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RESEARCH PAPER

Intelligent Business Processes in CRM

Exemplified by Complaint Management

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Abstract Customer relationship management (CRM) is becoming a critical source of competitive advantage for businesses today. However, many CRM business processes are deficient and inflexible. For example, many customers are dissatisfied with complaint management. Still, companies seldom systematically adapt the complaint management process. In theory, operational and analytical CRM form a closed loop: analytical CRM uses business intelligence (BI) tools to analyze operational data and the knowledge gained is used for continual optimization of operations. One special approach in establishing this loop is to continually support decision points in operational processes with knowledge from BI. In this way, the use of BI becomes an integral part of business processes, which are then referred to as intelligent business processes. However, in CRM not much is known about this approach. Based on an extensive review of the literature, the study explores the state of theory and practice in the field of intelligent business processes in CRM, with special attention to complaint management because of its considerable importance and application potential. In particular, the conceptual framework of intelligent business processes in CRM is depicted and two implementation options are identified: embedded intelligence and business rules. Focusing on complaint management, evidence on intelligent business processes is systematically documented, weak points are identified, and a research agenda for the shift to more intelligent processes is presented.

Keywords Intelligent business processes · Business process management · Business intelligence · Decision management · Customer relationship management · Complaint management

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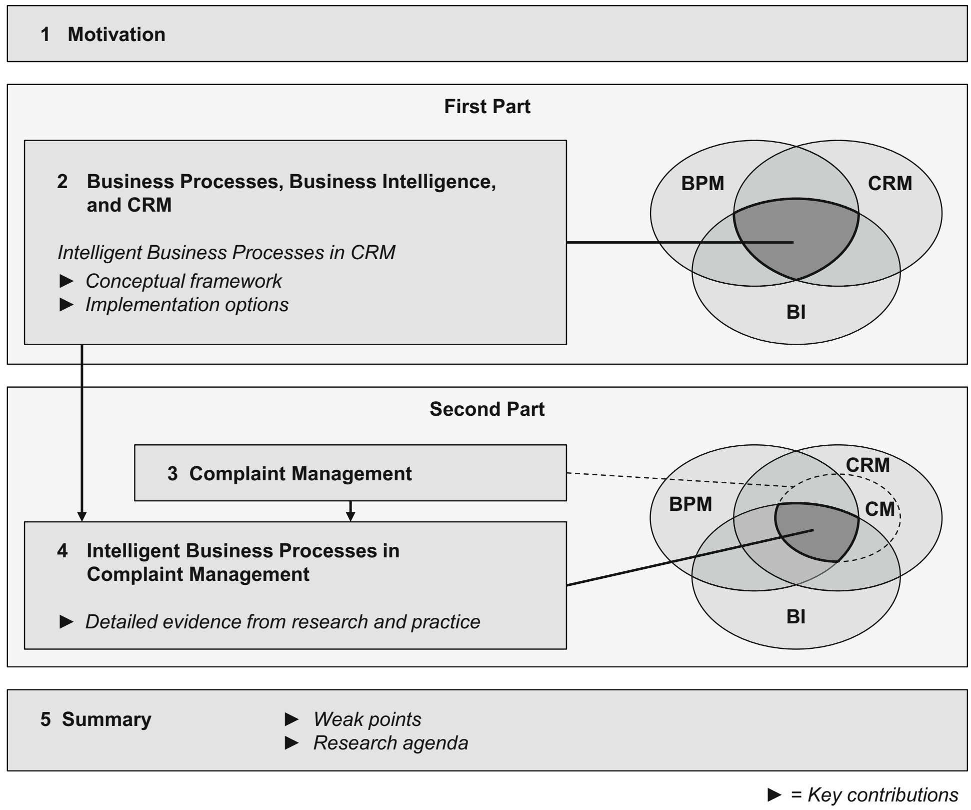
1 Motivation

Thanks to the Internet, customers are better informed, more networked and flexible, and thus more powerful than ever before. Their demands are constantly growing and changing. At the same time, competitors are also better informed and more flexible, and competitive pressure in the market is increasing. Consequently, well-working customer relationship management (CRM) is becoming a critical source of competitive advantage (Band 2013). There are several far-reaching trends in CRM (Band 2013). There is social CRM and mobile CRM. There is also business process management (BPM), which already is well-established in many areas and is playing an increasing role in CRM – to fix today's inefficiencies and disconnections in many CRM processes, and because business processes need to be improved and adapted more quickly. Analytical CRM is also gaining importance because it is the key to obtaining valuable knowledge about customers. Finally yet importantly, customer feedback management is finding its way into more organizations. Between 2011 and 2012, the

Fig. 1 Research model



proportion of companies using voice of the customer programs has risen from 55 to 68 percent, clearly driving retention and growth (Band 2013).

In spite of the general acceptance of the CRM idea, many CRM processes are far from optimal today (Band 2013; Thompson 2013). In theory, they should be optimized continually using the latest knowledge generated from operational data with business intelligence (BI) (Wilde 2010). Important starting points of such an optimization are the decision points in the processes. Continually optimizing the decision logic in these decision points with targeted BI support results in intelligent business processes (Hill 2012; Kemsley 2013).

The literature has not yet examined this topic in detail and in its entirety. For this reason, we will investigate the state of the art of intelligent business processes in CRM systematically in the first part of the study (Sect. 2). In particular, we will explain the conceptual framework of intelligent business processes in CRM and identify options for implementation.

