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Competitive balance implications for hospitals of innovations in networked electronic health records

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Abstract

Purpose – The purpose of this paper is to examine the implications of electronic health records (EHRs) for competitive balance among hospitals in the USA.

Design/methodology/approach – To analyze the competitive balance implications of EHR networks on hospitals, the authors reviewed empirical, theoretical and practical literatures bearing on the problem.

Findings – US hospitals are increasingly facing decisions regarding whether, when and how to participate in networks of EHRs. EHRs can replace paper-based medical records, improve the quality of patient care and decrease medical errors. EHRs also support product innovations such as e-visits and online prescribing. Such a significant innovation will alter the competitive standing of many hospitals, some favorably and others unfavorably. Hospitals with dynamic capabilities, absorptive capacity and organizational designs that facilitate innovation will fair best.

Practical implications – Hospitals can also utilize several strategies to increase their odds of improving their competitive positions as the industry adopts EHR networks. Examples include strategies involving new products, early entry into an EHR network, promotion of organizational learning, and management of social impacts of workflow changes.

Originality/value – The findings show which hospitals are most likely to embrace EHR networks, and how hospitals can best manage the adoption of EHR networks.

Keywords United States of America, Hospitals, Innovation, Customer records

Paper type Research paper

Introduction

Networks of electronic health records (EHRs) are an innovation that all US hospitals will need to consider adopting in the near future. EHRs are designed to replace the paper-based medical records that constitute the main source of patient information for health care providers (Anderson and Stenzel, 2001). This innovation has the potential to improve the quality of care for patients, while decreasing medical errors (Wang *et al.*, 2003). EHRs also support product innovations such as e-visits and online prescribing. Networking EHRs among health care providers on a local, regional, or national basis will leverage a much larger amount of patient care data. This would allow networked providers' to achieve levels of quality and efficiency greater than any single providers' information system could support. Adoption and implementation of networked EHRs by hospitals has the potential to change the competitive positions of hospitals.



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The purpose of this paper is to examine the implications of a technological innovation, EHRs, for competitive balance among hospitals. This paper begins generally by considering the notion of disruptive and sustaining technologies. Next, the key organizational factors moderating the effects of exogenous technology innovations on competitive positions and the strategies for managing such technologies are considered. Finally, the paper specifically examines the features and effects of EHRs and the characteristics of hospitals that contribute to their implementation. Strategic recommendations for hospital administrators are discussed, and an illustrative case is provided.

Technology and competitive balance

Technological innovation and incumbent viability

Technological innovations in industries have the potential to challenge the superiority and viability of competitors. Notably, “disruptive technologies” have the potential to drastically change a given industry by shifting competition and shattering existing business models. Danneels (2004, p. 249), acknowledging that many questions remain regarding the definition of disruptive technologies, proposes the following definition: “A disruptive technology is a technology that changes the bases of competition by changing the performance metrics along which firms compete.” Christensen and Overdorf (2000, p. 72) use a broader conceptualization of disruptive technologies defining them as creating:

... an entirely new market through the introduction of a new kind of product or service, one that's actually worse, initially, as judged by the performance metrics that mainstream customers' value.

Although there are many examples of organizations that have successfully dealt with disruptive technologies, the majority have failed (Danneels, 2004). In most instances, managers can see that a technological innovation is generating demands for new organizational competencies and that their organizations possess the resources to confront the changes (Christensen and Overdorf, 2000). Where they fail, however, is in effectively balancing efforts to develop new capabilities with pressures to maintain and further develop their current capabilities (Christensen and Overdorf, 2000).

Christensen and Overdorf (2000) contend that organizations' capabilities consist of three factors:

- (1) resources;
- (2) processes; and
- (3) values.

These factors evolve over time by starting in resources and moving to processes and values before ending with the culture of an organization. Management is somewhat “straightforward” as long as an organization continues to deal with problems that the processes and values were designed to address. However, when problems change (e.g. due to disruptive technological innovation) these factors can make organizational adaptation very difficult. Additionally, since disruptive technologies occur sporadically, organizations rarely have a process in place for handling them (Christensen and Overdorf, 2000). Thus, large organizations often give into smaller ones because they are in a better position to pursue these emerging markets (Christensen and Overdorf, 2000).

In summary, technological innovations can be disruptive for incumbent competitors in an industry due to the conflict with their existing organization. Yet, research has found that some incumbents remain viable and even competitively superior following exogenous technological innovation.

