ESA also gives a brief overview over integration of front and back end. One has to consider that this Solution Brief

Coverage of…	Research			Practice	
	CC BAI	CCS	ProcessLab	SAP	Finnova
… IT-supported innovations and trends in customer-bank-interaction	0	1	2	1	0
… customer process orientation	3	1	4	0	0
…horizontal integration	3	4	2	1	3
…vertical integration	4	1	1	0	1
... service orientation	0	4	0	3	3
Legend:	0 not mentioned	1 mentioned	2 partly described	3 described	4 described in detail

might not depict the whole reality of SAP.

Like SAP, Swiss-based Finnova Bankware provides the financial industry with modularized standard software. It claims to be state of the art regarding all business requirements.
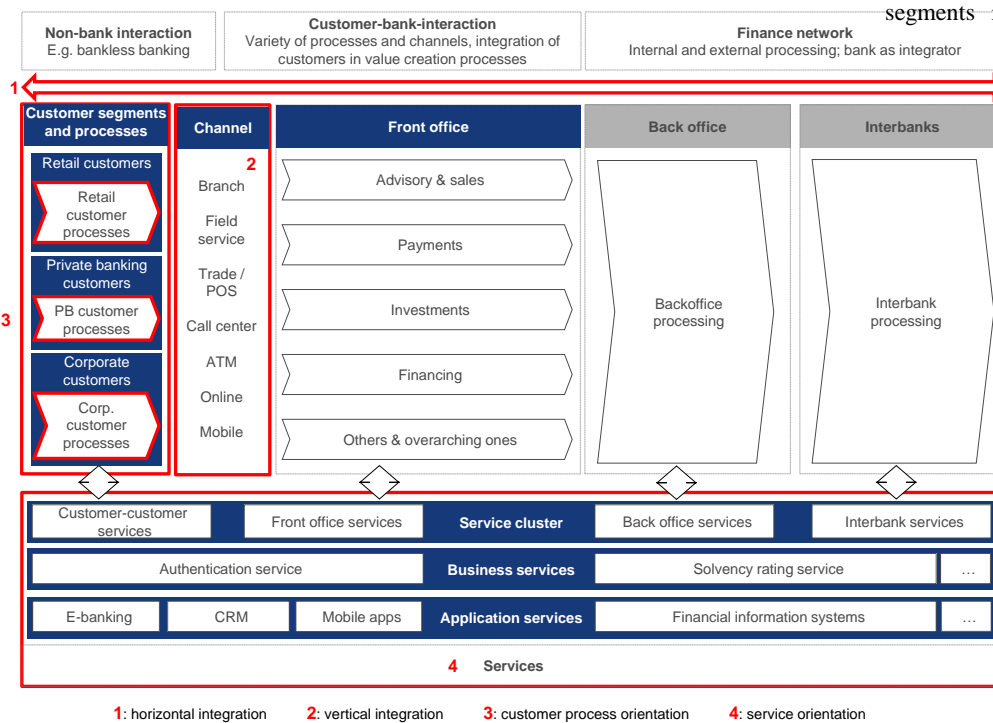
Regarding customer interaction, this does not seem to be the case, as the trends regarding the future POBs are hardly reflected. In the field of phone banking for example, Finnova offers basic functionalities like information on balances and bookings, opening hours of banks, and document orders only. The state of the art is rather reached in back end issues where Finnova offers open standard interfaces based on a SOA concept for the integration of third-party systems. This openness is crucial for the horizontal integration strategy of Finnova as Finnova is part of a large finance network, called the 'Finnova Community' [17][18].

table 4: gaps of existing banking architectures

3.4 Developing an Architecture for Service-based Integration of IT-Innovations

This section proposes a banking enterprise architecture (see figure 1) which meets the defined requirements from section 3.2: Customer process orientation, horizontal and vertical integration, and service orientation. It relies on an adoption of the CC Sourcing meta model which is structured according to the three layers of business engineering [4].

figure 1: overview over process and information system layers

Non-bank interaction E.g. bankless banking	Customer-bank-interaction Variety of processes and channels, integration of customers in value creation processes	Finance network Internal and external processing; bank as integrator

1

Customer segments and processes	Channel	Front office	Back office	Interbanks
Retail customers	Branch	Advisory & sales		
Retail customer processes	Field service	Payments		
Private banking customers	Trade / POS	Investments	Backoffice processing	Interbank processing
PB customer processes	Call center			
Corporate customers	ATM	Financing		
Corp. customer processes	Online	Others & overarching ones		
	Mobile			

2

3

Customer-customer services	Front office services	**Service cluster**	Back office services	Interbank services
Authentication service		**Business services**	Solvency rating service	...
E-banking	CRM	Mobile apps	**Application services**	Financial information systems ...