Generally, such intelligent business processes are deployable in all areas of CRM. A particularly important CRM subprocess is complaint management because a complaint implies an actual hazard to a customer relationship – the essential CRM object – and represents an excellent opportunity to strengthen customer retention by offering a solution (Stauss and Seidel 2007). Stauss and Seidel (2004) even refer to complaint management as the "heart of CRM." In practice, however, complaint management is often neither effective nor efficient (Günter 2012). This is because it lacks basics – the effect of companies' complaint-handling activities on the customer relationship is widely unexplored (Davidow 2003; Orsingher et al. 2010). For example, how do the type and amount of a compensation affect repurchase intentions (Grewal et al. 2008)? As long as such relationships are unknown, organizations cannot improve their processes and customers are left unsatisfied. With BI, an organization could analyze such relationships and their relevant variables continually and align the decisions in the complaint management processes with them. In theory, a promising field of application for intelligent business processes can be opened up here.

Although complaint management is such an important part of CRM that could greatly benefit from intelligent business processes, not much is known about the adoption of intelligent business processes in complaint management. Therefore, in the second part of the study (Sects. 3, 4) we will enlarge on the state of the art of CRM intelligent business processes using complaint management as an example. Section 3 outlines the current state of research and practice as to the complaint management processes. Section 4 explores, in-depth, what is suggested by research and what is undertaken in practice to attain intelligent business processes particularly as regards complaint management.

Section 5 summarizes the results and shows implications for further research based on the weak points identified. Figure 1 illustrates the structure of the article and its key contributions. From an academic point of view, the study is located in design-oriented information systems research (design science) at the overlap of BPM, BI, and CRM, and it touches several of the current CRM trends mentioned. To acquire the necessary information, we performed an extensive literature review, which is a well-established research method for state of the art studies in design science. Details on the methodology and the literature knowledge base inspected are provided in the Appendix.

2 Business Processes, Business Intelligence, and CRM

2.1 Business Processes and Business Process Management

The purpose of a business process is to create output, and it consists of a series of enterprise tasks or functions (Scheer 2002). As is common, when speaking about business processes we mean business process *types*, each of which describes a class of uniform business processes (Frank and van Laak 2003; Scheer 2002). Individual business processes (business process instances), in contrast, are rarely studied. Business processes can be split into process logic and decision logic. The process logic covers the sequencing of functions including the resources, data, and organizational elements assigned to them, whereas the decision logic specifies the behavior of the decider in the decision points of the process (Scheer and Werth 2005; Wagner 2007). A decision point is any function that involves a decision (following Krcmar 2005; Taylor 2012a).

According to the St. Gallen management model, an organization with its external links can be perceived as a system of business processes (Rüegg-Stürm 2009), which is called a process architecture (Österle 1995). Within this architecture, business processes can be categorized into core, support, and management processes (Liappas 2006; Rüegg-Stürm 2009; Ulrich and Krieg 1974) (Fig. 2). Core processes include all operations that contribute directly to customer value (Rüegg-Stürm 2009). Support processes provide infrastructure and internal services; they include human resources and training, infrastructure management, information management, communication, risk management, and legal processes (Rüegg-Stürm 2009). Management processes include planning and control tasks, which take place in a management cycle (Kruppke and Bauer 2005) (Fig. 3). Planning is the systematic, forward-looking elaboration and definition of objectives and corresponding actions (Wild 1974), which requires relevant knowledge.

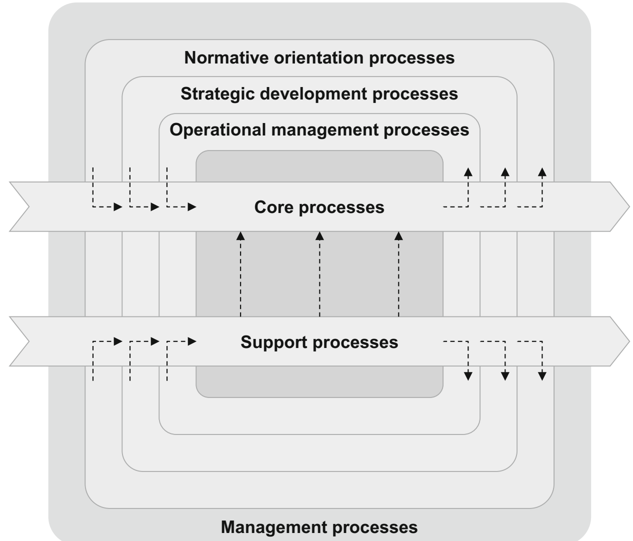


Fig. 2 Process categories in the St. Gallen management model (following Rüegg-Stürm 2009)

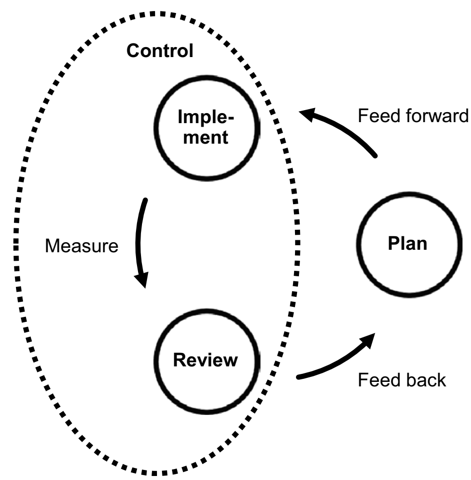


Fig. 3 Schematic of the management cycle according to Kruppke and Bauer

The planning results are passed on to control (feed forward). Control includes the implementation of the planned actions and its review. The latter analyzes the measured results, generating new knowledge for the planning step in the next cycle (feedback). This results in a self-regulating system (Kruppke and Bauer 2005). Depending on scope, management processes are further classified into normative orientation processes, strategic development processes, and operational management processes (Rüegg-Stürm 2009).

A central business objective in a market economy is long-term profit maximization. Any business activity has to gear towards it (Wöhe and Döring 2013). Business processes have to be aligned with it, too, entailing the goal of effective and efficient processing (Jost and Kruppke 2004).

