December 2003

Transformation in the Pharmaceutical Industry) Developing Customer Orientation at Pharma Corp

Rainer Alt

Institute of Information Management, University of St. Gallen

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Rainer Alt

Institute of Information Management, University of St. Gallen, Switzerland
Rainer.Alt@Unisg.ch

Abstract

The pharmaceutical industry is in the midst of a fundamental transformation. Institutional regulations that have been in place for decades are being removed and competitive pressures force pharmaceutical companies to adopt customer-oriented strategies. Information technology which has traditionally been applied to many processes in this industry is an important enabler for the interaction with key customer segments such as physicians and patients. However, developing and transforming customer relationships is merely a technological undertaking. Changes are required regarding strategy, processes as well as the systems architecture. To develop an integrated customer relationship management strategy this research draws on elements from established business redesign. The emphasis is on portals that bundle services for the patient's and physician's customer processes. This architecture framework has been elaborated in cooperation with nine companies and applied at a major pharmaceutical company.

1.   Introduction

1.1   Information Technology in the Pharma Industry

The pharma(ceutical) industry is currently undergoing a period of fundamental change. Structural changes, such as the direct sale of prescription drugs, increasingly well-informed patients, the growing number of cost reductions of governments and health insurance providers as well as new Internet-based initiatives have significant impact on a pharma company's relationships with its customers. In this competitive market environment developing and selling high volume products ('blockbusters') to physicians, hospitals, and wholesalers is simply no longer sufficient. Like in other industries increasing customer retention by expanding and personalizing the services offered to customers becomes a strategic imperative. Compared to the banking or high tech sector, pharma companies still have a strong focus on their products and are only at the beginning of systematically managing relationships to customers [35]. Kalustian et al.

[18, 64] observed that customer relationship management (CRM) "has become a pharma buzzword, but few companies actually practice it." Among the goals of CRM are to enhance the intensity of interaction with customers across one or more touch points and to establish a uniform view on customer data [14, 81], [16, 31]. This helps to address attractive customers, to decrease the cost of serving customers, and to increase customer retention by providing tailored offerings to existing and new customers [33, 102].

Although pharma companies are not at the forefront of adopting CRM systems, information technology (IT) the industry has pioneered many customer oriented applications of IT in the past. First, interorganizational information systems (IOS) improved the relationships to professional customers and well known examples for the strategic use of IT such as the ordering systems from Baxter (formerly American Hospital Supply) and McKesson originate from this industry [20, 209]. Secondly, hospitals are operating internal systems to improve the healthcare process, e.g. administrative systems, telemedicine, patient records [32]. Devaraj/Kohli report that IT-enabled business process redesign initiatives from hospitals had a positive impact on the satisfaction of their patients [11, 62]. Thirdly, the advent of the Internet more brought more circulation of product and disease information to customers, the support of campaigns and clinical trials, and the possibility of providing more value added to customers [22, 102]. The buzzwords e-health and e-healthcare refer to the application of Internet technology to pharma processes [9, 207] and the entire online drug industry is expected to grow significantly in the long-term last but not least due to the IT-affinity and the increasing role of healthcare to the 'baby boomers' [37, 445].

1.2   Goal of Paper and Research Methodology

The IT-driven transformation in the pharma industry creates strategic opportunities and competitive pressures at the same time. On the one hand, existing and new players are developing websites and portals for customer interaction as well as for enhanced quality of care [19]. On the other hand, the Internet creates opportunities for pharma companies to improve the depth and/or breadth of interaction with existing and new customer segments. Both effects emphasize Porter's view that Internet technologies are complementary to existing interaction channels (e.g. sales force, call centers) and need to leverage a company's existing competencies [31]. Therefore, pharma companies are forced to assess their existing strategies and to (re)position themselves. It is the goal of this paper to present a framework for understanding the changes and for developing solutions for electronic customer interaction for a pharma company.

CRM systems from Siebel, SAP and others are key enablers for CRM strategies as they provide a consistent and consolidated customer database, electronic support for customer interactions, and sophisticated analytical tools. However, CRM projects are merely technological. Studies show that the organization around the customer, the prototyping of new (electronic) processes, and cultural factors determine CRM adoption [39, 205], [42, 18]. Business process redesign (BPR) methodologies such as business engineering recognize the process as the link between strategy and systems development [28, 20]. However, these BPR methods have mainly been applied to processes within organizations and are not focused on shaping customer-oriented solutions.

In cooperation with nine international companies an architecture framework has been developed between 2000 and 2002 for customer and supplier interaction. Based on individual research projects with each company, the research team drafted an architecture which was subsequently refined in several workshops with representatives of the partner

companies.[1] In applying the architecture at Pharma Corp, one of the largest pharma companies worldwide, this research follows the tradition of action research where the researcher is directly involved in the project work [38, 20].

2. Transformation of Downstream Processes

2.1 Challenges for Pharmaceutical Companies

Currently, a variety of changes is taking place which influence a pharma company's downstream (or customer facing) relationships. Innovations in R&D and CRM are seen as the main areas of action for pharma companies [8]. While the former are an established research topic addressing product innovation, the latter is a young field in the pharma industry. Considering that over 110 million people are estimated to look for health-related online information each month in the US alone, the Internet has significant potential [44]. Among the major challenges for CRM are:

- *Demanding healthcare customers*. More competition increases the negotiation power of patients who demand more value at lower prices and more freedom of choice regarding healthcare providers [43, 9]. More active and informed patients increasingly influence the choice of drugs and reduce the physician's role as decision-maker. Pharma companies need to include the specific requirements of both patients and physicians in their strategies.