4 Services

1: horizontal integration **2**: vertical integration **3**: customer process orientation **4**: service orientation

For example, a securities process might look like the following in the future. A retail client has concerns regarding her savings for retirement, which is matched by a retail customer process called retirement and pension. Examples for other retail customers processes are death / heritage, housing or education (see table 3 for customers segments and processes). On the train to work she downloads (channel: online) a financial planning application (application service) that is provided by technology provider (back office area) of her bank. After authentication (business service), the application accesses all relevant data the bank stores about her financial situation. Some basic simulations (business services) confirm her concern and she decides that it is time to do something about it. As she prefers to get professional advice in such matters, she has her calendar compared (channel: online) with the one of her advisor, whom she then meets one day later after work (channel: branch). After authentication (business service), her data is loaded into the system (application service) of an interactive touch screen table at the branch office, A and her advisor do some more detailed simulations in order to quantify the gap and derive possible actions from it (business services). The resulting financial product is designed of various components (standardized for vertical integration) and, after another authentication her order is electronically routed to the securities and payments processor of her bank (back office area). There it is automatically recognized, verified, and released (back office processing using back office services). With the help of the financial information system (application service), the best place for trading (interbank area) is selected, where then it can be executed (interbank processing using interbank services). The next process steps in the back office and interbank area include clearing and settlement, output management, and archiving.

This small use case depicts how the proposed architecture integrates all four requirements into one model:

- *Customer Process orientation*. It depicts the customer segments retail customers, (affluent) private banking customers, and corporate customers. Each segment has its own specific customer processes (see table 3), based on its needs or behaviour. What they have in common is that they seamlessly interact via several channels with the front office areas of the bank. The relevant elements of the architecture are "customer segments and processes" and "service portfolio".

- *Horizontal integration*. The model presented here is more customer oriented than existing solutions. Customers may obtain banking services that rely on real-time information in the whole banking supply chain. A prerequisite for this are integrated processes and systems across the entire value chain starting from the requirements of the customer process. The relevant elements of the architecture are "customer segments and processes", "front office", "Back office" "interbanks" and "service portfolio".

- *Vertical integration*. Customers in the future have the possibility to switch channels and seamlessly continue a process on another channel. In principle, customers can access the same information as their advisors can do, anywhere and at any time. This requirement calls for integrated channels that are aligned with all customer facing processes. Consolidation of client landscape / frontend systems, a homogeneous middleware layer and a standard core banking system in the backend seem to be important facilitators for cost efficiency and time to market. For the consolidation of front end systems communication and governance are essential. Firstly, the value added of standardization needs to be understood in the business units. Secondly, the desire for diversity of variants needs to be lowered, for example through demanding sound business cases for individual exceptions and offsetting extra IT cost with the management compensation of the business units. The relevant elements of the architecture are "customer segments and processes", "channels" "front office" and "service portfolio".

- *Service orientation*. A service architecture which covers all channels, customer and value chain processes is the enabler of future banking scenarios as described in the first part of this section. These services address different user groups, such as customers, front-office, back-office or interbank users and relies on business services and application services [33]. The relevant elements of the architecture are "customer segments and processes", "front office", "back office" "interbanks" and "service portfolio".

4. SUMMARY, RESEARCH OUTLOOK, AND CONCLUSIONS

Changing customer behaviour and new IT-based innovations challenge banks in competing with new market players which offer new forms of customer-bank-interaction. Banks need to adapt those innovations and adapt their strategies in customer-bank-interaction. This article presents an overview of state of the art IT-innovations, summarizes trends for banks and defines requirements for a new banking architecture model. It compares existing architectures, shows gaps, and, based on this, develops a new architecture model showing an enhanced integration model for horizontal and vertical integration of IT-innovations. The article provides additional progress in current research and practice in the following areas:

- *Service life cycle management*: Due to their life cycle phase, most of the service-based IT-Innovations in banks are still isolated from each other and not adequately integrated yet. An overall service life cycle management ensures a proper fit into the existing architecture.

- *Enhanced horizontal and vertical integration*: Current banking architectures in research and practice consider horizontal and / or vertical integration as major dimensions. This article adds the customer process and the service orientation as two enhancements to existing architectures.

- *Business and IT linkage*: Service-based integration addresses the close link between business requirements and IT implementations which current enterprise architectures lack very often [33]. The presented architecture uses a structured overview on IT-Innovations and five trends, in order to analyze requirements for an architecture model (see table 2).

Limitations of this paper arise from the possibility that single institutes might already have developed appropriate architectures but did not publish them. Another limitation is that, albeit a lot of empirical research was conducted regarding the innovations, the model was only partly tested with (or derived from) case studies or other field work.

Further research can address questions related to the implications and detailing of the new banking architecture. Moreover, the following questions need to be answered: Do existing methods for transformation suffice to realize the new banking architectures or do they require adjustments? Which customers need to be approached via which channels with which bundles of goods and services? What does vertical integration mean for ways of interaction that today we do not even think about? How should roles, processes, and services be designed in future financial networks?

Besides the introduced technology-based drivers, progress is also driven by regulatory or bank-specific drivers. Due to requirements of interoperability and required investments, the options of individual banks could be quickly exceeded, eventually leading to increasing cooperation, for instance between banks and technology providers.

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