External dependence of the organization: Causes and effective response

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Abstract
Organizations can manage external dependence by establishing favorable external linkages and introducing changes in organizational design. This study analyzes from a theoretical perspective how changes in technology and consumer preferences can promote a firm's dependence on external agents such as external firms and customers. The analysis is focused in main three objectives: first, finding a relationship between the changes in technology and the firm's dependence on external actors. Second, to find a relationship between the changes in consumer preferences and the firm's dependence on external actors and third, to find out the way the firm should respond to the change according to these environmental factors. The study concludes that firms with flexible organizational design are well equipped to cope with environmental changes. Firms not only need to access resources and capabilities from external organizations, but they also need to include their customer's knowledge in product design and development process.

Keywords: external dependence; technology; consumer preferences; flexible organization; changes; environment.

JEL codes: O17, L38.
组织的对外依赖：
原因与有效应对

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文章摘要
组织可以通过建立有利的对外联系和变更组织设计来管理对外依赖。本项研究从理论角度分析技术和消费者偏好的变化如何可以推动企业对外部代理的依赖，例如外部代理商和消费者。分析主要有三个目的：一、找出技术变化与企业对外部因素的依赖的相互关系。二、找出消费者偏好的变化与企业对外部因素的依赖的相互关系。三、找出企业如何应对这些环境因素导致的变化。研究发现拥有灵活组织设计的企业能够充分地应付各种环境变化，企业对外部组织的依赖不仅是为了获取资源和能力，而且还要包括其消费者的知识在产品设计及发展过程当中。

关键词: 对外依赖、技术、消费者偏好、灵活的组织、变化。

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1. Introduction

Technological advances, globalization and intense competition have increased the importance of strategic alignment of organizations and their environments (Lewin and Stephens, 1993; Cummings and Worley, 2014). Dijksterhuis et al. (2005) describe the need for managing the environmental turbulence that firms face. In the process of environmental adaptation, organization design has been considered as an important source of change (Burns and Stalker, 1961; Lorsch, 1977; Raisch et al., 2009). As “environments do not stand still for organizations to catch up (Gho-shal and Nohria, 1993: 24), traditional mechanistic or static organization is losing ground in favor of a dynamic, organic or flexible organization”.

Contingency theory of organization design takes environmental conditions as the primary cause of changes in the internal organization of the firm. Environments rarely are stable and predictable (Williamson 1991: 278). Environmental uncertainty triggers adaptation which is the central problem of economic organization (Jones et al., 1997). The challenge for management is to design and redesign organizations through adaptation to existing environmental contingencies. However, adaptation to existing environments doesn’t explain the dynamics of continuous learning and adjustment in an organization. Continuous learning enables the organization to handle uncertainty by improving effective search rather focusing only the best practices. An organization’s ability to handle uncertainty refers to its adaptive capacity. Adaptive capacity, as described by Parsons (1964: 340), is a search process that enhances the “ability to survive in the face of its unalterable features ... the capacity to cope with ... uncertainty ... and unpredictable variations”. Adaptation reflects equilibrium-seeking behavior and maximizes fitness to existing conditions while adaptive capacity refers to the ability to cope with unknown future circumstances (Staber, 2002). Adaptive capacity enables the firms to reconfigure themselves in face of a rapid change in environment, and makes possible to replace new routines with the older ones when it is necessary (De Pablos-Herédero et al., 2015). Organizations with high level of adaptive capacity exhibit dynamic capabilities (Teece, 1997) and avoid structures that are too well adapted to specific circumstances, unless there is some reassurance that these circumstances will never change (Staber, 2002).

This study emphasizes that organizations need serious managerial interventions to respond environmental changes. If environmental variations require the firm to adopt a flexible organization, it will need many managerial initiatives regarding; internal focus to external linkage, learning-unlearning to new learning, routine to non-routine and new routines, competence trap to new competence building, and changes in organizational culture. In response to environmental change new organizational forms arise as a joint outcome of managerial actions that are shaped by shared managerial schemas and environmental developments (Dijksterhuis et al., 1999; López Berzosa et al. 2012). Working on some specific environmental factors might be interesting to examine the influence of change in environment on the firm.
This study picks technological change and change in consumer preferences from the environment of organization to conduct such examination. Advances in information technology have facilitated the easy and low cost access to information. Today’s consumer is well informed and changes rapidly his/her preferences. This study argues that the change in technology and consumer preferences may cause a firm’s dependence on external agents such as external firms and customers, and suggests that the firms can manage external dependence by establishing favorable external linkages and introducing changes in organizational design (Kotter, 1979; Fogliato et al., 2012). The study assumes that the firms with flexible organizational design are well equipped to cope with environmental changes. Using insights from organizations theory and capability approach of Resource Based View, the main objectives of this study are: First; to find a relationship between the changes in technology and the firm’s dependence on external actors Second, to find a relationship between the changes in consumer preferences and the firm’s dependence on external actors. Third, to find out the way in which the firm should respond to the change in these environmental factors. The rest of the work is organized as; 2 discusses the environmental change in the context of technology, and consumer preferences, section 3 examines how the firms should respond to external dependence, and the final section presents conclusions and implications.