- *Restricted access to physicians*. The number of visits of the pharma sales reps to present products ('detailing') is set to decrease due to regulation in various European countries and the doctors' falling acceptance. At the same time, the number of sales reps in the 40 largest pharma companies has doubled while prescriptions have only grown by 15% [3, 256]. Pharma companies not only need more efficiency in their sales force, but also must exploit new interaction channels with this key customer segment.

- *Increasing cost pressure*. To contain health costs, governments are exerting increasing pressure on the prices of pharma companies. At the same time, parallel imports from low-cost countries and the growing competition from generic drug manufacturers are eroding margins. Many pharmaceutical companies have therefore decided to optimize their sales strategies by introducing key account management structures [30].

- *Declining regulation*. Council Directive 92/28/EEC of March 31, 1992, for example, prohibits the advertising of medical products for human use among end users in the European Union. The US removed these restrictions in 1997 and similar developments are now expected for Europe [5, 62]. Pharma companies need to include direct sales and marketing in their strategies since online pharmacies, procurement platforms or health portals may intermediate the pharma company's customer access [24].

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[1] For more information on this multilateral research design see [1, 11].

2.2 Potentials of CRM

Xu et al. define CRM as an "all-embracing approach, which seamlessly integrates sales, customer service, marketing, field support, and other functions that touch customers" [41, 442]. By systematically collecting and analyzing information on customer contacts CRM aims to maximize the lifetime customer value [40, 94]. In the pharma industry multi-channel CRM approaches are suggested which integrate traditional sales force and Internet-based channels (eCRM) [15]. These will lead to improvements in three areas:

- Market or *customer segmentation* is the basis for differentiated customer service [25, 378] and recognizes that neither patients nor physicians are homogeneous in their requirements. For example, opinion leaders can be segmented in four different physician types [21, 165] and patients depending on their disease. Patients with chronical diseases are long-term patients who invest time in understanding their disease as well as possible medication alternatives. Patients with acute diseases are often only interested in standard information on combating symptoms to overcome their disease. CRM should also aim at expanding the needs of this segment, e.g. from short-term illness to long-term wellness [10, 8].

- Based on a fine-grained segmentation pharma companies are able to offer *value added services* that go beyond the selling of drugs and 'blockbusters'[2]. These services support the specific customer segments in all stages of their life cycle. For example, chronical bronchitis patients could be provided in-depth information on cortisone and antibiotics as well as various drugs which are necessary during the course of their illness. Patients with acute diseases could be offered standard drug information to combat high temperatures, chest pains or coughing and general prevention advice.

- *Cross-/Up-selling* are one outcome of integrated customer knowledge across a pharma company's divisions, such as diagnostics and pharmaceuticals. For example, a physician who works with diabetes patients and uses a pharma company's equipment for blood analysis can also be offered drugs for preventing weight problems (cross-selling). The same applies within individual product lines to support sales of a higher-grade product (up-selling).

2.3 Limitations of Traditional Sales and Marketing

The present sales organization in many pharma companies is oriented towards three customer segments: (1) physicians (2) hospitals, wholesalers and pharmacies, and (3) end customers, i.e. patients [22, 101]. While computer manufacturers such as Dell deal with the end customer direct, a pharma company's main customers are physicians, pharmacies, hospitals, and patients. For interaction with these customer groups, pharma companies use different systems today:

- Systems for Territory Management (TMS) or Sales Force Automation (SFA) have been in operation for some time and support the sales force in visiting physicians on a regular basis. A study conducted in Austria shows that good sales reps still determine customer satisfaction and lead to indirect economic success [34, 964].

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[2] Products with annual revenues of USD 500 million or more [10].

- KAM is an enhanced form of TMS, where dedicated key account managers look after major customers such as hospitals, wholesalers, hospital buying syndicates and other decision-makers.

- Call centers and portal applications are emerging in certain countries for physicians as well as for patients. Examples are portals for specific diseases (e.g. oncology) or products (e.g. Aspirin). Patients are currently not addressed due to regulation and complex relationships between end customers and the pharma companies in Europe.