Attaining this goal requires the business processes themselves to be planned and controlled as described (Scheer and Heß 2009). This is the responsibility of BPM, which is a part of the management processes and affects all three process categories (core, support, and management) (Rüegg-Stürm 2009). The management cycle of planning, implementation, and review is called business process life cycle in this context and brings about a continual process optimization (Kruppke and Bauer 2005). BPM takes place on the strategic and the operational management levels (Rüegg-Stürm 2009). Strategic BPM mainly affects the fundamental configuration of the process architecture or of single business processes. It brings about rather revolutionary changes. Operational BPM especially includes evolutionary changes of processes, aside from scheduling and other fine-tuning of day-to-day business. BPM can involve reactive and proactive changes. According to the business process maturity model by Kleinsorge (1999), the perfect process is adaptive – it permanently optimizes itself. BPM is a core topic of design science and plays an important role in practice (Becker et al. 2012b).

2.2 Business Intelligence

There is a variety in the use of the term business intelligence (Gluchowski et al. 2008). From a design science point of view, it is important to think of it as a process (Mertens 2002). A process-oriented definition says, "business intelligence (BI) refers to the analytical process that transforms – fragmented – company and competitors' data into action-oriented knowledge" (Grothe and Gentsch 2000). The newly gained knowledge is to be used continually for adjusting structures or processes (Gluchowski et al. 2008). Of particular interest is the knowledge about causal relations that are relevant for business action (Gluchowski 2001; Hippner and Wilde 2001), because the aim of BI is decision support (Gluchowski et al. 2008). As an information management process, BI belongs to the support process category (Rüegg-Stürm 2009). The BI process is comprised of four stages: provide data, analyze data, prepare results, and evaluate results (following Chapman et al. 2000; Gluchowski et al. 2008; Kemper and Unger 2002; Weber et al. 2012).

There are different approaches for analyzing the data (Gluchowski et al. 2008). Online analytical processing (OLAP) is dominant among hypothesis verification approaches (confirmatory data analyses). Users can analyze measured variables (e.g., cost or revenue) by several dimensions (e.g., customers, products, regions) in a type of data cube. Thus, they can examine relations, for example, between the revenue of a product and the sales region. Data mining predominates the hypothesis generation approaches (exploratory data analyses). They search data for unknown relations.

Software can support the BI process. The demand for these solutions is high; BI software is ranked as the number one project priority for companies (Kisker and Green 2013).

2.3 Business Intelligence in Business Process Management

A result of the findings in Sect. 2.1 is that new knowledge for optimizing business processes has to be generated in the review step of the business process life cycle. As shown in Sect. 2.2, BI can assist. Therefore, the application of BI in BPM seems natural and is claimed regularly by BI researchers (see Davenport et al. 2010; Gluchowski 2001) and by BPM researchers, especially in the literature on performance management (see, e.g., Junginger et al. 2004; Karagiannis et al. 2007; Kruppke and Bauer 2005) and also on business process improvement (see Johannsen and Fill 2014). In practice, it is an important topic at the moment, too (Komus and Gadatsch 2013). The following closer examinations are limited to the BI-assisted optimization of core processes, not of support or management processes.

The measuring step preceding the review step generates the data input to be analyzed by BI. In principle, BI can process structured or unstructured, internal or external, data (Gluchowski et al. 2008; Taylor and Raden 2007). The standard case today is using structured, internal data from transactional systems (Davenport et al. 2010; Gluchowski et al. 2008) – i.e., the measuring takes place in the context of core process execution, although systematically it is part of the management process. It is important that the data pool ultimately contain measurements that are potentially relevant for optimizing processes.

In the review step, the BI process takes place, the knowledge output of which is then passed on to the planning step by the feedback step. Nowadays, this is typically done in the form of "craft analytics" (Davenport et al. 2010; Davenport 2013), where standard reports and OLAP tools are central. The feedback goes to people who have to interpret the results and plan and implement actions (Davenport 2013; Gadatsch 2010; Neumann et al. 2012). These actions can affect the process logic and the decision logic. The literature does not draw a distinction in most cases (see, e.g., Becker et al. 2012a; Gadatsch 2010). However, it makes sense to look at the two logics separately because there are substantial differences in optimizing them, opening up different ways for BI support (Table 1).

Changing the process logic can involve, for example, adding or removing particular functions, altering the sequencing of functions within a process, or replacing

Table 1 Optimization of process logic vs. decision logic (schematic comparison)

	Process logic	Decision logic
Characteristics of optimization		
Frequency	Infrequently	Frequently
Structuring	Poorly structured	Well-structured
Complexity	Complex	Simple
Characteristics of BI support for optimization		
Decisions to be supported	Ex ante unknown decisions *about* the process	Known classes of decisions *in* the process
Clarity of knowledge needs	Unclear	Clear
Potential of automation	Hardly automatable	Well automatable
Suitable BI approach	Craft analytics	Industrial analytics

people or systems. Such projects occur in longer time intervals, and they tend to be complex and poorly structured. Usually, which decisions will be up for discussion are not known in advance. Hence, the precise knowledge needs are unclear. Here, the craft analytics approach makes sense because standard reports intend to inform a range of possible decisions. BI provides support for optimizing the process logic – i.e., for decisions *about* the process only. It does not support the operational decisions *in* the process during process execution.

Changes of the decision logic occur more frequently and only affect the logic of decision-making in the process decision points (Wagner 2007). This logic is better structured and easier to change than the process logic. The goal of supporting the optimization of the decision logic with BI is to support the decisions ultimately affected (decisions *in* the process) with the knowledge from BI. In this case, the decisions to be supported with BI are known. Based on their structure and the availability of corresponding information, the knowledge needs can be narrowed down and the BI support can be tailored directly to these needs. In addition, there are whole classes of uniform decisions involved because BPM takes place on a type level on principle. Therefore, the automation potential is higher than when optimizing the process logic. Under all these conditions, special, more structured BI approaches are suitable – Davenport et al. (2010) speak of "industrial analytics." They not only allow for tailoring the BI analyses to the knowledge needs of the decisions affected but also are designed for making the BI knowledge automatically available in the decision points when the process is running.

