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Creating Competitive Advantage Through Telemedicine-based Value Webs

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Abstract

In most European countries public health is stepping towards an economic crises. Extensive competition thus challenges healthcare organizations to redesign their business, to evaluate their product/services portfolios, and to develop new strategies. In this context, the paper examines the creation of competitive advantage through telemedicine-based value webs. Telemedicine has the potential to offer new distribution channels to healthcare services, and it enables creating new cooperation and business models. The focus of our paper is on how information technology and in particular telemedicine can create new, or may change traditional business models in healthcare.

Introduction

Public health is an important indicator for the prosperity of a society. However, due to increasing deficits in public households in most European countries, more and more conflicts arise between new medical approaches and traditional medicine, between technology-centered and human-centered care, and between increasing demands of patients (societies) and limited, even decreasing healthcare budgets. At the same time, new achievements in medical research, in medical technology, and in pharmacology do substantially increase competition in the healthcare sector. This situation challenges all players in the healthcare market to evaluate their product/services portfolios, to develop new strategies, and to redesign their business models. This is in particular relevant for small players who are not able to cover by themselves the whole value chain at competitive costs.

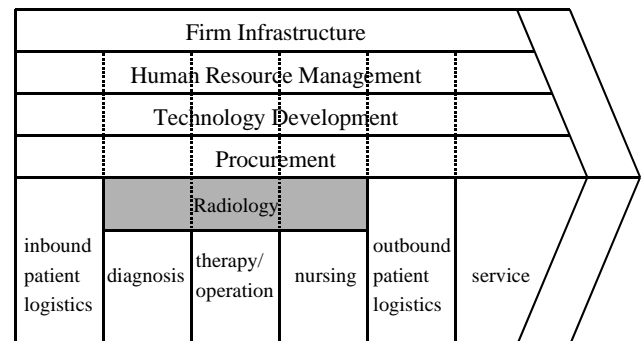
On the other hand, achievements in information technology provide healthcare service providers with new opportunities to design their processes for creating competitive advantages. Three main trends need to be considered here. First, a rapidly increasing portion of information about patients, and healthcare services is represented electronically. Examples are personal records, results of diagnostic screenings, disease descriptions, radiological information, etc. This provides for all advantages that generally come along with digitalization of information. Second, digitalized information can be transported very fast, and at low cost from A to B (and

may be also to C, D, E at the same time) through local and wide area computer networks telemedicine). Third, the world wide web (WWW) in particular provides an easy to use infrastructure for all (institutional, personal) participants in the healthcare market. Through the WWW they may offer, sell, retrieve, test, request, and consume a broad range of healthcare services. Thus, the WWW enables completely new healthcare services, new business models in healthcare, and new arrangements of coordination, and cooperation in healthcare service processes. Callon has thus mentioned that competitive advantages can be achieved through IT (Callon,1996). In the scope of this paper an business model can be understood as an architecture for the product, service and information flows, with descriptions of the different economic agents, their roles, the potential benefit and revenue flows (Selz, 1999).

Methodology

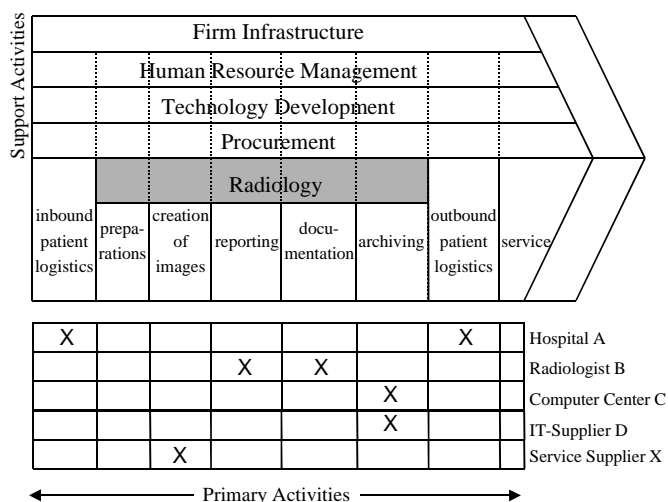
The value chain model was developed as a systematic method for examining all the activities a firm performs and how they interact, as a basis for analyzing the sources of competitive advantages (Porter, 1985). An important point regarding Porters value chain model is that it only requires minor adaptations for use in the healthcare sector (Callon, 1996). According to Porter, hospital value chain activities can be categorized into primary activities (inbound patient logistics, diagnosis, a.s.o) and secondary activities (firm infrastructure, procurement, a.s.o.) (fig. 1).