Figure 1 shows the evolution of these systems at Pharma Corp. Customer information is neither systematically gathered and communicated between the local marketing divisions, nor are interactions with customers on portals or call centers coordinated with the existing KAM or TMS. This impedes to identify customer segments (e.g. chronically ill patients), to develop the required additional services, and to use the potentials of up-/cross-selling. Pharma Corp therefore decided to develop an integrated CRM architecture.
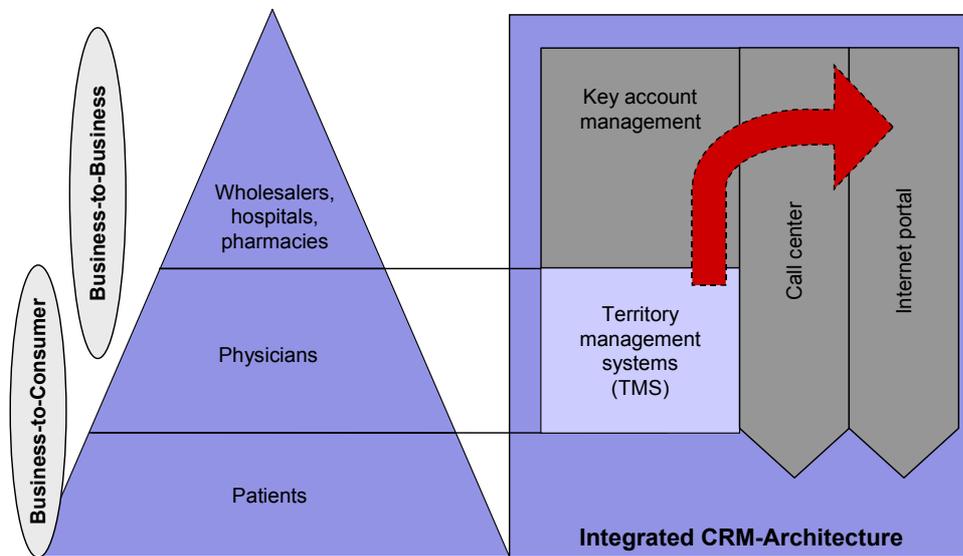

Figure 1: Customer Segments and Channels in the Pharmaceutical Industry

3.   Development of a Customer-oriented Architecture

Architecture is an instrument for the systematic development of solutions in many areas such as civil and systems engineering. In the latter it describes the integration of different components to deliver one or more (technological) capabilities [36]. Although various e-business architecture frameworks have emerged (e.g. [12]) these are mainly technology-driven. In the following a top-down approach is described that encompasses three levels: a business architecture which provides the frame for understanding the transformation of the sales channels within the industry, a process architecture which develops the main design elements for shaping customer-oriented services, and a systems architecture which structures the supporting applications.

3.1   Strategy: Business Architecture

3.1.1   Analysis of Downstream Actors and Relationships

On a strategic level customer orientation requires a sound understanding of the downstream business network which depicts all actors involved [33, 102]. **Figure 2** shows the existing business architecture with Pharma Corp's marketing, sales and service departments as well as the customer segments along the various interaction channels (business-to-business, business-to-doctor, business-to-consumer, and business-to-government).[3] This structure represents the European market since the greatest changes were expected here.

- *Physicians* are the most important customers for pharma companies as they possess the authority and the know-how to decide on the prescribed products.[4] Nearly all academic physicians and a growing number of community physicians are regularly using the Internet [27, xii]. Pharma companies strive to reduce the current cost of EUR 1,000 per visit and to increase the length of each visit which today takes only approx. nine minutes [17].

- Although physicians make the product decision, *patients* are the final buyers of pharma products [16, 32]. They are more likely to prepare themselves for discussions with their doctors and have independently decided on their preferred drug [23, 494]. Pharma companies aim at providing information which may influence the choice of drugs.

- *Hospitals* are high-volume customers for medicines. For example, the hospitals in Switzerland purchased 20.7% of prescription medicines in 2000 [6]. Although product decisions are still influenced by physicians, hospitals increasingly employ professional procurement staff that exerts competitive pressures on pharma companies.

- *Wholesalers* are not regarded as customers but rather as a distribution channel. In Switzerland the three largest wholesalers (Galenica, Amedis and Voigt) together command a 90% share of the market, while in most of Southern Europe the market is still less concentrated. Consolidation is expected to increase, for example, the three largest wholesalers already operate throughout Europe and aim at downstream integration of pharmacies and hospitals.

- P*harmacies* sell drugs to patients on a prescription basis. In 2001 pharmacies sold 55.6% of all prescription drugs in Switzerland [6]. Pharmacies buy their drugs from wholesalers and do not source direct from pharma companies.

- *Patient groups* are interest groups who offer information and support regarding specific illnesses. They influence politics and the pharma industry [7]. An interest group, for example, was effective in securing approval of Herceptin (a drug used against breast cancer) by promoting the drug to gain faster approval from the food and drug administration (FDA) [2, 7]. Pharma companies aim at addressing these patient groups with suitable services and information at the right moment in time.