Essentially, there are two industrial analytics approaches. In the first one, BI analyses are specially tailored to designated decision points and situationally made available to the decision maker, for example, in the form of reports or key performance indicators (KPIs). With this information, the decision maker plans the individual decision at issue (Nijkamp and Oberhofer 2009). Because the decision is made adaptive to up-to-date analytical information, the business process is optimized on an instance level at the same time. This approach is suitable for decision points of high complexity, where a human decision maker is desirable (Davenport et al. 2010). Technically, as soon as a decision is pending in the operational system, the relevant analyses are presented to the user in the same system (Gartner 2012; Nijkamp and Oberhofer 2009). Miscellaneous software vendors, for example, SAP (2005) and Oracle (2012), have included this technology in their products, calling it embedded intelligence (embedded analytics; embedded BI).

The second approach aims at decision points of lower complexity. Again, BI analyses are tailored specially to designated decision points. However, in the planning step the knowledge is incorporated manually or automatically into operational business rules (Eckerson 2002; Hill 2012; Wray 2010). These are guidelines or business practices that guide or affect the direct behavior of business operations. They resemble control parameters for functions and process flows and can represent the decision logic (Scheer and Werth 2005; Taylor and Raden 2007). An example: "Five percent off every purchase for gold customers." If now, for example, a BI analysis shows four percent off satisfies the gold customer just as well, and saves costs, the rule would have to be adapted accordingly. Because of their formalization, business rules are easy to implement and adapt within an IT system, potentially even enabling it to make decisions automatically (Allweyer 2014; Wagner 2007). These can be either fully automated as background processing or semi-automatic in terms of a decision recommendation that the user can override. A combination is possible as well, where only exceptions are routed to a responsible person, based on certain thresholds. Taylor (2008) believes 95 percent of all business decisions can be automated. Automating decisions and embedding them into a management cycle is also called decision management,

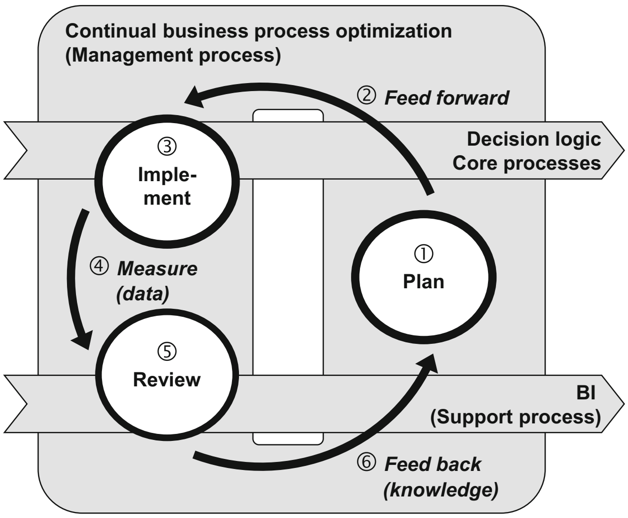


Fig. 4 Intelligent business processes

which is a new but growing discipline focused on more effective, efficient, and agile decision-making (Davenport 2009; Evelson et al. 2008; PWC 2008; Taylor and Raden 2007). On the technical side, a close linking of operational and analytical system components is required for this purpose (Fish 2012). Integrated solutions, for example from Oracle (Taylor 2012b), IBM (2012, 2014), Pegasystems (2016), Fair Isaac (FICO 2016), and NICE (n.d.), are already available on the market. Decision management solutions are considered BI solutions on the highest level of maturity (Dittmar et al. 2013; Schulze and Dittmar 2006). In an international study among large-scale enterprises, 45 percent of the respondents reported plans to adopt such an integrated solution over the next year (Forrester 2012).

By supporting the continual optimization of the business process decision logic with BI, operational decisions in the process decision points are supported continually with BI knowledge. The use of the knowledge gained from business intelligence is built permanently into the business process, which is then referred to as an intelligent business process (following Hill 2012; Kemsley 2013; Kisker 2010; Nicholls 2006; Pegasystems 2011). It presents itself as an adaptive process that constantly optimizes its own behavior. In short, by an intelligent business process we understand a business process, the decision logic of which is optimized continually with the aid of business intelligence.

Figure 4 shows the part of the St. Gallen management model corresponding to this definition. The core processes are limited to their decision logic and the support processes to BI. The management processes focus on continual business process optimization as the BPM core. Depending on whether the optimization includes evolutionary or revolutionary changes, it is a matter of operational or strategic BPM. In the St. Gallen management model, strategic optimization is called renewal. The classification is difficult (Rüegg-Stürm 2009). Because the rationale of intelligent business processes is the same in both cases, we refrain from this distinction, and due to the smaller importance of BI in strategic BPM (vom Brocke 2013), we use optimization as the generic term. Even though we do not show the levels of management processes in the figure, lower levels generally are controlled by guidelines from higher levels (operational management processes by guidelines from strategic development processes and these, in turn, by guidelines from normative orientation processes). To localize the individual steps of the management process in the figure, we superimposed a schematic of the business process life cycle (we are still looking at the optimization of core processes only):

1. Business process planning as a pure management task.
2. Feeding forward information from business process planning to business process implementation.
3. Business process implementation at the interface between the management process and the decision logic of the core processes.
4. Measuring data from the core processes for the business process review.
5. Business process review supported by BI.
6. Feeding back knowledge from business process review to business process planning.