Organizational factors affecting innovation adoption and implementation

Organizational factors influence which organizations gain and which ones lose as a result of exogenous technological innovation in an industry. Innovations affect the value of organizational competencies, and can be competence sustaining or competence destroying. Dynamic capabilities possessed by some organizations allow them to survive rounds of competence-destroying innovations. Various structural and cultural factors also determine an organization's adoption and implementation of an innovation.

According to the resource-based view of the firm, each organization possesses tangible and intangible assets (Barney *et al.*, 2001). These assets in turn endow the organization with certain capabilities to create value. Contrasting the capabilities of organizations in a given market reveals comparative advantages and disadvantages. An organization can possess core competencies – capabilities that can be exploited for financial value, that are rare among competitors, that are unlikely to be imitated by competitors and that function in ways that substitute capabilities cannot. By exploiting core competencies through effective strategy formulation and execution, an organization can realize above-normal returns.

The dynamic nature of many competitive environments challenges the long-term sustainability of any organization's competitive advantage. Markets provide incentives for organizations to innovate (Schumpeter, 1950). Organizations can experience innovations in their market as competence sustaining or competence destroying. Competence sustaining innovations meet the needs of an organization's current customers, and by embracing such innovations organizations can enhance an existing competence. However, innovations that radically transform an industry involve new competencies, and destroy the value of established core competencies. Incumbents who have experienced success may find that their core competencies become core rigidities (Leonard-Barton, 1992). For example, as additional investments are made to incrementally improve their current core competencies (which serve their current customers), incumbents are distracted from investing in capabilities associated with new technologies (which might dominate their market in the future).

Perhaps, the greatest opportunity for sustainable competitive advantage in dynamic environments is the capability to develop new capabilities; i.e. dynamic capabilities. Dynamic capabilities are the capacity to renew, augment and adapt core competencies (Teece *et al.*, 1997). While the capabilities exploited to create superior customer value are first-order capabilities, dynamic capabilities are second-order capabilities that facilitate creation of new first-order capabilities (Winter, 2003). Dynamic capabilities have been demonstrated in the disk drive industry (Christensen and Bower, 1996). Additionally, in the case of NCR Corporation, they have been identified as a key to renewal and survival across industries and through numerous competence-destroying innovations (Rosenbloom, 2000).

Capabilities emerge as a consequence of a learning process (Zott, 2003). Organizations differ in their "absorptive capacity," their ability to absorb and

exploit new knowledge gained from external sources (Cohen and Levinthal, 1990). Absorptive capacity for a new technology is partly a function of prior knowledge related to that technology. Prior knowledge is developed cumulatively through prior investments and learning experiences.

Organizational adoption and implementation of innovations that emerge in markets are also influenced by organizational, structural, and cultural factors. Meta-analyses indicate that factors such as managerial positive attitude toward change, the proportion of managers relative to non-managerial personnel, norms of external and internal communication, and decentralized decision-making promote organizational innovation (Damanpour, 1991).

Thus, organizations encountering exogenous innovation do not all experience the same fates. Each organization's outcomes will be affected by a variety of organizational factors. Such factors include whether its current capabilities are "destroyed" by the innovation, whether the organization has dynamic capabilities, the organizations' absorptive capacity and the degree to which its structure and culture facilitate or impede innovation. Next, the paper addresses strategic actions organizations can pursue that influence their fortunes following exogenous innovation.

Strategic management of exogenous technological innovation

A variety of strategic actions can improve an organization's odds of surviving and thriving following exogenous innovation. Organizations investing in dynamic capabilities must engage in practices that foster organizational learning. Similarly, management of the effects of innovations on social groups within organizations when work activities change also promotes the success of the innovation.

Winter (2003) contrasts the organizational change experiences of organizations that rely on "ad hoc problem solving" with those that possess dynamic capabilities and higher-order capabilities. Organizations that perform ad hoc problem solving in response to exogenous change react to major force in their environments, coordinating non-routine change initiatives, and implementing changes in organizational routines as needed. Organizations with dynamic capabilities, on the other hand, have routines for changing their routines. They make investments in dedicated staff and other resources for the purpose of developing new organizational routines. Cost structures of the two types of change management approaches differ. The continual investment needed to foster dynamic capabilities is resource intensive. By contrast, the costs associated with ad hoc problem solving are lower and might include costs such as the opportunity costs of personnel who lead change initiatives at the cost of performing their standard duties.

For investments in dynamic capabilities to provide adequate returns, the rate of organizational learning of organizations investing in such meta-capabilities must substantially surpass those of organizations relying on ad hoc problem solving. Organizational learning involves three processes:

- (1) experience accumulation;
- (2) knowledge articulation; and
- (3) knowledge codification (Zollo and Winter, 2002).