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[3] Since the business-to-government area does not have a direct impact on sales activities it is not analyzed here.
[4] In the US 85% of all healthcare decisions are currently controlled by physicians [13].
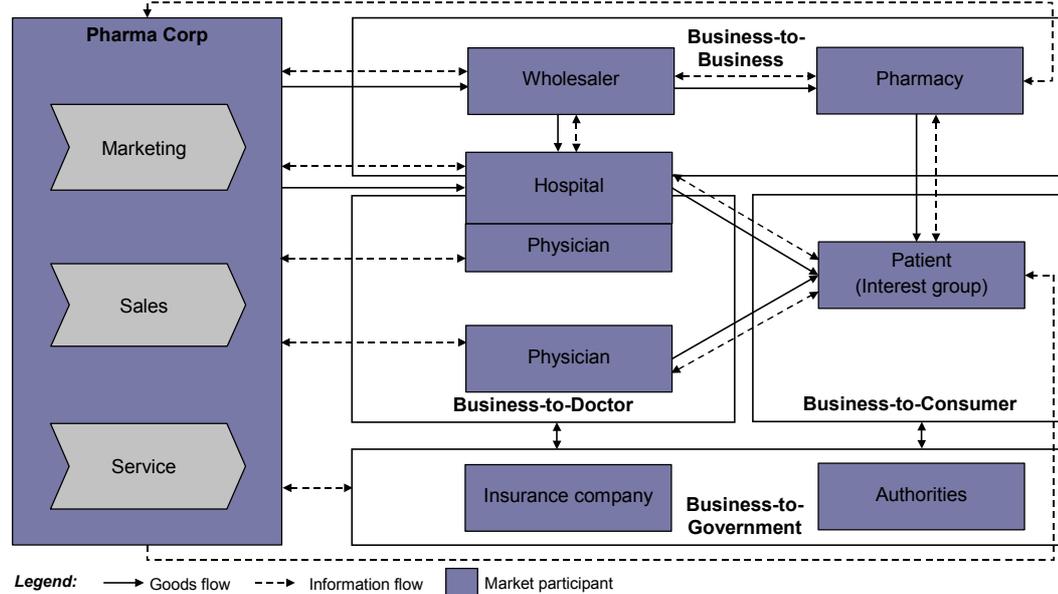
Figure 2: *Traditional Business Architecture in the Pharma Industry*

3.1.2 Transformation of Business Architecture

The Internet has spurred a variety of websites, portals and marketplaces which various players in the downstream pharma network have used. Portals are websites that personalize and integrate information on products and services from different vendors and applications. While portals bundle information to provide a maximum coverage of customer processes, marketplaces provide a transaction infrastructure among competing suppliers using market mechanisms (e.g. auctions). Pharma companies have established solutions to five customer segments (see 1 in **Figure 3**):

- *Patients* receive information and services concerning diseases or therapies. Among the examples are lillydirect.com for oncologists by Eli Lilly, raacademy.com for patients with rheumatoid arthritis or ibreathe.com for asthma patients by GlaxoSmithKline (see also [22, 102]).

- *Hospitals* are offered catalogs for electronic procurement with multiple pharma companies. To prevent hospitals from using order entry systems from various pharma companies in parallel, marketplaces such as GHX have been established in cooperation with competitors.[5]

- *Physicians* obtain information on drugs, treatments, current research as well as support in their operational processes and in training. Several companies have started online and interactive product presentations to supplement or substitute physical sales rep visits ('eDetailing') [3, 256], e.g. MyDoc Online from Aventis.

- *Pharmacies* and *wholesalers* receive only little information from pharma companies. The former are traditionally the wholesaler's customers and the latter have their own ordering systems in place.

Wholesaler portals (see area 2 in **Figure 3**) support electronic ordering and the purchase of drugs between multiple pharma companies and pharmacies. Often they build upon a wholesaler's established electronic ordering system.

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[5] Founders of GHX are Johnson & Johnson, GE Medical Systems, Baxter, Abbott Laboratories, and Medtronic.

Pharmacy portals emerged in two directions (see 3 in **Figure 3**). First, pharmacies establish websites that include electronic chats with the pharmacist or ordering services which enable patients to enter the required drug, fax the prescription and collect the product in the physical store. Second, virtual pharmacies in the US and the UK offer electronic catalogs, order entry and prescription handling. Among the remaining examples are drugstore.com or cvs.com.[6]

Among the *hospitals* the medical schools are offering a wealth of medical information on their websites. An analysis of the top fifty-one medical schools in the US showed that especially the higher ranked schools had broad and deep information on diseases and therapies etc. [44].

New information providers (see 4 in **Figure 3**) include telemedical services for exchanging multimedia data (e.g. reports, x-rays, insurance number, etc.) between physicians and patients [26]. Other portals provide in-depth knowledge on drugs and healthcare (e.g. drkoop.com, webmd.com) or offer e-detailing services (e.g. iPhysicianNet). To ensure the quality of medical information the Health on the Net Foundation Code of Conduct (HONcode) was defined (see http://www.hon.ch).
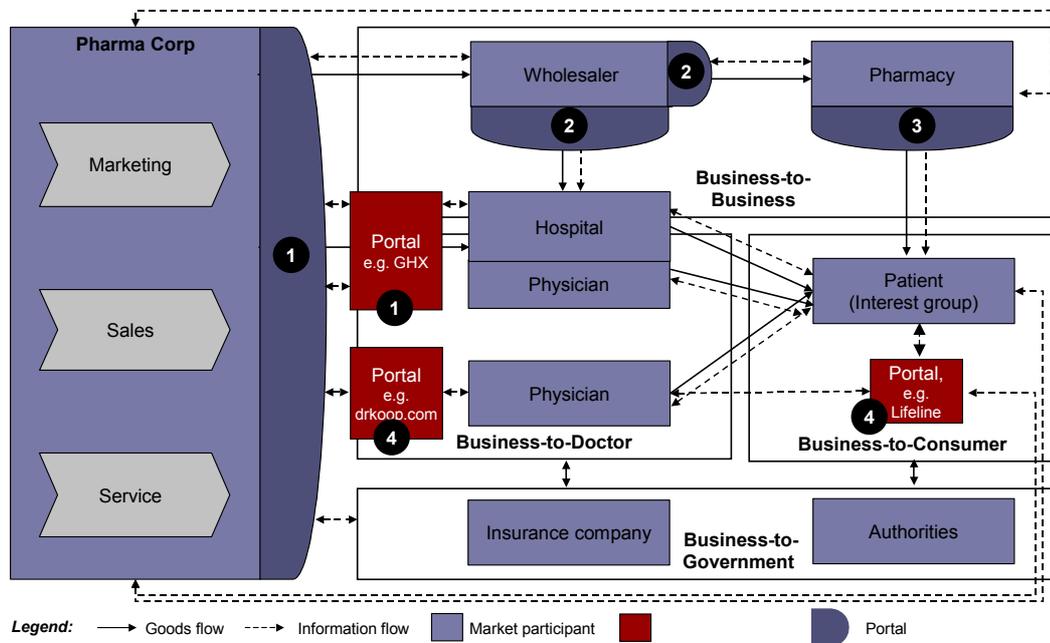