2.4 Relevance to CRM

According to Leußer et al. (2011a), CRM attempts to establish and strengthen profitable long-term customer relationships by applying coordinated and customized marketing, sales, and service concepts with modern information and communication technology. The goal of profitable long-term customer relationships is an integral part of the business goal of long-term profit maximization, and it is influenced substantially by customer retention, which, in turn, depends on customer satisfaction (Homburg and Bruhn 2013). Because customer behavior and competitive environments are changing rapidly today, the CRM processes have to be adapted frequently to stay aligned with the goals (Boulding et al. 2005; Evelson 2011; Grieser and Wilde 2011). The knowledge required, for example, about current drivers of satisfaction, is often contained in the CRM data accumulated over time (Barber 2011; Boulding et al. 2005). Continual optimization requirements combined with a suitable data basis are a perfect setting for using intelligent business processes in CRM (Sun et al. 2006; Walker and Khoshafian 2012).

Design science draws a distinction between operational (oCRM) and analytical CRM (aCRM), from process and technology points of view. The marketing, sales, and

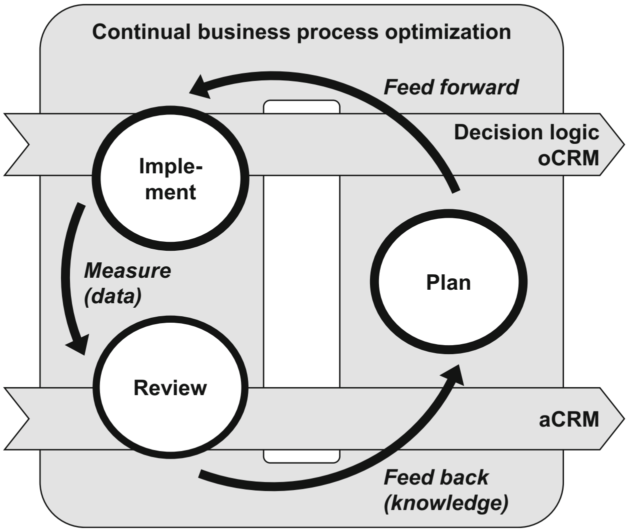


Fig. 5 Intelligent business processes in CRM

service processes supporting customer contacts are oCRM processes facilitated by operational CRM systems. The aCRM processes analyze customer contacts and reactions on a systematic basis and are facilitated by analytical CRM systems (Rentzmann et al. 2011). The goal of aCRM is to provide relevant knowledge to guide and continually optimize the oCRM processes in terms of a closed loop architecture (Wilde 2010). In particular, integrating aCRM knowledge into decisions within the oCRM processes contributes to intelligent CRM (Leußer et al. 2011b). This concept includes a CRM-specific manifestation of intelligent business processes because the oCRM processes (customer contact supporting processes) belong to the core processes (processes with direct customer value contribution) and the aCRM processes are a part of business intelligence (Gluchowski 2001; Wilde 2010) (Fig. 5).

Not only researchers, but also analysts and CRM users believe that a closed loop is important in CRM. Gartner argues aCRM is more difficult to implement than oCRM, but that the potential return on investment will continue to grow over time because of the continual optimization impact (Herschel 2004). In a CRM user survey, 64 percent of the respondents called aCRM necessary or at least beneficial (Avantgarde 2009). However, the same survey showed that just 11 percent of the respondents are using aCRM. A common pattern is that companies install an oCRM system first and turn towards aCRM three to five years later to take advantage of all the data collected (Chui and Comes 2012). All in all, growing aCRM efforts are expected (Band 2013).

Along the business process life cycle, CRM intelligent business processes take shape as follows (Fig. 5). The data input for aCRM (measuring) comes from the systematic recording of customer interactions within the oCRM processes (Hippner et al. 2011). Interesting CRM metrics are customer satisfaction and retention or sub-targets thereof (for example, cancelations avoided). These can be measured either directly or indirectly via indicator dimensions (customer satisfaction, for example, either by interviewing the customers or by measuring their sales volumes) (Krafft and Götz 2011). OLAP and data mining are well-established tools for analyzing the data in the aCRM process (review) (Englbrecht 2007; Leußer et al. 2011a). The major challenge is transferring contextual aCRM knowledge into the oCRM processes (feedback through implementation) (Eckerson 2002; Schubert and Doerpmund 2007). The approaches already described in Sect. 2.3 – embedded intelligence and business rules – qualify for this purpose. The embedded intelligence approach has existed in CRM for some time, and it is built into marketable standard software (Oracle 2012; SAP 2005). For example, as a decision-making support during order release, the customer's exposure is displayed to the user (Hilgefort and Wu 2009; Schubert and Doerpmund 2007). The business rule approach has been under discussion in CRM for quite some time, too (e.g., Ryals et al. 2000). Still, business rules are mostly developed manually today (Grieser and Wilde 2010). However, there are some software vendors who provide aCRM components for developing rules and integrate them with oCRM products, such as Oracle, IBM, and Pegasystems, which we have mentioned above without special reference to CRM (see Sect. 2.3). Such systems can, for example, recommend the best cross-sell offer for the specific situation, based on analytics, to the salesperson, during a customer interaction (Pegasystems 2012). Forrester assumes automating decisions as part of a comprehensive decision management ultimately will find its way into CRM (Brosnan 2013; similar already in Bucklin et al. 1998).

At the moment, research and practice on intelligent business processes in CRM are focusing on campaign management (see, e.g., Bühler et al. 2008; Fuhrmann 2012; Grieser and Wilde 2011; Pegasystems 2012). Yet, we also found sporadic reports on other CRM processes – on churn, customer recovery, lead, credit risk, and complaint management (see Cope 2007; Leußer et al. 2011b; Oracle 2009; SAS 2013; Schmitt 2013; Terpin and Siegl 2011; and Sect. 4 on intelligent business processes in complaint management).

