YOSHIYUKI NAKURA
Chuo university, Japan

TIME LENS PERSPECTIVE FOR ASSEMBLY TYPE MANUFACTURES

Abstract:

The purpose of this study is time perspective for assembly type manufacturing industry to affect the competitive conditions, which are the constraints of time and a distributed work activity, for every business involved in the value chain.

The Internet as a communication media became the industrial infrastructure that supports business activities. Business environment for enterprise activity varies substantially in a short time, became diverse business operation and unique management strategy would be feasible. It has become a difficult to adapt to the changing competitive environment. As a result, between organizations require a positive attitude for communication. A innovation is the way to solve problems. However the goal of innovation is not only to develop new products but also to create various intangible management resources, which are knowledge of the market, and technical know how.

Stimulation of this innovation is induced by feedback of information. That is, companies located downstream of manufacturing process as a user, have a knowledge of problem solving, it is likely contributes to stimulate innovation. Information sensitivity for innovation, that is the speed of information processing efficiency and selection of information are the organizational capability.

Keywords:

Time perspective, competitive environment, innovation, information sensitivity

1. Introduction

The improved network environment as social infrastructure, the increase in the velocity of circulation of information and the sheer amount of information has arrived. It is possible to engage in the research and development, which were heretofore performed independently, and can now be done quickly and efficiently using external resources. Digitalization as today's external environment has brought substantial change to the telecommunication architecture by the transformation of the concept between time and space. For example, cloud computing has become the infrastructure for social media. Cloud computing was developed to able to use collectively stored and various services of large data systems instantaneously without large individual initial investment. Social media applications have vastly altered the Internet. Previously the Internet was only a simple tool to access information and now social media applications have become the key linkage between people and organizations.

The point of view of the supply side, digitization is that feature decomposition of time concept of order such as before and after the relationship. There is an essence of digitization that technology development can copy and recombinant without being bound by the ordering. On the other hand, according to the demand side perspective, network externality services such as social media has spread in the case of the number of subscribers increasing over a certain threshold, and thus the greater benefit for users is increased at an accelerating rate.

2. Time sequence perspective

2-1. Information propagation speed by time diversification and fragmentation

It should be pointed out that the structural change of the market includes two important items. Firstly, a middle-tier emerging market has seen an explosion. To expand sales in emerging markets, it is required to respond promptly to the needs compared with developed countries, dramatically low price setting and to frequently change the market offering. Secondly, information diffusion speed has quickened and simultaneously generates uniformity and diversity in the global market.

From the perspective of the manufacturers, it has increased a choice of correspondence that means standardization, product diversification, such as market segmentation. It is understood that if standardization has penetrated, the market size will increase, but the product differentiation becomes a new challenge. It is necessary to understand the difference in the direction of choice whether the "diversification" or the "fragmentation". The diversification will be the different direction and it could signal expansion of a new market. On the other hand, the fragmentation is usually the same

direction and it could be used signify traditional techniques. Therefore, in the execution of strategy, it is necessary to understand the various time concepts that are associated with business activities. Digitization can be found the time concept of context and the Internet can be implemented to time synchronization and time integration. Geographic constraints are generally eliminated by networked information and as information propagation velocity has become sophisticated in the market of a variety of time concepts, the corporate activity has expanded globally. Information propagation speed is advanced by the networked information, the constraint is no longer geographically, and market with a variety of time concept has expanded to a global scale. In other words, a social structure was generated by synchronization of time for intellectual that can be the recombination of the information re-use and the storage.

2-2. The acceleration of business activities

Change of speed as well as speed of execution of business processes to market from development, namely it is suggested that the time derivative of the speed change, equal to the acceleration of the implementation of the strategy is the competitive advantage. The execution speed of business processes and speed of corporate activities, it is a vector concept that thought about both the direction and the magnitude. If the time axis of the market is shortened, maintaining a competitive advantage in the current business speed becomes difficult. It is necessary to change to high speed rather than the conventional speed. If the direction of enterprise changes even if speed does not change, the speed will be recognized to have changed and will be interpreted as acceleration. Such a condition can be caused by the change of market segments and innovation. Changes in this speed are the acceleration of business activities.

