Information Technology and Knowledge Exchange in Health-Care Organizations

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Abstract
Despite the increasing global interest in information technology among health care institutions, little has been discussed about its importance for the effectiveness of knowledge management. In this study, economic theories are used to analyze and describe a theoretical framework for the use of information technology in the exchange of knowledge. The analyses show that health care institutions would benefit from developing global problem-solving collaboration, which allows practitioners to exchange knowledge unrestricted by time and geographical barriers. The use of information technology for vertical integration of health-care institutions would reduce knowledge transaction costs, i.e. decrease costs for negotiating and creating communication channels, and facilitating the determination of what, when, and how to produce knowledge. A global network would allow organizations to increase existing knowledge, and thus total productivity, while also supporting an environment where the generation of new ideas is unrestricted. Using all the intellectual potential of market actors and thereby releasing economic resources can reduce today's global budget conflicts in the public sector, i.e. the necessity to choose between health care services and, for instance, schools and support for the elderly. In conclusion, global collaboration and coordination would reduce the transaction costs inherent in knowledge administration and allow a more effective total use of scarce health-care resources.

Keywords:
Health-care organization, information technology (IT), transaction costs, knowledge market, global communication.

Introduction
Today researchers agree that technological change, increasing competition, increasing marketing costs and changing consumer demands for health services influence organizational structures in health-care [1] [2][3]. A central issue for new health-care institutions is the ability to handle innovations, i.e., the organization's technology, plants and equipment, the systems and market processes [4][5][3]. The new institution needs to support the flexibility and responsiveness of a decentralized structure without compromising the integration and control of a centralized organization. In fact, it has to be able to thrive on chaos, unpredictability and continuous change, and at the same time produce highly customized products and services [6][7][3]. For this, the training and knowledge of the personnel (practitioners and managers) are essential. The possibility of developing health-care knowledge exchange by integration of communication systems at both national and international levels is today a fact. However, despite the increasing interest in the effects of the use of information technology in both the private and public sectors, little is known about its importance for the effective exchange of knowledge in a restructured health-care service. The aim of this investigation is to outline an explorative economic theoretical framework for the use of information technology in knowledge management in the new health-care institutions.

Theoretical background
Traditional economic analyses have examined the organization mainly as a "black box" and limited the analysis to examining its input, output and structural relations. Today, economists describe business-oriented organizations as "those that are aware of how they do things" [8][9][10]. An organization's ability to produce goods, services or some combination of the two depends therefore on what it knows, i.e., on knowledge about what is embedded in the work routines and machinery of production [11]. Attention has therefore shifted to inside the black box and to how market forces (demand and supply) transfer knowledge and/or information. In other words, it has shifted to how practices and knowledge are exchanged within the internal boundaries and how its members turn around work processes to produce innovative products and services [10].

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The common approach used to analyze organizational structures has been transaction cost theory [12]. According to this theory, organizations form themselves in ways that minimize their transaction costs [13] i.e., costs for negotiation of contracts, information failures, and for coordination problems [14][15].

According to Williamson [15], market-based transactions follow and thus regulate through price signals. In such a system, traders supply goods and services if the market price exceeds their own valuation of the cost of production. Further, they buy goods and services if their valuation exceeds the market price. In contrast, hierarchies or institutions use decisions makers as regulators of transactions. Consequently, all aims, decisions and distribution of resources such as knowledge are handled inside the institutions and through the interaction between the individuals [16][17].

In modern health-care institutions, both transaction systems exist. Even though the institutions are hierarchical, they have become more market-oriented and segmented. For instance, hospitals and primary care centres produce and sell "health services" but they belong to different markets segments. As a consequence of this segmentation, the transaction costs for acquiring knowledge and coordination of services are often high. To solve the problem of transaction costs, health-care institutions can vertically integrate, i.e. integrate their knowledge of how to produce the best possible outcome and use it to perform all production and distribution of health care services. In this way, complex contracts to ensure co-operations between different health-care providers are avoided, but also allow a situation in which "the organization" in both the developer and the user of an outcome.

Methods

In contrast to studies focused on output measures, we attempt to build a model of the internal relationship between knowledge management and information technology in health-care institutions. For the theoretical basis of our model we have reviewed literature referring to the use of information technology in health-care institutions from two academic disciplines: economy, and medical informatics. The common factor in all the studies is how diffusion of information technology into the workplace is going to facilitate an often necessary restructuring of organizations [18][19][20][21]. In addition we have used observations, experiences and notes from previous studies [22][23][24]. The use of both the literature review and observations has made it possible to cross-validate notations and to construct a multi-disciplinary theoretical model.

Results

Health-care services are usually provided in collaboration between hospitals and primary health-care. Between 2 % and 13 % of the patients consulting a general practitioner in primary care are referred to a hospital specialist [25]. Many of the knowledge transactions in this collaboration take place by practitioners informally talking to one another. "Buyers and sellers" move knowledge through an "internal market", also facing difficulties inherent in the informality, e.g., that people continually need to keep in communication with each other to keep updated [10]. For instance, GPs maintain social networks of hospital specialists for informal advice-seeking structured according to area of expertise, reputation and availability [26]. Similar patterns for advice-seeking have been reported for in-house consultations between different professional groups at health-care units [27].

A major disadvantage of these local systems is that the communication channels are often undocumented. They are thus not available to all individuals who need the knowledge and not in all circumstance either. The balance between demand and supply of knowledge depends therefore on local connections, which work until one of the parties receives information about new suppliers (newcomer competitors) [10]. Further, health-care personnel often discuss a problem with someone close or who they already know. This is not necessarily because he/she is the best person to consult on the subject, but because time is valuable and a scarce resource [28]. Another reason is because habit patterns are difficult to change. It takes time and effort to seek information about other suppliers in other organizations, especially if the organizations are large and complex.