2. Change in environment and firm’s dependence on external actors

Economic and market circumstances, customers, technological innovations and other organizations make up an organization’s environment (Gibson et al., 2006). State legislations, political, social and cultural conditions also form the part of an organization’s environment. Among many environmental factors, this section is concerned only with technology and consumers to analyze how the changes in technology and consumer preferences create the firm’s dependence on external actors.

2.1. Technology

The importance of technology has long been recognized in economic history. Adam Smith’s improvements in machinery and the technical innovation in Karl Marx’s model of capitalist economy acknowledged the role of technological improvement in economic growth. Since Schumpeter (1934), there has been a lot interest in studying technology at industry and organization level. At industry level, important contributions come from Brittain and Freeman (1980), Astley (1985) and Barnett (1994). During 1960’s, organization theory research introduced some specific technology concepts as Technical complexity by Woodward et al. (1965), Uncertainty-Interdependence by Thompson (1967) and Routine-nonroutine by Perrow (1967). Later contributions are from Chandler (1977), Burkhardt and Brass
Technological change deserves a central role in any organization theory (Tushman and Nelson, 1990) because it has a great potential to affect structure, shape interaction and influence the personal characteristics of organization members. A change in technology alters the competition basis of an industry because of the change in industry’s core assets (McGahan, 2004; López Berzosa et al., 2012) which will change the task interdependence within and across firms, requiring a corresponding change in their structures. Technological advances reduce the importance of those structures which were formerly designed to coordinate the activities within and across firms. Technological innovation may be incremental and/or radical. Henderson and Clark (1990) describe incremental and radical innovation as: Incremental innovation introduces relatively minor changes to the existing product, exploits the potential of the established design, and often reinforces the dominance of established firms. … [While] Radical innovation, in contrast, is based on a different set of engineering and scientific principles and often opens up whole new markets and potential applications. … Radical innovation often creates great difficulties for established firms … and can be the basis for the successful entry of new firms or even the redefinition of an industry.