While experience accumulation can result from execution of known procedures with occasional and spontaneous experimentation, coordinated change efforts accelerate the pace of knowledge accumulation. Following knowledge accumulation, knowledge is

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articulated among members of an organization through activities such as discussions, debriefings following a learning challenge, and performance evaluation processes. Knowledge codification requires a commitment of attention and does not automatically follow accumulation and articulation. Knowledge codification involves testing and sharpening ideas to create tools, manuals, etc.

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When innovations that alter workflow are adopted and implemented, attention to managing to the human side of organizational processes increases the likelihood that the innovation will be integrated and lead to improved processes and/or products. Socio-technical systems theory suggests that innovations are more likely to achieve their intended benefits when employees are organized in groups, given autonomy and voice, and allowed to adapt their work efforts as they adapt to the innovation (Manz and Stewart, 1997).

Timing of reactions to opportunities to capitalize on innovation in a competitive environment partly determines the level of returns achieved. Schumpeterian economics (Schumpeter, 1950) proposes that rival organizations are inclined to imitate each other's innovative actions, and imitation can dilute and even nullify the competitive advantage achieved for the initial actor. Empirical research confirms the validity of "first-mover advantage." The returns associated with new product introductions indicate that first movers and fast followers achieve greater returns than slow and late movers (Lee *et al.*, 2000). First movers fair best, followed by second movers. Those who imitate a product innovation after the first and second competitor do not experience an advantage. Differential returns achieved by competitors level off after three or more competitors have produced a once unique product, thereby establishing a degree of competitive parity.

The timing-related consequences of technology investments in networks to enhance processes are not as straightforward as the timing of new product introductions. The value of network technologies linking multiple organizations is largely a function of the number of parties linked by the network (Stabell and Fjeldstad, 1998). For instance, being the first party to own a facsimile machine would have provided no clear value until other parties adopted the technology. Similarly, Brousseau's (2003) analysis of e-commerce development in France found that early adoption of Minitel and EDI in the 1980s contributed to France's slow development of e-commerce. Commitments to Minitel and EDI inhibited French organizations' ability to invest in internet-based e-commerce. Consequently, being a first mover into the wrong type of network was a competitive inhibitor. However, Brousseau also found evidence that being an early mover in the broad category of e-commerce technology did facilitate quick "catch up" to e-commerce leaders who were early adopters of internet-based e-commerce such as Scandinavia and the USA. The quick catch up can be attributed to absorptive capacity developed through experiences with other forms of e-commerce. Hence, being a first mover or early adopter of a network technology can be an advantage if the size of the network were substantial at the time of adoption, and if the network adopted were to emerge as the dominant infrastructure. However, if another network emerges as the dominant network, prior experience with technological innovation in the field can contribute to an organization's absorptive capacity and thereby facilitate catch up.

In his controversial article on information technology and competition, Carr (2003) identifies "new rules" for information technology management that can be applied to innovations in EHR networks, if not perfectly so. Carr suggests that companies

“spend less,” as it is getting more difficult to acquire a competitive advantage by investing in information technology. To spend less, a hospital would be inclined to encourage a larger number of health care organizations in a given community to participate and thereby share the costs more broadly. Carr also suggests that firms wait longer to make their information technology purchases in order to avoid purchasing something that is flawed or destined to become quickly outdated. Following this rationale, a community of health care organizations would benefit from waiting until EHR networks are first adopted in many other communities. However, a given hospital would still want to participate in its community’s EHR network once it is formed. Laggard entrants into a community’s EHR network will trail their early-adopter competitors in development of new services and fall behind them on the learning curve.

Organizational characteristics and strategies pursued influence organizations’ viability following exogenous innovation. These factors may be keys to hospitals’ competitive standings following diffusion of EHR networks in the health care industry.

EHR networks and hospital competition

Innovation in health care: electronic health records

EHRs appear to represent a significant technological innovation in the health care industry. EHR systems involve the total computerization of a patient’s file and are likely to make paper-based files obsolete. These systems have the potential to provide benefits to a range of health care professionals including physicians, administrators, and other clinical staff, not to mention the patients themselves. Additionally, EHRs could lead to changes in clinical practices, such as referral to diagnostic tests and prescription of medications (Darr *et al.*, 2003).