Figure 3: *Future Business Architecture in the Pharma Industry*

When Pharma Corp evaluated the changes in their business architecture in 2001 they decided to provide state-of-the-art regarding their websites (e.g. uniform layout worldwide, consistent product information), to maintain parity in the area of online pharmacies and downstream marketplaces (i.e. act upon strategic necessity), and to develop competitive advantages by establishing portals for specific customer segments. In a number of workshops with Pharma Corp's country organizations, the existing and expected importance of the customer segments was evaluated. As **Figure 4** suggests, patients and wholesalers should receive more attention in the future. However, physicians still remain the most important segment for pharma companies.

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[6] For an overview on existing verified internet pharmacy practice sites (VIPPS) in the US see the National Association of Boards of Pharmacy (http://www.nabp.net/vipps/consumer/listall.asp).
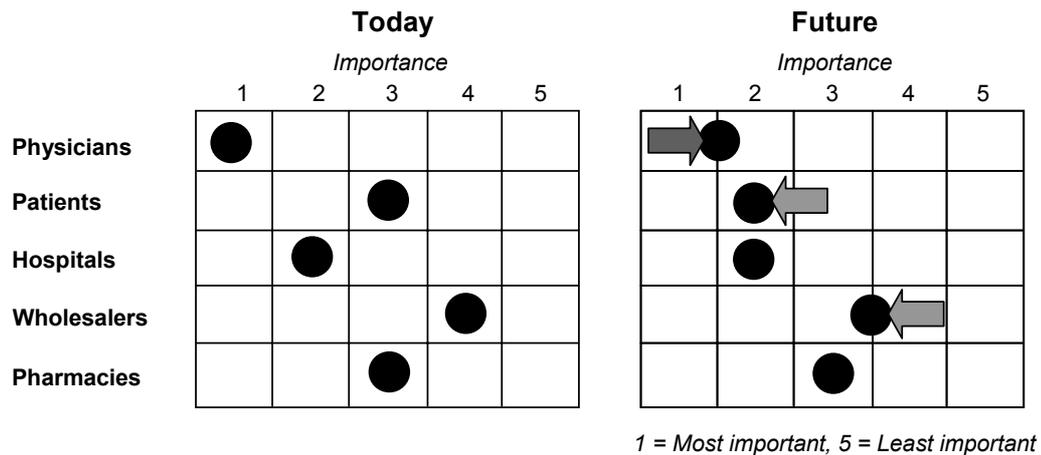
1 = Most important, 5 = Least important

Figure 4: *Importance of Customer segments at Pharma Corp*

3.2   *Process Architecture*

3.2.1   *Customer Processes Analysis*

On the process level Pharma Corp analyzed each customer segment to identify required and valued services to be included in a portal. The customer process encompasses all tasks which customers go through in order to satisfy their needs [29, 48]. Internal workshops and customer surveys in six European countries with an average of ten sales and marketing representatives were conducted. Three hospitals, two buying syndicates and two wholesalers took part in the external survey. From this analysis the customer processes as well as possible portal services were derived (see **Figure 5**):

- The customer process of *patients* evolves around the prevention and treatment of an illness. The sub-processes may differ in length and show that healthy persons can also be customers of pharma companies ('prevent').

- The *physician's* process focuses on patient treatment, i.e. providing advice and prescribing drugs. Included are knowledge management, i.e. systematic archiving of information from medical journals or newsletters, professional development, i.e. continuous medical education (CME) with online seminars etc. [4, 96], patient data management, i.e. the storage of patient data and their medical histories, and back-office, i.e. all administrative activities.

- *Hospital* pharmacies have an emphasis on warehouse management. The pharmacy manager's process starts with observing medical developments and searching information on sales figures, approval requirements and side effects of drugs. After checking inventory and comparing terms of delivery, the hospital pharmacist initiates a purchase order, the goods and the invoice are checked upon receipt, and the goods are assigned to the warehouse.