A change in technology is incremental or competence-enhancing if it can be exploited through the existing capabilities (Afuah, 2001) of the firm, while a change is radical or competence destroying because it can suddenly make existing skills and capabilities obsolete (Pisano, 1990). Biotechnology is an example of competence-destroying technology because the existing firms in pharmaceutical industry did not possess the necessary skills to exploit the benefits of this technology. Biotechnology required the existing firms to conduct their research and development by establishing joint ventures—formed in the United States between 1976 and 1982 (U.S. Office of Technology Assessment, 1984). An examination of the behavior of the existing pharmaceutical and new biotechnology firms has important implications to understand the capability differences and firm’s dependence on external actors. A simple explanation is that innovation in biotechnology required the pharmaceutical firms the capabilities which they didn’t possess. So, they were dependent on biotechnology research firms for new pharmaceutical developments. They needed to establish partnerships with biotechnology research firms to access their capabilities and combine them with their own ones. This radical innovation drew a straight line of difference between the capabilities of established pharmaceutical and new biotech firms. It was not possible for pharmaceutical firms to develop full range of required capabilities under one roof (Powell et al., 1996). Further, it can be explained as; the existing firms in pharmaceutical industry had better capabilities for commercialization of new products than the new biotechnology research firms, while new entrants had better R&D capabilities in biotechnology than the existing firms. Why did the established firms not decide to conduct R&D in biotechnology in-house and why did the new entrants not involve in commercialization of new products? It is because the development of new capabilities which are different from the knowledge and skill base of a firm are costly in rapidly evolving high technology industries (Barney, 2001). Further
explanation of this phenomenon can be attained from the knowledge based theory of the firm which looks the existence of firms as to generate, combine/recombine, and exploit knowledge (Nonaka, 1994; Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1996). The knowledge base explanation of this phenomenon is that tacit knowledge embedded in an organization’s routines is difficult to duplicate (Afuah, 2001) because it is attained through strong personal skills, experience and learning by doing (Polanyi, 1962; Nonaka, 1994). Even it becomes possible for one to explain all of one’s knowledge, cognitive limitations (Afuah, 2001) will not permit others to absorb it. Transaction cost economics also explains the situation by looking at the trade-off between the transaction costs of using market or organization (Coase, 1937). The rational decision in transaction cost economics is to realize a transaction where the transaction cost is low. Imagine the whole situation in which a radical technological change makes the existing capabilities of firm obsolete and it is costly to develop these capabilities in-house, and that the new knowledge is sticky which requires frequent interaction to “unstick” (Von Hippel, 1994). It looks almost impossible that a firm will be able to exploit new technology based on its existing knowledge and capabilities. So, hierarchy is unable to handle this situation. Market transaction brings together the faceless buyers and sellers (Williamson, 1979) which entails limited personal involvement and makes the markets a poor device for learning and the transfer of technological know-how (Powell et al., 1996). In case of biotechnology, knowledge is quite complex and multidisciplinary (Rosenberg, 1993) which required the interaction and cooperation among independent firms to exploit complementary resources (Arora and Gambardella, 1994; De Pablos Heredero et al., 2014). A firm may lack capabilities necessary to develop a complex product even when the change in technology is incremental, not radical. High-value, engineering and software-intensive products, systems, networks and constructs like jet aircraft, air traffic control systems, telecommunications networks, intelligent buildings and flight simulators, have been named as Complex Product Systems (Hardstone, 2004). A similar term complex system has been used in Tushman and Nelson (1990), almost in the same sense applied by Hardstone (2004). Tushman and Nelson have used the telephones and power generation as examples for complex system which, according to them, are made up of multiple discrete and associated linkage mechanisms. Tushman and Nelson emphasize on the conceptualization of complex products as systems made up of core technologies and associated linkage technologies. As both core and linking technologies have their own technological trajectories (Tushman and Nelson, 1990), a high number of relevant domains of knowledge and areas of capability (Hardstone, 2004) will be required for the development of complex products, which are not possible to be accumulated in a single firm. Hardstone (2004) describes this situation as; –It would be unlikely for a single firm to have within it all the bodies of knowledge needed to produce a CoPS, hence the prevalence of the network form of organization amongst firms undertaking CoPS projects. CoPS producers might therefore be thought more likely to form strategic alliances, joint ventures or other forms of collaboration than to move toward internal integration.
The development process of CoPS is extremely complex because it involves various distinct components, knowledge and skills which come from a large number of firms. The integration of these components, knowledge and skills further needs a very high degree of expertise which is less likely to be found in a single firm. As Hobday (2000) writes; “In modern aircraft … a wide variety of skills embracing new materials, software technologies, fluid mechanics and communications systems need to be mastered … The need for elaborate systems integration can expand the variety of skill and engineering inputs far beyond the competencies of even the largest individual producers and dictate that they work closely with specialist firms to produce the final system. In some cases, project completion depends critically on knowledge embodied in key individuals and groups, recognized for their abilities”.

2.2. Consumer preferences

Until 1930s, many mainstream economists acknowledged that demand is susceptible to influence by producers. In 1933, Chamberlin highlighted that in the same industry many firms face different demand curves. It has important implication for demand to be considered in a firm’s strategy. Demand is not something given but it changes with the development of new products and changes in consumer preferences. As Penrose (1959: 80) emphasizes: The really enterprising entrepreneur has not often, so far as we can see, taken demand as given but rather as something he ought to be able to do something about. So, the possibility of exploiting opportunities is not confined to the production side only, but it can also be a feature of consumption side. In neoclassical view, technological innovation and its acceptance by consumer has been seen as technology acceptance process (Venkatesh et al., 2003) but the consumer's choice and his/her technical knowledge have not been considered important, and due to this short fall, it may not fully address the current market dynamics (Constantiou, 2009). Product innovation is normally originated by producers who believe that they can introduce a new product to the consumers who are ignorant of its uses. Many firms bring products into the market and inform their consumers (Kirzner, 1978: 148) about their uses. However, firms may even go into production of new products in the face of consumer resistance.

