



Linking technology management, transaction processes and governance structures

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Abstract

This paper links technology management, transaction processes and governance structures so that managers in firms may understand the various links involved in the management of technology and by understanding these links, may be able to interact in a more competitive manner in a changing economy. It does this from a wide perspective. Of all the influences in an organization's environment, technology is the key factor that may provide competitive advantages. Technology may provide managers with opportunities to gain competitive advantage over competitors, but technology management in firms is linked to other factors. The interlinking of these other factors is what brings firms competitive advantage. Some of these factors include management styles giving rise to alternative means of technological sourcing, knowledge management, organizational learning and relationship management, etc. This is the first time this meta-model has been proposed.

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1. Introduction

Globalization, technology and the new economy are creating waves of change and uncertainty. Old ways of doing business become obsolete and the rules of the game change at a bewildering rate. Toffler (1980) speaks of the third wave of technology that will alter the way firms function. The third wave rests upon the pillars of information, technology and knowledge. Toffler speaks of a source of power for the third wave, which arises from ideas, information and knowledge, where knowledge and application of ideas creates a pace of change. Technologies evolve and change daily. The business world is flooded with technologies. Technologies are implemented in design, operations processes, manufacturing, administration and management. Firms attempt to synchronize operations from front to back office with technology being the glue that facilitates the flow of information and knowledge through the firm. Toffler (1970, p. 37) says that if technology is to be regarded

as a great engine then knowledge must be regarded as its fuel. Synchronization of information flow and knowledge transfer within the firm and between strategic partners may create competitive advantages. Toffler (1970, p. 136) adds that "(i)nformation surges through society so rapidly, drastic changes in society come so quickly that newer, even more instantly responsive forms of organization must characterize the future". The availability of timely and reliable information enables firms to react quicker to market threats and opportunities. The ability to react faster provides competitive advantage over other firms. Firms adopt technologies to improve their reaction abilities and thereby improve competitiveness. Technologies provide benefits in criteria like cost, quality, speed, dependability and flexibility. These are called transactional benefits, which can be seen as either cost reducing or value adding.

Product technologies alone will not provide competitive advantages. Firms have to develop competitive advantage in transactional process through either cost reduction or value added services. Managers in firms are responsible for assessing the firm's technological needs. Managers are responsible for defining technological strategy, technological investment, technological implementations and assessing the firm's technological

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risks. Managers are faced with many challenges that affect the way in which they determine the firm's technological needs. This is as a result of the many technological profiles that exist.

Against this background this paper proposes a model for understanding the links between technology management, transaction processes and governance structures. Understanding these links may create competitive advantages for those firms that have synchronized the activities involved in these linkages. This paper encompasses the areas of technology, transaction cost economics, strategy and operations management. (It is therefore necessary that technology, transaction processes and governance structures be defined, as these terms could be defined ambiguously by different scholars.) For clarity the following definitions will be used as a basis in this paper viz.

- Day and Schoemaker (2000, p. 2) describe technology in a broad sense as the process of transforming basic knowledge into useful application. Tushman and Anderson (1986, p. 439) cites Rosenberg (1972) who defines technologies as those tools, devices and knowledge that mediate between inputs and outputs (A: process technology) and/or create new products or services (B: product technology). These two complementary definitions are used.
- Transaction processes occur through the transformation process as firms exchange goods and services. Transaction processes may be necessary to build criteria like cost, quality, speed, dependability and flexibility. Transaction processes are either cost reducing or value adding, Williamson (1981, p. 1546) characterizes transaction processes to include attributes like transactional certainty, frequency, durability and transaction specific interests.
- Williamson (1981, p. 1544) defines governance structures as the explicit or implicit contractual framework within which transactions occur (markets, firms, and mixed modes e.g. franchising). We understand this to encompass the tasks of administration, direction, or management of information flow through the organization by making decisions, suggestions, orders, etc. In other words providing the necessary leadership for the business.

Having defined technology we may say that the management of technology is associated with the application of technology for business purposes. In this paper we refer to the technology management, which encompasses the application of technology in business. Having defined technology management, transaction processes and governance structures, the linking processes may be discussed next. The rest of this paper starts with a discussion on links in general then a specific model is pro-

posed and discussed, thereafter the paper is concluded with relevant lessons for managers.

2. The linking processes

Technologies can be seen as part of larger systems. Larger systems consist of technologies ranging from complex to simple. Tushman and Rosenkopf (1992, p. 325) propose four types of technological products/systems ranging from complex to simple viz.

- Open systems are the most complex form of technological systems. These systems are composed of a set of closed systems that are linked together through interface technologies.
- Closed systems are the set of subsystems of open systems having a clear boundary unlike open systems. These closed systems are linked to other closed systems and may form 'islands of automation'.
- Simple assembled products exist through processes, materials and/or product substitution. This is the most primitive form of technological progress. These can be likened to standalone automated machines or equipment. They exist on their own or are part of a closed system or an open system.
- Non-assembled products exist either in process or materials. These non-assembled products form part of simple assembled products.

Fig. 1 shows a hierarchy of technological systems that exist in firms today. Into this hierarchy of systems, specific technologies can be inserted. Specific systems include ERP management systems, administration, design and manufacturing systems, etc. As shown in Fig. 1 technologies exist throughout the firm. Goldhar and Jelinek (1983, p. 146) say that the pressure is to integrate marketing with design, design with manufacturing and manufacturing with strategic positioning. They say that this form of integration makes other functional organizational structures obsolete. White (1996) provides a model that links manufacturing capabilities with business performance and Snaddon (1996, p. 388) identifies these manufacturing mix capabilities to include cost, quality, speed, dependability and flexibility. White (1996) links some of these capabilities to business performance. Some propositions of the model are discussed next viz.

- The most direct relationships between manufacturing capabilities and business performance is through conformance quality, delivery speed, dependability and product flexibility, which leads to higher profitability as a result of lower costs.
- The firm's performance on manufacturing capabilities will influence market share.

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