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ACHIEVING COMPETITIVE ADVANTAGE THROUGH INFORMATION TECHNOLOGY

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Abstract

Information technology has begun to alter fundamentally the manner in which organizations do business. In the information age, the organizations that survive will be those which develop strategies for using information technology (IT) to provide sustainable competitive advantage. This paper discusses changes in the business environment that require new ways of thinking about information systems. It identifies both desirable attitudes and pitfalls in planning IT for strategic advantage, and describes a process for formulating such an IT strategy.

Introduction

Federal Reserve Chairman Alan Greenspan was recently quoted as saying, "Information technology has begun to alter, fundamentally, the manner in which we do business and create economic value . . . [contributing to the] greatest prosperity the world has ever witnessed (Melloan, 1999, p. A27). Greenspan further stated that these technologies did not "just happen, they were incubated," and that how this occurred provides important lessons for organizations.

An information system that is intended to achieve sustainable competitive advantage applies information technology (IT) to the strategic needs of the organization. This information enables the organization to offer products or services that are of value, that are rare, that cannot be imitated easily, and for which no real substitute exists (Barney, 1991).

Few would argue that the information systems (IS) of today are powerful enough to aid in gaining a sustainable competitive advantage. Organizations now have the opportunity to gather operational and external data and manipulate it in ways that can transform the data into the basis for solid decisions. But to do this requires the transformation of data into information and the evaluation of that information using the judgment of a decision maker. IS have the capability to take data, the raw material of doing business, and synthesize it in a fashion that develops useful knowledge. Then this useful knowledge can then be applied in decision making.

This paper describes ways of incubating information systems that provide sustainable competitive advantage. It discusses changes in the business environment that require new ways of thinking about information systems. It identifies both desirable attitudes and pitfalls in planning IT for strategic advantage, and describes a process for formulating such an IT strategy.

The New Environment for Information Systems

The need to improve competencies in the area of IS are being driven by a combination of interacting factors. They include instantaneously available global information, accelerating technological innovation, worldwide deregulation and privatization, and the opening of markets and competition (Linkow, 1999). Elaborating on these factors, Cortada and Hargraves (1999) described how IBM and other firms are moving into the "networked age." In the chapter "How the Rules of the Game Are Changing" these authors list multiple themes that are now defining the game of commerce. Table 1 summarizes some of the Curtada and Hargraves themes as characteristics of a new environment for IS. This table suggests what we should expect and, therefore, how we should mold our IS to accommodate commerce in the future.

Table 1. The New Environment for IS

1. Time- and location-independent commerce
2. Low barriers to market entry or exit
3. Global accessibility to information via networks
4. Increasing consumer power; i.e., the consumer will order and schedule production and delivery
5. Consumers will use multiple channels--digital and traditional
6. More detailed customer segmentation; e.g. by disposable income or by technological astuteness
7. Firms will be more precise in targeting consumers

The existence of global information networks changes the nature of commerce for both consumers and for business. Business-to business and business-to-consumer e-commerce is conducted without regard to the locations of the parties to a transaction. Consumers are no longer limited by remoteness or by difficulty of communication. They can compare price and availability through traditional distribution channels with those through global networks. Because of the ease and rapidity of using computer networks, consumers can communicate their desires to sellers, and when purchasing, schedule production and delivery.

Businesses using e-commerce, on the other hand, are able to gather more information about their customers. This aids in their marketing by allowing them to segment markets more specifically and to more precisely target customers with ads and promotions. However, opening a business on global computer networks is much easier than establishing a brick-and-mortar business. Thus any business engaged in commerce in this new environment face increased competition because of this ease of market entry.

To be competitive in this new environment, managers must address the development of IT applications in different, more innovative ways.

New Ways of Thinking About Information Systems

Executives and managers are often overwhelmed by IS and IT. The amount of available information is but one of the problems. The increased speed of technological change in IT is outpacing the ability of most organizations to research, evaluate, test, install, and use it for competitive advantage.

Decisions are merely sets of choices under varying degrees of uncertainty. Knowledge is useful in decreasing uncertainty. But information and knowledge are not enough; to attain a sustainable competitive advantage, IS must retain the right knowledge until the right time and then communicate it to those who can use it. Indeed, it seems few understand these relationships well enough to develop truly useful information systems.

Lundeberg and Sundgren (1996) suggested that we are not gathering the right data for true strategic IS. They further say that it is impossible to map out all information that might be required because of the rapidly changing requirements. In a classic work, Rockart and Treacy (1980) pointed out that executive decisions are by nature ever changing and non-repetitive. Others (Baron, 1999, Flanagan and Safdie, 1999, Hackney, 1997, Inmon, 1998, and Pendse and Creeth, 1998) have suggested that business intelligence applications are now possible using data warehousing and on-line analytical processing. These are good technical solutions, but they are not solid foundations upon which to base decision support systems. In order to implement them for sustainable competitive advantage, IS need to capture the right information and provide design flexibility. This requires creativity in identifying ways to use information for management decisions.