- Compared to hospital pharmacies, 'independent' *pharmacies* are more sales- than logistics-driven. Dispensing drugs and advising customers is important here. Necessary support processes are prescription handling and ordering.
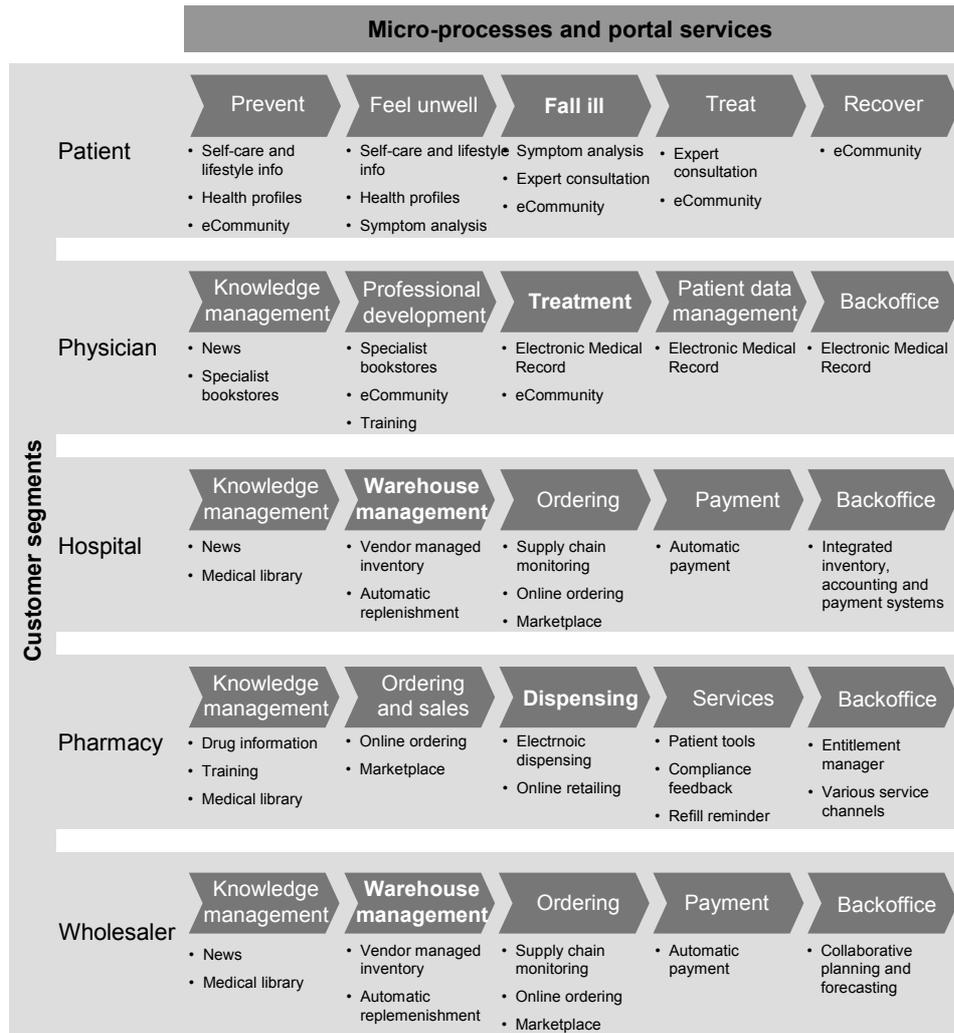
Figure 5: *Customer Processes with Portal Services at Pharma Corp*

- The *wholesaler's* process resembles the hospital's customer process. Purchasing managers search for product information, new products on the market and data on drugs such as the size of shipping units, the number of tablets or capsules per pack. Terms such as payment and delivery dates are agreed with the pharma companies depending on local reference prices.[7]

3.2.2 Portal Process Architecture

In a second step Pharma Corp developed the process architecture and analyzed how the portal services were linked to the main CRM processes marketing, sales and service (see **Figure 6**).

- *Marketing* mainly provides services for pre-transaction activities. Pharma Corp's marketing is organized according to the therapeutic fields in which the company is active. Although a distinction is made between the customer segments

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[7] In Germany, for example, a directive on the price of medicines regulates the price range between pharma companies and wholesalers. Only discounts, terms of delivery and payment dates are freely negotiable.

'hospitals' and 'physicians' at the top level, all activities one level further down are directed at specific products. For a systematic evaluation of customer contacts, an active communication to customers, and personalized marketing campaigns, marketing defined all customer information to be collected by the sales force.

- *Sales* is also organized according to hospitals and physicians, and product lines at the next level. To avoid that different sales reps visit the same customers, Pharma Corp has appointed key account managers who are not responsible for the success of an individual product but for success of certain customers. CRM supports them with information across product lines.