When technological innovation occurs, new product development doesn't follow a homogeneous process (Foxall, 1984: 65). Over the course of product life cycle, purchasers of new products differ from one another in terms of social, psychological, and economic characteristics. Moreover, the nature of what consumers believe is the essence of a given product often changes over time (Langlois and Robertson 1995: 97). Consumers change their preferences by adding and dropping certain attributes (Lancaster, 1980; Damm, et al., 2013). They may combine the product with another product that had been generally regarded as distinct (Langlois and Robertson, 1995: 97). For example, a mobile phone with software applications and internet services. They may also demand a component or sub product of an entire product, i.e. an
external hard disk for data storage. So, consumers’ tastes and preferences are critical to understand the dynamics of an industry and individual firms. In developing their theory of modular systems, Langlois and Robertson (1995) highlight –The nature of an industry and the extent of vertical integration therefore depend not only on which patterns of production minimize production and transaction costs, but also on which attributes consumers may wish. As a result of –bundling, –unbundling, and –rebundling various attributes of consumers, the definition of a product and the structure of the industry that manufactures it may change dramatically. It implies that the consumer’s changing attributes may affect the production behavior of the firms. For example, in case of established products with known and stable characteristics, consumer’s preferences might be considered stable (i.e. Coca Cola brands in Europe) for the products available from producers. As consumer tastes are well established for this product, firms can easily maintain the capacity to meet consumer demand. But in a situation in which the nature of product and hence consumer demand are uncertain and unstable, producers will not take the risk of investing in excess resources. The rapid degree of change and uncertainty associated with high technology industries such as telecommunications (López Berzosa et al., 2012) can affect a firm’s ability to produce and market in time the products demanded by consumers. Firms may find themselves in lack of internal capacity to meet the rapid increase in demand. This is because of high costs associated with the retention of excess resources in house to meet uncertain consumer demands. The rational decision in this situation will be to access external resources instead of increasing in house capacity. In their case study of three companies in the UK telecommunications industry, Marshall et al. (2007) find how three leading companies decided to outsource network-related implementation activities due to increasing demand and a lack of sufficient capacity internally.

In today’s environment of information technology, consumer is well informed and his/her demands are more sophisticated than the consumer of even one decade before. Today’s consumer changes rapidly his preferences in the face of new technological innovations thanks to his easy access to speedy information. Rapidly changing consumer preferences seek the firm to be capable of understanding the formation of consumer tastes and preferences, their information seeking and purchase behavior, and the diffusion of new products and ideas (Douglas and Craig 1997; Walcher and Piller 2012). Without considering consumer’s participation, producers ‘innovative ability remains limited. Penrose (1959: 81) writes: “if entrepreneurial notions about what consumers ought to like have some influence on what is offered to consumers and therefore on what they do is in fact like, or learn to like, a mere inquiry into the „state of demand will not enable us to understand the productive activity of entrepreneur and, in particular their innovating activity”. A typical analysis of demand is just an explanation of what the producers can produce and sell based on their own knowledge and ideas. Such an analysis does not provide the customers with the opportunity to articulate their own needs clearly (Earl, 1998). The separation of roles between producer and consumer (Nuttavuthisit, 2010) might be one of the main reasons of consumer resistance and the failure of new products, especially in...
high technology industries where the world moves very fast (Von Hippel, 1986). In a rapidly changing technological environment, the needs of consumers change with the improvement of their knowledge about the use of a new product, and the product attributes cannot be specified easily because they change over time (Dougherty, 1992: 78). Therefore, consumer participation in firm’s product development process—especially in case of complex product development—is of vital importance to meet rapidly changing consumer preferences. As Hobday (1998) writes; –Intimate user–producer links allow buyers to feed their needs directly into the specification, design, development and manufacture of CoPS [Complex Product Systems]. In telecommunications, for example, large user organizations i.e., AT&T influenced the innovation trajectory of public exchange systems. Successful users can be demanding and intelligent buyers, endowed with high levels of technological competence. The depth of user involvement and its influence at various stages of the innovation process is one of the critical dimensions of CoPS. Firms need to involve themselves in the community of their potential customers (Von Hippel, 1986) to understand how to specify customer needs (Dougherty, 1992) and transform tacit knowledge into articulated knowledge. For a successful introduction of new products, firms need the consumer as a production factor (Piller and Müller, 2004) to join in the process of value co-creation (Nuttavuthisit, 2010).