Although claims of the value of EHRs are intuitively appealing, it should be noted that there is scarce empirical evidence on their value. Wang, *et al.* (2003) found that implementation of a proprietary EHR system in primary care can result in a positive financial return on investment to the health care organization. Additionally, it has been noted that the “most wired” hospitals have attained higher credit ratings; higher productivity, efficiency, and financial measures; and higher clinical outcomes (Solovy, 2004). However, this data is not conclusive since the hospitals that are “most wired” tend to be part of a system or health care network, and the results may represent the size effect of a large system. Moreover, studies that have examined the value of local or regional inter-organizational networks of EHR systems are wanting.

Despite the paucity of rigorous empirical research on the return on investment in EHRs, hospitals in the USA will need to decide their stance on the technology in the coming years. The federal government’s Department of Health and Human Services recently announced a ten-year plan to make all patient health records electronic within a decade (Brewin, 2004). This was announced after a White House panel on information technology and health care advised Congress and the President that progress be accelerated on information technology utilization in health care, including local health information infrastructures (AHA News, 2004). The trend toward networked EHRs appears to carry major force. Some organizations have the traits to cope effectively with this trend, and others are less well equipped.

Organizational factors and hospitals' success with EHRs

Organizational characteristics will determine which general hospitals are likely to benefit most from the opportunities and threats created by EHR innovations. Their current first-order capabilities, dynamic capabilities, absorptive capacities, and organizational designs will be key determinants.

Important core competencies of general hospitals include the value of the services they provide and their ability to attract physicians, and EHRs can enhance a general hospital's offerings. In their study of 824 general hospitals, Douglas and Ryman (2003) found that cash flow margins of general hospitals perceived as having valuable resources were significantly greater than those of hospitals with less valuable resources. Moreover, the attractiveness of their service offering helped general hospitals develop relationships with physician practices, which in turn were positively associated with cash flow margin. One of hospitals' keys to achieving good margins is effective negotiation with powerful buyers of their services, namely managed care systems (MCSs). The more powerful buyers are, the lower sellers' margins, other things held equal (Porter, 1980). The researchers expected the perceived value of services offered to reduce the impact of the buyers' power on cash flow margin. However, the opposite effect was found. Perhaps, the significant capital investments required by many of the valued services were targeted by MCSs. On the other hand, the researchers did find that general hospitals' alliances with physician practices moderated the effects of buyer power on cash flow margin.

EHRs have the potential of making services more valuable and thereby attracting physicians. Many of the innovations are competence sustaining, but a few might be competence destroying and somewhat disruptive to the competitive balance in the industry. The improved quality of services facilitated by quicker, more complete and more accurate patient information has the potential of improving the quality of care. With quicker access to information, personnel productivity can also be improved. EHRs can reduce and potentially eliminate much of the efforts involved in filling out paperwork. Additionally, EHRs can provide real-time data on which services are covered by the patients' MCS. Hospitals will largely experience these innovations as competence sustaining, but timely adoption and effective implementation of the innovation will be key to maintaining or even enhancing a hospital's competitive position.

Competence destroying innovations – those with the most potential to be disruptive – include new services that might be offered. For instance, the potential for e-visits to emerge as a substitute for many routine patient visits might favor hospitals that quickly develop the capability to provide such services (E-visits, 2004). Alternatively, hospitals that are slow to embrace EHRs will be at a comparative disadvantage (E-visits, 2004). Online prescription writing can have similar results (O'Malley, 2004).

In summary, general hospitals that invest in EHRs will increase the value of their services, and attract physicians, which will enhance their strategic competencies. The competitive positions derived from service offerings of the hospitals that do not effectively employ EHRs will slip, incrementally in some areas and more dramatically in areas impacted by EHR-based service innovations.

General hospitals that have established dynamic capabilities will be permitted to evaluate service innovation opportunities in the industry environment and adopt and

implement service innovations. These hospitals will tend to benefit more than their competitors that do not. In contrast, the general hospitals that do not have an established capability to identify, adopt and implement service innovations will have to perform *ad hoc* problem solving. This will serve to make the innovation experience more inconvenient and foreign to their work processes.

Additionally, general hospitals that have made major investments in initiatives or strategies that run counter to exploiting EHR networks will tend to find that their core competencies serve as core rigidities. In particular, general hospitals that have developed core competencies in proprietary information systems to foster patient loyalty will be less interested in investing in community-wide EHRs. Competing for top management attention and financial resources, community-wide EHRs will be difficult to embrace and prioritize. In addition, hospitals that believe their competitive advantage is in face-to-face interactions with patients might fail to adequately exploit opportunities presented by e-visits.