3 Complaint Management

3.1 Principles of Complaint Management

If an organization does not fulfill expectations, dissatisfaction is caused. Subject to an individual dissatisfaction

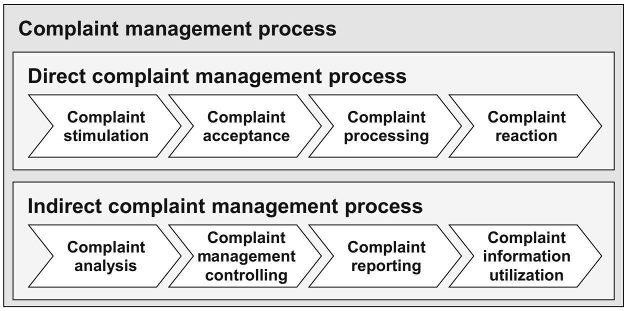


Fig. 6 Complaint management process (following Stauss and Seidel 2007)

threshold and individual cost-benefit considerations, a complaint may arise (Stauss and Seidel 2007; Töpfer 2006). A complaint is an articulation of dissatisfaction that aims at redress and/or change in behavior (Stauss and Seidel 2007). A complaint points out no less than two problem components to the organization: a shortfall in performance as perceived by the customer and a threatened customer relationship (Stauss and Seidel 2007). Hence, proper complaint handling by the organization is advisable.

Complaint management includes planning, implementing, and reviewing all actions taken by an organization relating to the complaints it receives (Schöler 2009; Wimmer 1985). Corresponding to the two problem components mentioned, complaint management has two kinds of goals: customer relationship goals to restore customer satisfaction and to minimize the negative ramifications of customer dissatisfaction, and quality goals to make use of the hints at corporate weaknesses and chances contained in complaints (Stauss and Seidel 2007). These two directions have led to the integration of complaint management into CRM and quality management (DIN ISO 10002: 2010-05; Schöler 2009; Stauss and Seidel 2007). However, it is not well understood to which extent different complaint management activities serve all these purposes (Davidow 2003; Orsingher et al. 2010).

3.2 Business Processes of Complaint Management

A widely accepted taxonomy of complaint management functions is offered by Stauss and Seidel (2007). They classify the functions into direct and indirect complaint management corresponding to the two kinds of complaint management goals. The direct complaint management process includes the tasks performed in direct contact with the customer that serve customer relationship goals. The indirect complaint management process pertains to the internal learning process and mainly serves quality goals (Fig. 6).

Meanwhile, in corporate practice, complaint management has become widely accepted but exhibits substantial potential for improvement (Günter 2012; Lenz and Stadelmann 2007; Stauss and Schöler 2003; Stauss and Seidel 2013). For example, almost half of the complaining customers of German Internet providers are unhappy with the handling of their complaints (ServiceBarometer 2013).

4 Intelligent Business Processes in Complaint Management

4.1 State of Research

Many authors recommend using BI in complaint management aimed at utilizing complaint information, i.e., improving a company's products or production processes based on analyzing the content of complaints, but not at continually optimizing the complaint management processes themselves (see, e.g., Sage 2013; Stauss and Seidel 2007). Yet, as pointed out in Sect. 2.4, it is vital to optimize the CRM processes continually. This is also true of complaint management as a CRM process. Not least, the DIN ISO 10002: 2010-05 standard stipulates its permanent improvement. Using BI in the form of intelligent business processes is promising here, not only because of the dynamics of the environment, but also for the effect of many complaint management activities on the achievement of objectives not researched statically, i.e., disregarding the dynamics of the environment.

As to shaping the business process life cycle, what we said about CRM in general (see Sect. 2.4) also applies here. We found a few additional details on complaint management in the literature. For example, some authors suggest specific target metrics such as total complaint cycle time or complaint satisfaction. For the review step, some suggest computing KPIs like the escalation rate or the follow-up complaint rate. Stauss and Seidel (2007) provide a comprehensive summary of such metrics and KPIs. They also make several suggestions for further analyzing and using the KPIs to optimize complaint management processes. A regular comparison of the KPIs with set standards can reveal deficit areas. A balanced scorecard can help identify causal relationships between the KPIs and find starting points for optimization activities. A multiple regression analysis can identify the relative influence on overall complaint satisfaction exerted by certain partial satisfactions, for example, satisfaction with the problem solution or with the processing time. This can support in prioritizing performance standards to be set (Stauss and Seidel 2007). Töpfer (2006) also mentions adjusting complaint management standards as a way to make use of the KPIs. However, all these suggestions involve typical craft analytics and do not necessarily relate to the decision logic directly. Concerning targeted BI analyses to gain knowledge for

Table 2 Case studies describing a closed loop with BI in complaint management

Organization	Reference	No indication of intelligent business processes	Intelligent business processes
alsterdorf assistenz umland	Jacob (2005)	●	
AUDI	SAP (2003)	●	
Australian Nursing and Midwifery Accreditation Council (ANMAC)	ANMAC (2013)	●	
City of Seelze	Seelze (2007)	●	
CQUniversity Australia	CQU (2012)	●	
Honeywell Federal Manufacturing & Technologies	Honeywell (2009)	●	
K&N Management	K&N (2010)	●	
Nestlé Purina Pet Care	NPPC (2010)	●	
North Mississippi Health Services	NMHS (2012)	●	
Silverline	Silverline (2012)	●	
Studer Group	Studer (2010)	●	
"Leading passenger transportation company from the DACH countries"	Georgescu (2011)	●	
Continental Airlines (now United Airlines)	Wixom et al. (2008)		●
O2 Germany (now Telefónica Germany)	Kühlmeyer (2007)		●
"A major telecom"	Keny and Chemburkar (2006)		●

continually optimizing the decision logic of complaint management processes, we could not find any information in the literature that went beyond what we said in Sect. 2.4 about CRM in general. Neither did we find anything extra about transferring the insights into the operational processes.