- Call centers are a major element in Pharma Corp's *service* area. A single telephone number (contact point) has been established for questions regarding products. Calls are automatically routed to the person or department concerned, depending on the call and the type of support required. CRM supports call center staff with detailed, up-to-date customer information.
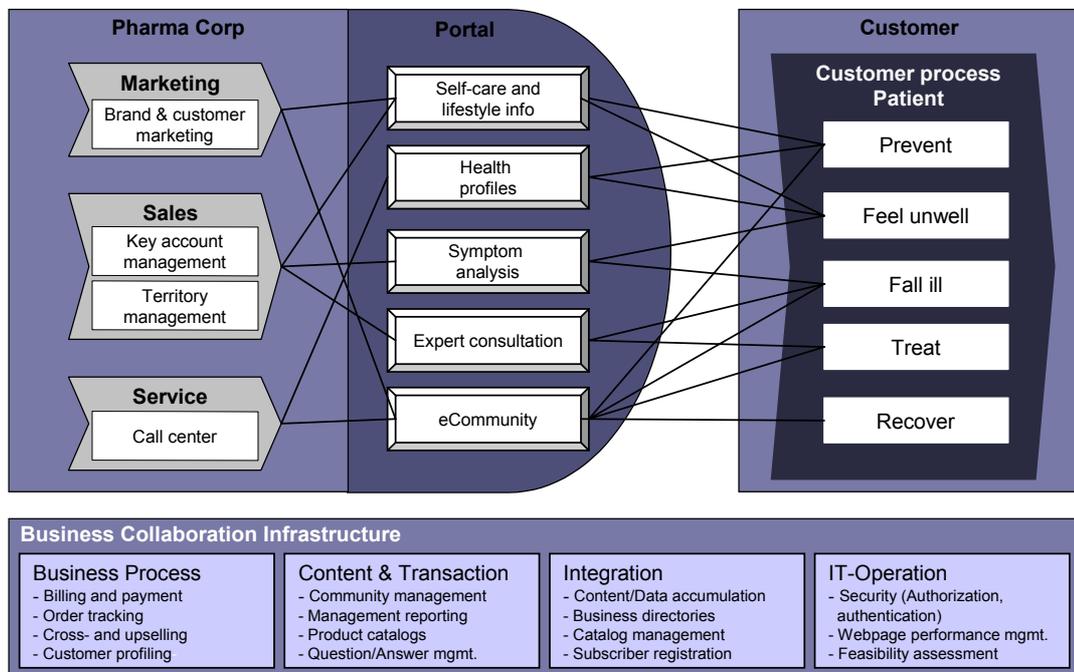

Figure 6: Portal Process Architecture for Customer Segment 'Patients'

The portal architecture in **Figure 6** also includes the services of external providers. These electronic services offer specific highly standardized tasks which are charged on a time or usage basis. They enable a pharma company to focus on critical areas and have emerged for specific tasks in business processes, for horizontal tasks that may be applied in various business processes (content & transaction services), for the consolidation, the unique retrieval, and the automatic routing of information (integration services), as well as for network operation (IT operation services) [29, 34]. **Figure 7** shows examples which were considered important for supporting the customer segments 'patient' and 'physician'.

Electronic services with examples	Customer process 'Patient'					Customer process 'Physician'				
	Prevent	Feel unwell	Fall ill	Treat	Recover	Knowledge management	Professional development	Treatment	Patient data management	Back-office
Business process services										
Online prescriptions, www.rxhub.net				●				●		
Appointment service www.healinx.com			●	●	●					●
Immediate medical assistance www.getwellness.ch	●	●	●	●	●					
Online visit to the doctor's www.healinx.com			●	●				●		
Professional training (x-rays) www.yxlon.com						●	●			
Online hospital registration optimizer.sanalink.com				●				●		●
Continuous medical education www.medscape.com						●	●			
Content & transaction services										
Health information www.pharmavista.net	●					●	●			
Discussion forums www.getwellness.ch	●	●	●	●	●	●	●			
Patient dossier exchange optimizer.sanalink.com				●		●		●	●	●
Personal health data record www.webmd.com	●			●						
Self-care tips www.webmd.com	●	●			●					
Journal service www.medscape.com	●					●	●			
Communities www.netdoktor.de	●			●				●	●	
Drug catalog and warnings www.drugstore.com				●		●	●		●	●
Drug check www.gesundheitscout24.de	●			●		●		●		
Integration services										
Dictionaries of illnesses www.medterms.com	●	●	●	●		●	●	●		
Dictionary of drugs www.medicineonline.com	●	●	●	●		●	●	●		
Physician and therapist search www.ama-assn.org/aps		●		●				●		●
Directories www.medizin.ch		●	●	●		●		●		●

Figure 7: *Electronic Services for Patient and Physician Portals*

These electronic services may also be pre-configured into a business collaboration infrastructure offered by a third party provider such as global healthcare exchange (GHX). At this moment, Pharma Corp is planning to integrate selected services bilaterally. The criteria which have been used were strategic relevance (task is not core to Pharma Corp's business), cost (cost of service is below internal cost), and market power (established player in the market / standard solution).

3.2.3 System Architecture

The system architecture implements the process architecture regarding (1) the applications which provide the functionality for the process portals and the CRM processes, regarding (2) the integration solution which provides semantic and syntactical compatibility for homogenized customer data, and regarding (3) the technical infrastructure for the secure technical connectivity. Since the infrastructure architecture uses standard Internet technology it is not elaborated here.

As a global company with strong local country divisions Pharma Corp decided to develop a decentralized system architecture. To avoid incompatible customer data and the implementation of multiple different systems, corporate guidelines determine the each country's configuration:

- The application architecture which reflects the functional requirements in the processes marketing (analytical and mailing functionalities), sales (functionalities for planning and reporting of visits, expense, sample and congress management), and service (functionalities for call centers, e.g. automatic call recognition). The ERP application is used for product management, ordering, and sales; the CRM application for call center, sales force, and marketing purposes.