Goleman (1998) said that emotional maturity and soft skills play a greater role than intelligence in eventual success. Two characteristics, the ability to manage one's self and the ability to handle relationships are requirements for directing IS development.

As Andrew Carnegie once said, "The only irreplaceable capital an organization possesses is the knowledge and ability of its people. The productivity of that capital depends on how effectively people share their competence with those who can use it" (Cortada and Hargraves, 1999, p. 82). Without the commitment to generating and sharing knowledge no IS will insure a competitive edge. This commitment is the starting point of all strategic IS. Hruby (1999) said that an organization today can use "garden-variety" decision, information, material, process, and telecommunications technologies to beat their competitors.

However, the management of those new technologies will transform how an organization does its business. That transformation can and will be difficult for an organization; management then becomes the initial key to a successful IS.

Marshall (1998) said that managers fail because they don't properly execute management fundamentals--selecting, directing, evaluating, and rewarding. So regardless of the IS guidelines and directions developed in any IS project, people and processes must be managed effectively. The next sections identify some ways to exploit human capital in order to gain the full potential of IS application.

Avoiding Common Pitfalls

One difficulty in structuring new IS applications in decision-making results from individual preferences and modes of operation. Everyone has developed frames of reference, contexts, histories, and educational experiences that can lead to bad decisions. These limit our ability to use information technology (IT) in innovative ways. Table 2 summarizes some of the traps that keep managers from the realizing of the full impact of IS on decision making.

Table 2. Common Limits to Innovative Thinking

1. **Anchoring**. Past events often form our preferences.
2. **Status-quo.** We believe we make rational and objective decisions, but in reality we have an bias toward perpetuating the status quo. The more choices, the stronger the pull of status quo.
3. **Sunk-cost**. We often hesitate to acknowledge our own mistakes.
4. **Desire for confirmation**. We often choose to listen to only what we want to hear.
5. **Framing**. The way a problem, opportunity, threat, or situation is presented defines how we look at the problem.
6. **Accurate perceptions.** Extremes, recent events, and preferences get too much attention.
7. **Over or under confidence.** Confidence is formed by our perceptions of experiences.
8. **Conservatism**. We often prefer an approach that we know will work.

All decision-makers evaluate new decision situations based on their prior experiences. Many consider this as the source of the judgement on which many decisions are based. Yet relying on prior occurrences tend to limit a decision-maker's ability to think differently or to explore new possibilities. This leads to choices that maintain the status quo, or that the decision-maker knows with produce satisfactory, but not innovative, solutions.

Sometimes prior experiences can lead to inappropriate levels of confidence or to perceptions based on extreme, but unlikely, possibilities. Often a decision-maker's preferences are too heavily influenced by how a situation is encountered or described. Furthermore, decision-makers frequently hear what they want to hear, or hesitate to acknowledge that mistakes occurred so they can be corrected.

Managers, when developing IS for strategic competitive advantage, should recognize these limitations to their own modes of thinking and decision-making. To avoid these common pitfalls one must exercise an extremely disciplined approach to judgements. Managers do this by listening objectively to others and considering possibilities that are outside our preconceived notions. One of IS' greatest potentials lies in helping organizational leaders make more rational decisions by pointing out biases and alternatives outside of their norms.

Just as some ways of thinking should be avoided, innovative use of IT requires the cultivation of certain desirable attitudes.

Desirable Management Attitudes

The issues that really matter in using IS for competitive advantage are not technology, speed, connectivity, nor hardware and software. Rather, they entail using IT to achieve a shared commitment of the institution's members to the satisfaction of needs of its stakeholders. These issues include achieving continuous improvements, incorporating new features that meet changing needs, and implementing systematic innovation in order to satisfy customers' perceived and expressed values. In each of these areas, information from outside of an organization matters more than information from inside it. Yet, current IS capture mostly inside information.

As Gordon (1999) said, "While knowledge management operates via computer systems, it isn't about computers--and it can't be if it is to be effective… We know people want the information they need to be successful, but information isn't useful to them if it's too complex or if it gets in the way of doing the job (p. 33). The gap between techno-hype and reality grows more obvious every day… We can't let our jobs be designed by software engineers (p. 38)."

Peter Senge observed, "The difference between a technology investment and a learning-organization investment is that people are more comfortable investing in physical capital than in human capital" ("Why Organizations Still Aren't Learning", 1999). CEO's must be convinced that sound investments lie with people and a solid IS infrastructure--not just plant and equipment. The comments of Jacobs and Whybark on enterprise resource planning (ERP) systems apply to IS in general:

In addition to the technical details, the way the hardware and software are organized, and technically how the logic of the system functions, there is another aspect to understanding ERP. It is the management and implementation issues associated with the systems (p. vi-vii). . . . The software doesn't manage-- the people do (p.16). . . . You need to solve the management problems and get the relationships between functions sorted out before you can fire up the system (Jacobs and Whybark, 2000, p. 12).