3. Managing external dependence

3.1. Managing external dependence

According to Kotter (1979), organization can manage external dependence by ... the establishment of favorable relationships with external elements ... [and] ... through organizational design. Based on this idea, this section argues that under the circumstance of rapid change in technology and consumer preference, firms need to establish external links and introduce changes in their internal organization.

Firms often establish their external linkages through strategic alliances. Organization theory has explained the creation of alliances among organizational actors to mitigate and manage competitive uncertainties and resource interdependencies (Nohria, 1992). Firms use alliance as a strategic device (Morris and Hergert 1987; Anderson, 1990; Katila and Ahuja, 2002) to gain competitive advantage in the marketplace, to share complementary resources and capabilities, to access or internalize new technologies and know-how beyond firm boundaries, to exploit economies of scale and scope, or to share risk or uncertainty with their partners, etc. (Teece, 1992). Strategic alliances are constellation of bilateral and possibly multilateral contracts and understanding among firms, typically to develop and commercialize new technology (Teece, 1992). There is a variety of such alliances. Manufacturing joint ventures, R&D joint ventures, co-marketing arrangements are just a few of them (Teece and Pisano, 1994). Based on the capability approach of Resourced Based
View, we argue that; in addition to having technological capabilities firms need to possess combinative and relational capabilities to establish successful external links. **Combinative capability**, as defined by Kogut and Zander (1996), is “the intersection of the capability of the firm to exploit its knowledge and the unexplored potential of the technology [i.e.] the degree of ‘technological opportunity’”. Dagnino (2005) further illustrates the combinative capability as —ability to combine in a single knowledge-ware the different kinds of knowledge which are traditionally scattered in various firms (that is, interorganizational combinative capability). When technology and consumer preferences change rapidly, firms need to develop and market in short time the new products. As time to market is short and new products are the combination of different technologies, firms, in addition to prior knowledge resources (e.g., Verona, 1999), need to develop combinative capabilities (Kogut and Zander, 1996) that enable them to synthesize and apply current and newly acquired external knowledge (Kogut and Zander, 1996; Eisenhardt and Martin, 2000).

Dyer and Kale (2007) define **relational capability** as —a type of dynamic capability with the capacity to purposefully create, extend or modify the firm’s resource base, augmented to include the resources of its alliance partner. They emphasize that resource base includes preferred access to resources and capabilities outside the boundaries of the firm. Dagnino (2005) refers relational capability as —the capability to coordinate and connect a certain number of firms in a unique system of firms. Many technologies work in connection with each other. Therefore, various areas of specialized knowledge (Grant, 1996) are necessary to be combined for the production of final goods and services. Moreover, some technologies add value as integrated systems and have a potential to cross-fertilize other technologies. Therefore, technologies may yield new functionalities when combined, regardless of whether the technologies in question have a wide applicability to many product areas or not (Granstrand, 1998). When the combination of two or more technologies creates new productive activity, these technologies are complementary technologies. If complementary technologies are embedded in different independent firms (for example software applications technology in Microsoft and cellular phone technology in Nokia) combinative capabilities are required to exploit complementarities. Parallel to the need for combinative capabilities, there is a need of relational capabilities for a successful value creation from complementary technologies. In the absence of relational capabilities firms will not be able to establish a stable coordination of complementary activities. For example, specialized firms in the production of plane engines, wings and fuselage need both the combinative and relational capabilities to construct a plane. According to Dagnino (2005) combinative and relational capabilities are highly interrelated and tightly coupled, and that the ability to couple these two capabilities in order to manage and recombine its value chain and to achieve superior performance represents the system of firm’s metacapability. Dagnino further argues that the system of firm’s metacapability augments its absorptive capacity (Cohen and Levinthal, 1990) and enhances its interfirm ability to communicate and stay connected.
Firms’ external links are not limited to the external firms. There are consumers also, whom the firms need to give attention, especially in rapidly changing environments. As Prahalad and Ramaswamy (2000) write – competence now is a function of the collective knowledge available to the whole system and enhanced network of traditional suppliers, manufacturers, partners, investors, and customers. Rapid change in technology and easy access to information, through the widespread use of information technology, are causing fast and frequent variation in consumer needs and preferences. For a successful product development and launching, firms need to establish links with their customers. According to Danneels (2002); – Customer competence is constituted by such market-related resources as: knowledge of customer needs, preferences, and purchasing procedures, distribution and sales access to customers, customer goodwill or franchise reflected in the reputation of the firm and its brands, and communication channels for exchange of information between the firm and customers during development and commercialization of the product. High technology firms, who are continuously in product development process, need to develop customer competence parallel to the development of their core technological competences. If they fail to do so, it is quite possible that their new product will not succeed. High technology firms as Microsoft and Cisco have been observed giving special attention to their customers in the development of their products. For example, more than 650,000 customers tested a beta version of Microsoft’s Windows 2000 and shared with the software giant their ideas for changing some of the product’s features. Cisco gives its customers open access to its information, resources, and systems through an on-line service that enables Cisco’s customers to engage in a dialogue. In this way, Cisco’s customers solve the problems encountered by other customers, and each customer has access to Cisco’s knowledge base and user community. Building customer competence is difficult but a challenge for the firms operating in rapidly changing environments. It is not easy for a large company like Toyota to understand the changing needs and preferences of the millions of its heterogeneous customers. To meet this challenge, firms need to –to engage their customers in an active, explicit, and ongoing dialogue; they have to mobilize communities of customers; they have to manage customer diversity; and they have to co-create personalized experiences with customers (Prahalad and Ramaswamy, 2000; Walcher and Piller, 2012).