- The customer information platform (CIP) is a key element of the integration architecture. CIP defines a customer data model and methods to integrate local and corporate customer data. Both CRM and ERP supply and use data from the CIP which consists of a data warehouse and master data management solution (MDM). The data warehouse integrates data from various heterogeneous systems and consolidates data for reporting purposes. MDM harmonizes the different field names and customer ID numbers into a corporate standard.

- The choice of system vendors which was limited to SAP in the ERP area and Siebel or Update.com in the CRM area. While large countries use Siebel, smaller countries use Update's Marketing Manager. Other CRM systems will be replaced. Standard configurations have also been developed for portals where a solution from BEA/ATG has been selected.
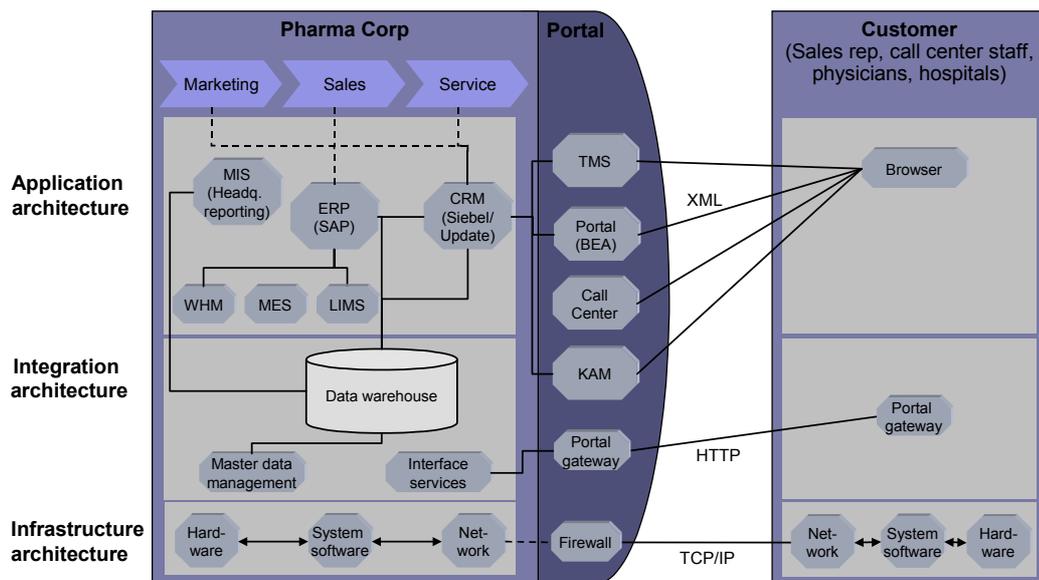
Legend: WHM: Warehouse Management, MES: Manufacturing Execution System, LIMS: Laboratory Information Management System, KAM: Key Account Management, TMS: Territory Management System, MIS: Management Information System, ERP: Enterprise Resource Planning, XML: Extended Markup Language

Figure 8: *System Architecture at Pharma Corp*

4.   Summary and Outlook

Deregulation, cost pressures, and new Internet channels are forcing pharma companies to adopt customer-oriented strategies and to reflect the sustainability of their existing strategies. CRM systems and customer process portals are becoming strategic necessities that determine customer retention as well as the operational efficiency of sales and marketing processes. Pharma companies face transformations on three levels. The business architecture supports the positioning regarding the target customer segments and electronic intermediaries. The process architecture identifies customer processes for each segment and derives portal services which can also be sourced from external service providers. Finally, the system architecture reflects the organizational culture and enables interoperability across heterogeneous applications. Pharma Corp estimates that the CRM architecture leads to benefits in two areas.

- *CRM benefits*. Since the implications of CRM on additional revenues are difficult to quantify, Pharma Corp focused on the efficiency of sales and marketing processes. For example, one branch office calculated an estimated increase in the sales force headcount from 530 to 940 until 2005 due to the amount of new products. CRM is expected to save approx. 190 of these additional sales reps since only A and B customers will be visited regularly in future, while C and D customers will be referred to the portals for product detailing. Besides manpower cost such as expenses, samples, advertising material and tied-up assets (e.g. laptops) are reduced. In another branch a more targeted communication with customers reduced the sales rep workload for a single product line by approx. 25,000 visits (to physicians who never prescribe) per year (plus the associated costs for advertising material, samples and expenses).

- *Architecture benefits*. Among the typical benefits of architectures are reduced redundancies which lead to reusable and interoperable solutions. For example, pre-configured portals for physicians can be implemented in multiple country organizations while development and maintenance skills are centralized in a dedicated organization unit, the portal factory. Pharma Corp has accelerated the portal development from previously 9-12 months to 2-3 months. Similar synergies are expected for the implementation of the CRM standard solutions Siebel and Update. Pharma Corp also expects that the architecture proves helpful in evaluating, positioning, and integrating new technologies (e.g. mobile technologies) at an early stage.

From a research perspective the presented architecture framework is only a first step towards a systematic methodology for (re)engineering downstream relationships. This includes techniques for developing result documents at each level of the architecture. Further research is also necessary regarding the metrics for assessing the results of the transformation which link the architecture to the business goals such as customer orientation.

Acknowledgements

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