What are the management principles to be followed to insure that strategic development is directed toward using IS tools for gaining and maintaining a competitive advantage? Some of these are presented in Table 3.

Table 3. Management Attitudes Contributing to Successful IS

1. An understanding of individual and organizational **frames and biases** as a way to expand alternatives.
2. A commitment to usefulness that is defined by **customer-centered functions** rather than technology centered applications.
3. Understanding the overriding necessity for gaining a **shared commitment** to an organizational purpose that places the ultimate value on the human capital.
4. Building **human resources systems and policies** that support the hiring, training, and rewarding of those who enable rapid change, innovation, and meeting changing customer needs.
5. A desire to create **systems that measure** of the ability to rapidly meet changing customer needs. (that which is measured will improve.)
6. Understanding that **relationships and discipline** are keys to successful management. (applies to constituents-- organizations, self and all human resources.)
7. Showing **flexibility** in awareness, perspectives, and alternatives. Flexibility is the key to survival.

No IS will contribute to a sustainable competitive advantage without recognizing in its design the human resources, customers, relationships and ability to change. The objective in IS design is to provide an IS that supports these overriding managerial essentials. Managers must recognize the need to shift emphasis from the management of stability and control to leadership directed toward speed, empowerment, flexibility and continuous improvement.

Furthermore, these IS designs should be directed toward enabling product, service, administrative, process, managerial, and organizational innovation. The power of information systems enabled by new technologies makes management to these ends especially critical for organizations to become and remain innovative; indeed, even for organizations to survive. Information systems must be flexible enough to be adaptable to changes in the organization's management and its environment.

Changes in information technology have led to successful IS implementations for some organizations. However, using recent technology for information systems does not guarantee success. And many important innovations relating to information systems for competitive advantage are mundane, involving no breakthroughs. All information innovations have the potential of providing competitive advantages, and should be viewed as critically as major technological information systems changes. How do managers take advantage of the "hi\low\no\tech" IS's promised potential? Managers start by formulating an IS strategy for competitive advantage.

Identifying IS Strategies for Competitive Advantage

A strategy that allows organizations to achieve an IS's potential is developed according to the steps described in Table 4.

Table 4. Formulating an IS Strategy for Competitive Advantage

1. Identify all information used in an organization value chain--or value chains.
2. Identify potentially relevant information technologies in other industries and under scientific development.
3. Determine the likely path of change of key information technologies.
4. Determine which potential information technologies are most significant for competitive advantage.
5. Assess a firm's relative capabilities in important information technologies and the cost of making improvements.
6. Select an information technology strategy that reinforces the firm's overall competitive strategy.
7. Reinforce business unit information technology strategies at the corporate level that support the overall corporate information technological strategy.
8. Insure that IS and IT strategy support organizational unit strategies and fit organizational capabilities, resources and needs.

These steps are not easy or quickly accomplished. They require understanding how the organization adds value to its customers and knowing the information necessary for achieving these objectives. They require sensitivity to the directions of technological change and to implementations of technology in other industries. To implement them, management must think creatively about how new technologies may contribute to the achievement of corporate goals. Most importantly, implementing them requires that any technological change be managed to support the organization's needs.

The above steps for formulating an IS strategy require the implementation of a consistent reward structure. All too often, management says one thing and rewards another. Managers often say they want quality and profit, yet we pay for production and sales. They preach the need for service, but measure work by number of customers handled or the length of the customer service phone call. They seek long-term profits, but manage and control by quarterly earnings. They talk about the need for innovation, but punish failure. Management's commitment to continuous innovation and change must be shown through its reward systems.

Regardless of the industry or the circumstances, getting the right people to identify the right problems is more important than determining the correct answers. So rewards must be geared toward identification and not necessarily toward solution. To help this process, an IS designed for strategic advantage must have the ability to capture, store and retrieve volumes of information from customers and potential customers.

Conclusion

Creating and spreading knowledge among the members of an organization is the essence of innovation (Sherman, 1996). The basic requirement for the creation and spread of knowledge is information. IT offers the ability to capture information from internal and external sources and the ability to categorize, maintain and update the captured information, until, finally, information becomes useful knowledge. IBM's Louis Gerstner once said, "I start every day with customers, but this is an industry that starts ever day with technology . . . [because] the customers are changing the way they're thinking about information technology (Schlender, 1996: p. 108).

This paper has discussed the need for new approaches to choosing applications for information technology. It has suggested that, to achieve competitive advantage for an organization, IS should be grounded in managers' needs for information rather than resulting from technological change. An organization's IS must be managed with clear direction and consistent reward structures. The paper has suggested guidelines for identifying and implementing such information systems.

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