Figure 1. Generic hospital value chain



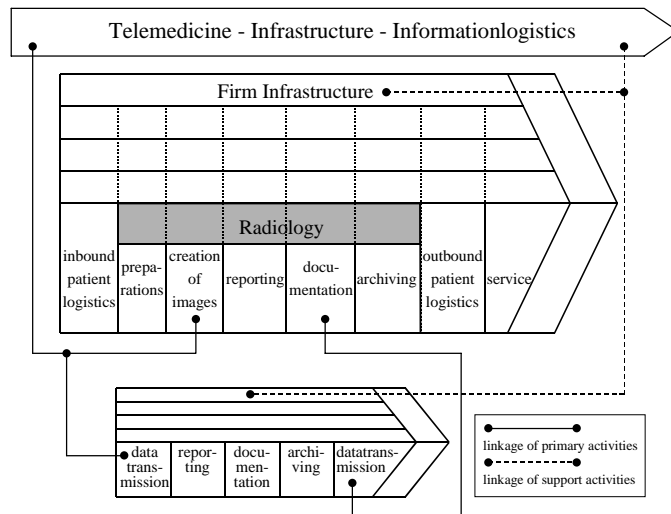
In order to achieve competitive advantages, Porter has suggested three different strategies: low-cost producer, differentiation, and focus (Porter, 1980). For example, strong competition in decreasing markets requires enterprises to cut their value chains, and to concentrate on their core competencies. It is thus possible (and may make sense in a certain situation) that a healthcare service provider (e.g., hospital A) offers full diagnostic services, but no therapy, no nursing, and no hotel services. In such a case, the healthcare value chain needs to be completed through vertical cooperation with hospital B. Cooperation, however, would require the two hospitals to integrate their local value chains in the scope of the radiological department (fig. 2, 3).

Figure 2. Vertical value chain (example)



For a moment, let us assume the example of second opinion request in radiology, e.g. in the case of a cancer diagnosis. This scenario does not necessarily involve telecooperation. E.g., it is still standard in most German hospitals that second opinion-services are still requested/provided in conventional manner. Fig. 3 depicts the telemedicine-enabled value chain .

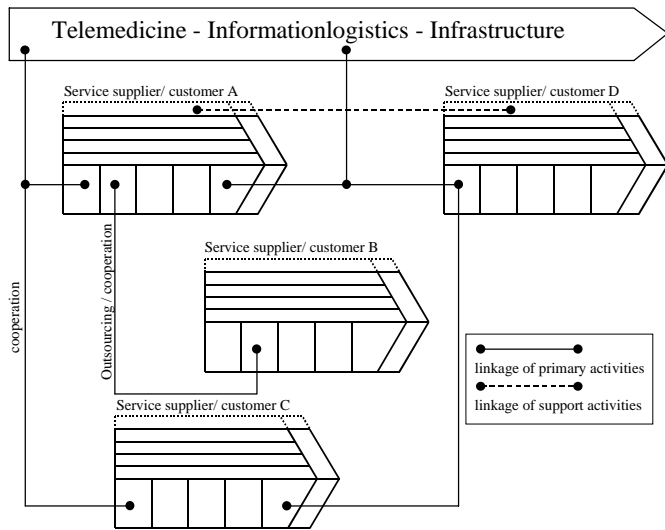
Figure 3. Value chain in radiology



This figures give already a clear picture of how different forms of teleradiological cooperations can be established. If the necessary telemedicine-infrastructure is available, telemedicine has the potential to enable inter-organizational value-chain-networks. But the emerging value networks as defined by Stabell and Fjeldstad (1998) focus only in a more static manner on the mediation role of information technology to link customers. In the style of Selz (1999) a value web model is a value network with respect to the changing nature of the customer relationship. (Selz, 1999).

Value Web in Healthcare is a boundary-less organization with the main focus on the quick movement of information and resources to where they are most needed and effective. E.g. the patient is normally no specialist in healthcare. He could turn to a trusted healthcare value web broker. The patient receives a custom-tailored medical service and the close relationship would be beneficial for all parties (Selz, 1999). This example looks at the interaction pattern Patient to Business (P2B) - other scenarios follow below.

Figure 4. Value chain network



Telemedicine-Based Business Models

Telemedicine can be defined as telecooperation in healthcare. It thus involves at least two participants, distributed in time and/or space, cooperating on a healthcare task and, to that purpose, applying to one or more telematic services.

- Participants:
Patients, nurses, med. assistants, pharmacists, doctors, etc.
- Healthcare tasks:
Consultation, diagnostics, med. control, therapy, medication, nursing, operations, etc. (across all areas of medicine).
- Telematic services
Email, file transfer, remote database / picture archiving system access, remote viewing, tele-robotics, video conferencing, etc.

The classification of business models can be done referring to Timmers (1998) with three elements

- value chain elements (see Porter and Section Methodology)
- interaction patterns
- value chain reconstruction

The combination of these three elements leads to various thinkable scenarios and potential business models. As in other fields, several basic telemedicine interaction patterns can be identified:

- Patient to Patient (P2P):
Patients may be connected to a chatroom, or to a

virtual community. Example: discussions of a particular disease.