4.2 State of Practice

4.2.1 Case Studies

There are many case studies on the application of BI in complaint management. Most of them do not aim at a closed loop for continually optimizing the complaint management processes but at making use of complaint information (see, e.g., SAP 2006, ConSol 2009). Many case studies indicate organizations are concerned with optimizing their complaint management processes, but it does not appear from the studies whether these organizations use BI for this purpose or they envisage a closed loop at all (see, e.g., SDH 2013; Steffens and Jahn 2009).

We found 15 case studies clearly describing a closed loop with BI (Table 2). In 12, the long optimization intervals (such as one year), the mention of team meetings, or the lack of detail suggest a craft analytics approach. No special attention was paid to the decision logic. Only the three remaining case studies clearly consider the decision logic and meet the definition of intelligent business processes. For example, Continental Airlines has an automated complaint handling process, which runs data from a warehouse through a rules engine that recommends to the agent within seconds which compensation the complaining customer should receive (Wixom et al. 2008).

4.2.2 Software

Complaint management software often comes with built-in analytical features or interfaces to external BI systems. Both are intended to perform analyses, the results of which usually are put into tables or graphs. Here, too, the main objective is utilizing complaint information. However, a few vendors point to the need for complaint management processes themselves to become more intelligent (e.g., Oracle (2011), Eccentex (2011), and NICE (Belkina 2012)). Consequently, some products come with functionalities for measuring dimensions of process efficiency and effectiveness such as processing times (e.g., BPM inspire (Inspire 2013), Verint Voice of the Customer Analytics (Verint 2012)) or complaint satisfaction using follow-up interviews (e.g., tellme (Olbisoft n.d.), i-Sight Service and Complaint Management (Customer Expressions 2009)). From here, most vendors imply a craft analytics approach, where it is the user's responsibility to analyze and interpret the data and to take action based on the insights (see, e.g., Customer Expressions 2009; Inspire 2013). Teradata points out the possibility of hypothesis

Table 3 Software solutions enabling intelligent business processes in complaint management

Software solution	Vendor	Reference	Embedded intelligence	Business rules
IBM Analytics and SAP CRM	IBM	Nijkamp and Oberhofer (2009)	●	
Real-Time Decision Manager	SAS Institute	SAS (2013)		●
Proactive Care	Amdocs	Amdocs (2013)		●
Pega Complaints	Pegasystems	Pegasystems (2013)		●
Customer Analytics and Decision Management	First Data	First Data (2008)		●
Eccentex Dynamic Case Management (DCM)	Eccentex	Eccentex (2011)		●
IBM SPSS Decision Management for Customer Interactions	IBM	IBM (2010)		●
Teradata Solution	Teradata	Teradata (2007)		●

testing. For example, one could test whether the speed of problem resolution has any impact on customer defections (Bayer 2007).

Nevertheless, we have identified eight solutions that enable intelligent business processes with industrial analytics technology (Table 3). Nijkamp and Oberhofer (2009) of IBM designed an embedded intelligence solution for complaint management in SAP CRM. It displays analytical details and diagrams within the operational system when the complaint handling agent moves the cursor over an entity, for example, a pie chart of client performance against plan when moving the cursor over the client's name. Other vendors pursue the business rule approach. For example, SAS says about the SAS Real-Time Decision Manager: "The software can recommend next best actions and make analytically based decisions about […] complaint handling" (SAS 2013). Amdocs notes on its Proactive Care solution: "Based on big data analytics, this solution provides proactive, real-time notifications and recommendations including issue resolution" (Amdocs 2013). Pegasystems reports on the implementation of a complaint management solution for financial services that presents agents with options based on insight gained from data, for example, with the forms of compensation that have the highest probabilities of success in a given context (Pegasystems 2013). Four more vendors describe similar accomplishments. Overall, the blending of complaint management and BI products is gaining momentum in the software market (McInnes 2011b).

4.2.3 Empirical Studies

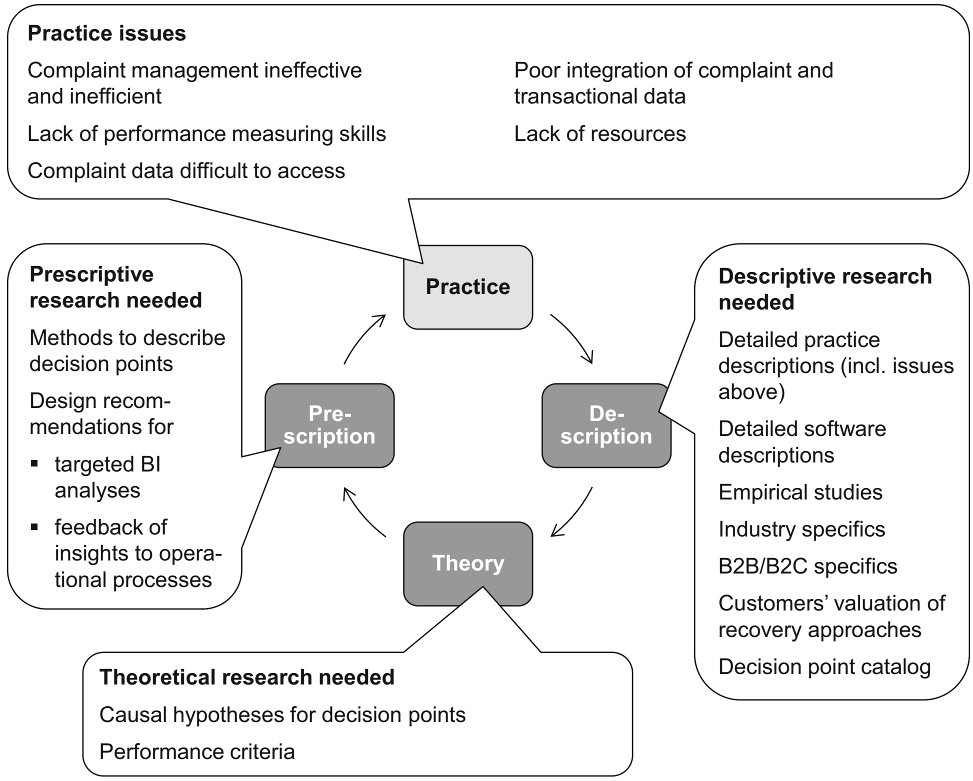
A study has shown that many organizations are aware of the importance of continually optimizing the complaint management processes (Lenz and Stadelmann 2007). Yet, several studies also have spotted serious shortcomings in implementation, as suggested by the small number of case studies (see Sect. 4.2.1). Concerning the measuring of target metrics, a study showed only 27% of major German business-to-consumer enterprises regularly measure complaint satisfaction (Stauss and Schöler 2003). A survey among Swiss companies a few years later yielded hardly better results: 30 percent surveyed the complaint satisfaction on a regular basis, although they considered it the most important target dimension (Lenz and Stadelmann 2007). The processing times of complaints were measured by 37 percent of the companies on a regular basis, other dimensions by less than 25 percent.