3.2. The flexible organization

Rapid changes in technology and market conditions require the firms to shift their focus from stable state equilibrium to more dynamic and responsive organizational forms (Hamel and Prahalad, 1994; Brown and Eisenhardt, 1998). As Teece (1994) writes: “It is increasingly recognized that the dynamism of a competitive private enterprise system flows from the development and application of new technology and the adoption of new organizational forms”. Conventional organization design
Sajid Haider was primarily concerned with the task allocation and communications structures within hierarchies. Technological advances have shifted the task interdependences from within out of organizations, which have created the need for new means of coordination (Bartlett and Ghoshal, 1991). Moreover, information technology has standardized some interfaces, and has enabled managers to conduct more transactions across organizational boundaries rather than within them (Siggelkow and Rivkin, 2005). As changes in technology and market demand are faster and frequent “contemporary firms need flexible and agile organizations that can effectively function in environments of continuous and kaleidoscopic, rather than periodic and paradigmatic, change” (Bahrami and Evans, 2000).

Frequent changes in technology and consumer preferences create uncertainty, for example; technological uncertainty and consumer uncertainty (Henderson and Clark, 1990). Uncertainty limits the ability of organization to pre-plan or make decisions about activities in advance of their execution (Volberda, 1996). Organizations working in certain and stable environments can rely on classical organization design of hierarchical control to integrate the behavior of subunits, but the organizations in dynamic and complex environments are unable to rely on traditional control techniques (Gibson et al. 2006: 416). Organizations in such environments of uncertainty need the capability of high responsiveness (a dynamic capability) to take actions which are not pre-planned. In an environment of rapid and radical change, rather than choosing a planned strategy as an option to achieve control, a better option is flexibility. Flexibility requires high responsiveness of organization and sufficient managerial capabilities (Volberda, 1996; Lacayo-Mendoza and De Pablos-Heredero, 2016). According to Bahrami and Evans (2000), a truly flexible enterprise needs different offensive and defensive qualities. On the offensive side, he describes that the organizations need to be agile—a critical capability—for enabling time-based competition, facilitating rapid response, and reducing product development cycles... the ability to quickly redefine a position and re-focus in the midst of a dynamic engagement”—and versatile—the ability—to do different things and apply different capabilities depending on the needs of a particular situation. On the defensive side, he explains that flexibility—refers to qualities which enable an enterprise to endure when negatively affected by change. These offensive and defensive qualities provide the firm with—ability to do the things differently or do something should the need arise.