The fact that the "best" supplier of knowledge is difficult to locate and reach, even if the location is known, increases the transaction costs (expressed in time and effort) and thus the price for exchange. Because in economic terms scarce resources not only include tangible goods such as money, but also intangible goods such as time. Consequently, a fundamental principle in market economy, that an efficient market has to generate the most good at the least cost [29] does not seem to be achieved in the actual knowledge market in health-care organizations. This is due to factors that cause market inefficiencies, for example,

a) Asymmetry of information. Strategic knowledge that resides at the specialist level may not be available to all physicians when they need to use it.

b) Monopoly situation. If only a group of specialist holds knowledge that many need, a knowledge monopoly exists. The effects are therefore similar to that of monopolies in the market for goods and services. The knowledge will come at a "high cost" because there is no competition to
moderate the price. In sum, the lack of infrastructure for knowledge transfer creates barriers to access for buyers and barriers to trade for all individuals. Due to an insufficient inter-organizational integration, knowledge becomes scarce, local and difficult to obtain.

The electronic knowledge market

Any organization needs appropriate information-processing capabilities for effective performance. In this regard, information technology represents one means for increasing inter-organizational contacts due to the fact that its key potential is the support of the information processing in a relationship, thereby enabling co-operative activities unrestricted by time and space boundaries [1]. This information-technology-supported vertical integration enables new forms of collaboration without increasing transaction costs for the organizations involved. Information can be distributed instantly to widely different places, making it unnecessary for people who work together and share knowledge to be physically located in the same place. Shared knowledge also increases the joint involvement in a work activity [30] [31] and provides the capacity to focus on the systemic consequences of an action rather than on local consequences [32]. When information technology is used for vertical integration, health care can exploit links between activities and create new interrelationships among its different components. The joint use of intellectual resources, and the sharing of internal costs (transaction costs) for information and knowledge management, create increasing possibilities for competitive advantage [30]. In sum, in vertically integrated health-care institutions with a common electronic knowledge market, buyers and sellers receive the knowledge they need to do their work well and get appropriate utility from the knowledge they share, without time constraints. Specialists feel that their expertise is valuable (due to increased demand of knowledge) and know that other organizations will co-operate with them when they need expert assistance.

A global vertical integration of knowledge exchange

The new forms of interaction between the different agents in the electronic knowledge market not only involve lower transaction costs or improving assets. They also involve advantages obtained from a major integration of different health-care institutions in different parts of the world. Most health-care institutions are already used to the idea of electronic commerce. Given the chance, they may be willing to search on an international basis for knowledge and services traditionally considered national or even local. In this way health-care institutions can turn uneconomic functions into others that are more competitive and innovative. By providing interfaces to information and databases and giving knowledge demanders the tools they need to customize them, many health-care institutions can actively outsource their knowledge management both to other organizations and to the patients directly. As a consequence of this, customers and providers will reduce transaction costs at the same time as new skills and perspectives help provide new frames of reference.

Discussion

To allow efficiency gains, the division of labour in medicine is based on specialization. However, with increasing specialization there is a corresponding need for co-ordination [33] for two main reasons: due to the vast variety of specialized knowledge in medicine and because health care organizations by tradition and culture do not use price mechanisms to exchange knowledge between practitioners.

This study has discussed a model in which the use of information technology for vertical global integration of health care producers decreases costs for negotiating communication channels, facilitating the exchange of knowledge. It suggests that health care in all countries would benefit from developing a global problem-solving network and would allow practitioners to exchange knowledge through a developed organizational collaboration independent of space and time, and also requiring minimal legal fees and costs.

The results also point to ways for introducing an effective global market for knowledge exchange. People in health systems around the world are currently dealing with similar challenges. Like any other branch of economics the fundamental problems are resource allocation to health-care and the choice of techniques of production. These issues indicate that mediators such as information technology for rapidly transferring knowledge and explicit strategies for knowledge exchange are necessary from a national and global perspective to make the exchange more robust and inexpensive. This is essential, because many times the resources available in health care directly depend on the global economy and on the total means available to the public sector in each country.

We do not plead for a full vertical integration of health care organizations in the production of services, because of the division of labor and specialization level in different parts of the world. However, an integration of the knowledge infrastructure can be used to overcome psychological and formal barriers in the problem-solving atmosphere, e.g. asymmetry, scarcity, monopoly and barriers to entry. Neither do we believe that information technology as such solves the knowledge market inefficiency, but it allows collaboration opportunities for parallel progress [34] and content management [35]. However, successful global
collaboration also necessitates that all involved groups – in economic terms, producers of goods have distinct and complementary skills, domain knowledge and technical expertise that can be shared at any moment in an effective ways [34]. Such solutions are required if health care institutions are to improve outcomes from changing partnerships, coalitions or alliances [36].

Conclusions

Today lower transaction costs allow companies and organizations to control and track information that would have been too costly to acquire and process jus a few years ago. These principles can also be applicable to health care, because health care practitioners, whether in Sweden, Canada or elsewhere, have knowledge having a specific value which is difficult to quantify and transfer to the right recipient. A free knowledge network would increase the total productivity in health care globally, using all the intellectual potential of market actors to release economic resources in the public sector to other necessary investments, e.g., schools and support of the elderly.

Acknowledgments

The Swedish Board for Technical and Industrial Development NUTEK supported this work through the MTO program.

References


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