In a Forsa poll among major German enterprises in 2013, just 13 percent fully agreed with the statement "we measure cost and benefit of all customer feedback related activities." Twenty percent rather agreed, whereas two-thirds rather or fully disagreed (Ollrog 2013). Sometimes companies define metrics from their own, limited, point of view. For example, a company drew on the idle time a customer issue sat in the service queue until someone took ownership of it. However, the total cycle time, including the processing times, would have reflected the actual customer experience much better (McInnes 2011a). What is measured incorrectly or not at all cannot be meaningfully analyzed, and without analyses, there is no basis for process improvements. But even when companies measure meaningful metrics, they often do not use them for optimizing processes (Bayraktar 2011). We have documented individual cases where they do use them for optimizing processes in Sect. 4.2.1, but did not find any broader empirical studies on this issue.

5 Summary and Implications for Future Research

In this study, we have examined the state of the art of intelligent business processes in CRM, first in general, and then delving deeper by using complaint management as an

Fig. 7 Practice issues and research needs



example. At the same time, we have identified several weak points with implications for future research. Our analysis was based on a comprehensive review of the literature.

The study contributes to a closer nexus of the BI and BPM fields within CRM, with intelligent business processes in CRM falling within this overlap. Based on the St. Gallen management model, the business process life cycle, and a process-oriented BI perception, we incrementally have developed the conceptual framework of intelligent business processes and applied it to CRM. To achieve intelligent business processes, BI must continually support the operational decisions in the decision points of the processes and bring about a permanent, data-driven process optimization. Concerning CRM, this is equivalent to a closed loop between aCRM and oCRM (Wilde 2010). In practice, we have identified two alternative ways of implementation: BI analyses are specially tailored to designated decision points and then (1) situationally made available to the decision maker, for example, in the form of reports or KPIs (embedded intelligence), or (2) the BI knowledge is incorporated into business rules. We have found little evidence of intelligent business processes particularly as regards complaint management, neither in theory nor in practice.

A straight literature study is normally sufficient to obtain an overview of the state of research. However, we acknowledge the limitation that it can only partially capture the state of practice, due to the fact that many things occur in companies without publication. In addition, vendors' statements are often commercially motivated and difficult to verify. Thus, empirical studies of software vendors, service providers, or user companies would be worthwhile.

Still, it is surprising that so little is reported on the systematic use of intelligent business processes in complaint management. After all, the study has also disclosed that many customers are unsatisfied with the handling of their complaints and that most organizations lack knowledge about the effect of their complaint management activities on the achievement of goals. Moreover, such causal relationships are becoming increasingly dynamic. On the other hand, organizations constantly accumulate current data on their customers. Hence, complaint management has all the attributes that let the use of intelligent business processes appear especially promising for improving the existing processes. At the same time, there is evidence that aCRM will actually become more accepted and merge with oCRM. Thus, intelligent business processes in complaint management are an issue that organizations will hardly get around in the future. On the way there, miscellaneous research gaps need to be closed.

In principle, research pursues three succeeding goals – describing the practice (descriptive goal), acquiring knowledge (theoretical goal), and designing the practice based on this knowledge (prescriptive goal) (Schweitzer 1978). The altered practice can then be described again, eventually forming a cycle. We use this framework to organize the weak points uncovered in the course of this study in terms of practice issues and research needs (Fig. 7).

Complaint management practice is said to be ineffective and inefficient today. Particularly alarming is that most companies still do not measure complaint management performance and often do not even have the skills to do so. Without measured data, they cannot perform any analyses, and without analyses, they cannot improve the processes. Other practice issues include difficult access to complaint data, poor integration with transactional data, and a lack of resources (Sage 2012).

We uncovered research needs in complaint management regarding all three research goals. In the description field, we noticed the lack of detailed reports on complaint management practice, including the issues mentioned. Marketable software products also are not described in much detail. Neither could we find broadly based, up-to-date empirical studies on complaint management in the style of Stauss and Schöler's complaint management excellence report (2003). Also, it is striking that the literature almost never differentiates between industries or between business-to-business (B2B) and business-to-consumer (B2C). Surprisingly, there are just a few publications on how customers value particular recovery approaches. In view of the emerging decision management field, a catalog of typical decision points in the complaint management process would be desirable. In the theory field, knowledge and causal hypotheses for the individual decision points, and performance criteria for complaint management are missing. In the prescription field, methods to describe decision points are needed. In addition, recommendations are required for designing targeted BI analyses to reveal relationships between target dimensions and alternative courses of action in complaint management or to examine the variables relevant to these relationships. Guidance also is needed on how to feed the knowledge back to the operational processes. Following this research agenda, and especially filling the prescriptive gaps, should enable companies to establish intelligent complaint management processes increasing customer satisfaction, customer retention, and success in business.

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