In rapidly changing technological conditions, firms (esp. high tech-firms) need the people with a flexible mindset and ability to adjust unexpectedly to the demands of new assignments (Bahrami and Evans, 2000; Abella et al., 2015). As the performance of knowledge-base firms depends on the capabilities and motivation of their employees, they cannot put their employees in machine-like hierarchy of pre-determined job assignments. That’s why; many high-tech firms create a versatile environment in their organizations by leveraging their workers in various capabilities, so that the firm’s situational needs could be accomplished. Empowering workers to participate in decision-making, enabling them to work in teams and linking their
compensation to the organization's performance, are the mechanisms which enhance organization's functional flexibility by providing employees with multiple skills so that they could be redeployed relatively quickly from one task to another. Firm's internal labor versatility and external flexible staffing arrangements (Houseman, 2001) help the firm to acquire and exchange successfully the insider and outsider workers in interorganizational collaborative arrangements. As Harrison (1996: 196) writes: “Today, business is operating in a world in which best practice increasingly entails vertical disintegration, downsizing, outsourcing, and formation of networks of companies in order to operate across national borders and sectoral boundaries... when we characterize the prototypical business organization of the new era as a lean and mean flexible firm, embedded within networks made up of partners and dependent suppliers and subcontractors, we are implicitly recognizing that the workplace in the new economy is, arguably by managerial intent, being systematically divided into insiders and outsiders”. Rapidly changing consumer preferences have shortened product life cycle in high technology industries New markets appear and disappear quickly. Firms need to capitalize quickly on narrow windows of market opportunity (Bahrami and Evans, 2000). Uncertain and changing user requirements require the firms to adopt innovative non-functional organizational structures to coordinate production. Moreover, product complexity, short product life cycle and short time to market often require the firm co-development of new products in collaboration with external firms and consumers. A successful collaboration with firms and customers requires a degree of openness and flexibility. A flexible structure of organization provides it with inter-organizational Leeway in supporting and sheltering new technologies or developing new products or markets, for example; co-makership, co-design, joint venture and other alignments (Volberda, 1996). A rigid and closed environment of firm can hinder a rapid communication among different and strange groups of co-workers while a flexible internal environment can facilitate a closer producer-consumer interaction, and inter-organizational resource and information sharing.

In case of complex product development, where high levels of knowledge and skills are involved, and product ambiguity (Sosa et al., 2004) hinders to foresee design interfaces a direct interaction among design teams is required to match the design. The teams designing complex products not only face difficult challenges when they need to search for and transfer technical knowledge across their organizational boundaries, but also tend to simplify and filter certain aspects of external information to facilitate internal problem solving (Henderson and Clark, 1990). In this case, there is a need to rely on flexible structures, on-the-spot decision making, and informal coordination modes (Faraj and Xiao, 2006). As Hobday (1998) writes: “For efficiency in CoPS [Complex Product Systems] projects, it is likely that a responsive, step-by-step, crafted management is needed to deal with uncertainty ... rather than the more deterministic approach The intricate demands of CoPS lend themselves to the organic approach ... rather than mechanistic, hierarchical management styles.”
4. Conclusion and research implications

The study suggests that the firms need not only to establish external links but also to bring changes in their organizational design. This is possible only when the firm has the ability to defreeze the rigidities in its learning, routines, competences and culture, and moves towards new learning, new routines, new competence and adaptive culture. This is because the frequent changes in firm's environment require a dynamic adaptive response rather than traditional environment adaptation. What we learn from this study is that the firms are in a continuous process of adjustment with their environment. Firms need to possess a high level of dynamic capabilities to respond quickly to the changing circumstances. A high level of dynamic capability will allow the firm to exhibit combinative and relational and absorptive capabilities when there is a need to establish external links. Firms with higher dynamic capabilities will also be able to practice adaptive capacity and flexibility when they need to redesign themselves for a quick response.

As the changes in environment occur rapidly, it is neither possible for the firm to develop within a short period of time the new capabilities in non core areas, nor feasible to make heavy investment for short period. It implies that firms will advance competences in their core business areas. It has an implication for future research. For example, the focus on core business areas will question the firm's flexibility and dynamism. Perhaps, it is a Partial Dynamism—partly focused and partly flexible. A firm will not be able to maintain its heterogeneity and competitiveness if it doesn't focus on some core business activities. While on the other hand it will be unable to respond effectively the environmental changes without a certain degree of flexibility and dynamism. The concept of partial dynamism introduced here, is planned to be worked out in our future research. In case of radical technological breakthroughs, there is an important implication for future research when the short run and long run behavior of the established firms is studied. As Pisano (1990) observed in case of established pharmaceutical firms in United States, that —the incidence with which established pharmaceutical companies undertook biotechnology R&D projects internally is striking. The data ... suggest that, as of 1986, established pharmaceutical firms were conducting slightly less than half (47 percent) of their biotechnology R&D projects in-house. It is quite possible that the large established firms will try to reduce dependence on external firms in the long run.

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