- Patient to Business (P2B):
Patient requesting a service from a health care provider. E.g., requesting a medicament for a head ache.
- Business to Patient (B2P):
Health care institution providing services to a patient. E.g., offering ontology precaution services.
- Business to Business (B2B):
Two or more health care providers cooperating on a particular health care task. E.g., two pharmacists coordinating drug logistics, or tele-reservation systems for surgical operations..
- Business to Business to Patient (B*2P):
Two or more health care service providers cooperating on providing services to a patient. E.g., cooperation of a local surgeon with a remote surgeon during an operation.

Depending on application requirements, this list can be extended, and refined. Possible models include E-Shops, E-Procurement, E-Malls, E-Auctions, Third party marketplaces, Virtual Communities, Value Chain service providers, Collaboration platforms, Information brokerage a.s.o. (Timmers, 1998)

First examples in healthcare can be found in dermatology, pathology, or surgery (e.g., robotics, video conferencing). The most advanced field of telemedicine, however, is teleradiology. This is due to the fact that information, objects, and thus most processes in radiology can be dematerialized much easier than in other clinical fields.

Teleradiology as such includes a broad variety of different services. These services can be grouped into four categories:

- *consultation*: e.g. emergency consultation; transport consultation; expert consultation; background consultation;
- *clinical communication / cooperation*: e.g. clinical demonstrations and discussions; service for distribution of images and results to other medical fields, distribution of images for inhouse cooperation, distribution of images on shared modalities, provision of radiological attainments;
- *knowledge bases / knowledge transfer*: e.g. continuing education; advanced education; connection to reference databases; further development of existing treatments; development of new treatments;
- *other applications*: e.g. product support; maintenance of software application or modalities; external archiving; telerobotic; technical quality assurance.

Telemedicine and in particular teleradiology provides for dramatic cost reductions in many cases. This allows for preserving agreed quality levels at the same time. It also offers new opportunities for creating new forms of cooperation, e.g. within and across hospitals. Further, Telemedicine-based systems are supposed to be a powerful asset in many settings when a healthcare provider aims to negotiate new business models with other healthcare suppliers. This may result in new types of strategic partnerships in healthcare. Another possibility is the creation of value-added services. A good example here is the parallel diagnosis of a MR-image by specialized remote radiologists.

Current Research, and early findings

The conventional supply chain model focuses to the management of relationships in order to achieve a more profitable outcome for all parties in the chain. To reflect that the "chain" should be driven by the healthcare market, not by suppliers, the supply chain model and the generic value chain model should be adapted and developed as a kind of value web model with interdependences and possible information technology enabled cooperations and dynamic changing relationships [Kirn, 2000].

We found that healthcare participants in Europe are not as much prepared as industry to form strategic alliances, to go for process reengineering, and for efficient integration of intra- as well as inter-organizational value chains. Further, it seemed to us that it is still not so common in public health to systematically commit oneself to create, and sustain competitive advantages. We are thus just at the beginning of the development of business models supported by information and communication technologies in healthcare.

In this context information technology is used not only to protect and create competitive boundaries, it can be used to create new healthcare relationships and to establish new strategic alliances. The boundaries of a single hospital thus may become blurred if information technology involves networks that go across enterprise boundaries.

The relevant question to us is which ones of them may be of prior interest to the participants on the market, how they may affect cost, quality, and availability of (e.g. radiological) services, and how they may impact the process of restructuring the healthcare systems in industrial countries. This perspective forms the conceptual frame for our further research in telemedicine. Our main interest is in what types of new business models can be created on basis of telemedicine-based cooperation scenarios.

By doing research in this field we do not only expect to support strategic management decisions in large healthcare institutions. Another important point for us is to understand how earlier experiences in other fields like banking and assurance industries, in the automotive industries and the like can be transferred to the healthcare

sector – on the simple basis, that dematerialization of objects, and processes in very different economic fields leads to information objects. And these information objects, and there interpretation, handling, logistics, etc. follows the same rules – completely independent of what they represent in the real world.

Our research has shown that players in healthcare institutions can gain great benefits from telemedicine. In particular, telemedicine can provide competitive advantages through:

- *better quality*: e.g. faster treatments with lower level of contamination for the patient;
- *reduction of cost*: e.g. economies of scale and scope;
- *information procurement*; e.g. university-level diagnostic competence for small hospital
- *standardization*: e.g. oranzizational and administrative processes;
- *specialization*: e.g. telemedicine-based networks will support professionalization, and specialization (Gogan, 1999);
- *IT competence*: e.g. increasing number of digital modalities telemedicine will penetrate the local routine processes in hospitals and to sustain the IT competence required.
- *availability of human resources*: e.g. better coordination of Enlistment periods for radiologists across a teleradiology network;
- *shared digital archives*: e.g. digital archives are an expensive resource and build boundaries for new entrants;
- *procurement*: e.g. telematics-based networks change the bargaining power of healthcare institutions;
- *continued development of treatments*: e.g. much better date base of patient records through telematics-based networks.

Up to now the findings of a project with 6 medium sized Hospitals in Germany served as a knowledge and decision basis for our current research. The results are not representative for a generalization but point out to first emphases.

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