General hospitals with prior learning experiences related to community-wide EHRs will have developed greater absorptive capacity for EHR adoption and implementation. Hospitals that have historically led their competitors in effective use of information technology will more quickly grasp and accommodate community-wide EHRs. For instance, hospitals that have developed and effectively used proprietary EHRs will tend to accommodate their networked counterparts more readily. A successful history with information technology-related innovations, such as hospital web sites, online interaction with payers and online research, has also conferred superior absorptive capacity on some hospitals.

Finally, Fleuren *et al.* (2004) found that, as with other organizations, structural and cultural factors determine adoption and implementation of innovations by hospitals. In particular, their research found that structural factors such as decentralization and reward structures were key determinants. Cultural factors such as norms of participative decision-making and inter-departmental collaboration were also keys.

Strategic suggestions for hospital leadership

Successful treatment of emerging opportunities in networked EHRs will require strategic management on the part of hospital leadership. Administrators will need to decide when to join an EHR network. They will also need to decide whether they will create new services from the technological innovation and, if so, which ones. Effective implementation of changes stemming from EHRs will necessitate effective organizational learning experiences as well. Attention to the social impacts of changes in workflow will also increase the likelihood of successful adoption of EHR-based innovations.

First movers in EHR-based innovations face the greatest risks and the greatest potential returns. Entering the network early advances a hospital up the learning curve ahead of rivals that enter later. However, the value of the network is shaped by the number of participating organizations, so first movers are likely to join the network as a set rather than individually. First movers will also be likely to seek some assurances that the network's infrastructure and standards will be the dominant format for the industry over the long haul. Investment in a network that becomes obsolete as a consequence of the emergence of a superior network would be a costly detour en route to successful use of EHRs. To enjoy the greatest benefits of

participation in a community-wide EHR system, hospitals will need to develop new services. New services that eventually satisfy the needs of markets for old services will be competence destroying for the capabilities underlying those services, creating opportunities for providers of the innovative services to capture market share. While less dramatic, applying EHRs in a competence sustaining manner by using them to enhance existing services will also help a hospital improve its competitive position and attractiveness to physicians.

The odds of successful execution of EHR adoption will be enhanced by concerted efforts to promote organizational learning. Promoting experiential learning with EHRs, facilitating user groups among staff members to share their insights concerning EHRs, and formalizing approaches to effective EHR use will advance the organizational learning process. Consideration of the social system consequences of EHR adoption will also increase the odds of successful implementation. Innovation adoption in health care and other industries is influenced by social support for adoption and opportunities to model the behavior of others adopting the innovation (Fleuren *et al.*, 2004).

Illustrative case: Santa Barbara County

To date, the number of communities that have adopted EHR networks is insufficient for rigorous testing of the competitive balance consequences discussed here. Nevertheless, such networks are beginning to emerge throughout the USA.

Landro (2004) identified five communities that have implemented EHR network technologies. One of these communities, Santa Barbara County, has emerged as a leader in the effort towards broad adoption of community-wide EHRs.

In Santa Barbara County, California, 280 physicians have formed a network to have internet access to patients' real-time clinical information such as test results, X-rays, radiological reports, specialists' voice recordings, clinical notes, and drug information (McGee, 2003). This data helps physicians make more informed decisions regarding treatment and potential drug interactions. Although this collaboration is seen by many physicians as beneficial for the community, many concerns have been raised with regard to losing patients to competitors.

The case of the Santa Barbara County Care Data Exchange illustrates the impact that networked EHRs can have on the basis of competition and thereby impact competitive positions. McGee (2003) contends that a change in the "competitive mindset" is needed before a major move toward the sharing of clinical information will take place. This change in mindset involves focusing on quality of care rather than patient information/data as the basis of competition. One health care executive refers to this as competing at the "end of technology" rather than "with technology" (Morrissey, 2001).

As the number of communities with networked EHRs increases, it will be interesting to see how effectively the various factors identified in this paper explain the competitive balance implications of this innovation. At this stage, anecdotal evidence indicates that health care administrators are concerned.

Conclusion

In conclusion, EHR networks are an important exogenous innovation in the health care industry. There are a variety of organizational characteristics and strategic actions likely to influence which hospitals are able to exploit the opportunity EHR

networks present to improve their competitive positions. Hospitals with dynamic capabilities, absorptive capacities and organizational designs conducive to innovation will tend to benefit most. Strategic management of innovations in EHR networks will be essential for competing effectively in the healthcare industry. Hospital executives will need to time their adoption properly, create new services with the technology, and effectively manage the social and organizational learning implications of the technology.

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