Reduction of social time axis of the modern industrial society will increase the uncertainty in the business activities of both current and future. This is a case where the probability of a result of uncertainty can occur is not known. It is a deviation from the state that was the targeted plan based on a pre-rationality or research and development activities aimed at innovation. In other words, from the viewpoint of the business activities, it is recognized as surplus resources.

Therefore, the magnitude of the uncertainty can be observed in the form of amount of surplus resources.

2-3. 2 Variety context in the global market

Smooth communication is essential in order to do this quickly and efficiently by using an external resource. The "context" is the basis of communication, such as "knowledge,

experience, values and logic of common language". There is a variety of different context society in the global market. High context means share of the context without effort and skill to tell, by using sympathize intention to give each other. A context is mainly formed on the basis of shared experiences and sharing time, but between low context societies, the communication would be stuck. On the other hand, the low context society is relied on the environment to increase the communication by the language. It also presents a positive attitude and high value for that language. It is important that logical thinking, expressive ability, explanatory ability, debate ability, persuasion, and bargaining power on communication. Therefore, the skills required and approach to communication is different in low social context and high context society. Experience, knowledge, values and outlook on life, ethics, history and other religions are diverse in the global market. In other words, it can be said the global market is low context society. Thus communication within it must be carried out on the assumption that “not communicates each other.”

3. Interaction of business process and organizational structure

3-1. Dual Characteristics of value chain of assembly manufacturing

According to von Hippel, Eric, (1976), Shaw, Brian, (1985), Voss, Christopher A., (1985), Ogawa, Susumu, (1998), Franke, Nikolaus and Sonali Shah, (2003), It is becoming clear that not only the manufacturer but the product users are contributing to product innovation. It is probable that assembly-type manufacturer is familiar with the market trends and end user's requirements for the upstream processes companies in the value chain such as material or parts manufacturers, measurement instrument manufacturers, and machine tool manufacturers. It is strong possibility that the value chain of the assembly type manufacturing industry has duality that is both maker and user, like Figure 1.

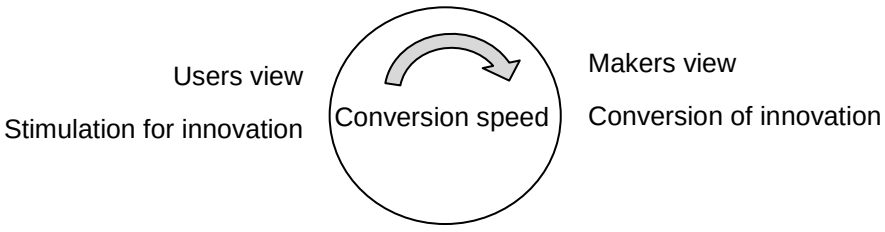

FIG 1. Dual Characteristics of value chain

It is likely that innovation is not only to generate unique product but also to create various intangible management resources, knowledge of the market and related

technologies internally. Namely, companies located downstream as users have knowledge towards problem solving are likely to contribute to innovation stimulation. The stimulation of innovation is induced by feedback of information. For this reason, information sensitivity that includes information processing efficiency and information selection speed is the organizational capability. These management resources are experience, skill and know-how. These capabilities will enable the tangible resources by acting to labors, equipment and capital. Hence these resources should be distinguished from the legacy management resources.

3-2. A vertically integrated organization versus a horizontal dispersion type organization

The way people view time differs from by cultures, as described by researcher Edward Hall.

Corporate's time concept also differs from by structures of vertical or horizontal.

According to Edward Hall, Monochronic time cultures emphasize schedules, a precise reckoning of time, and promptness. People with this cultural orientation tend to do one thing after another, finishing each activity before starting the next. In a vertically integrated organization, tend to do one thing after another, finishing each activity before starting the next step.

On the other hand, in polychronic cultures, people tend to handle multiple things concurrently and to emphasize the number of completed transactions rather than the adherence to time schedule.

A horizontal dispersion type organization could operate multiple tasks simultaneously, even not to finish each activity before starting the next task.

The organization has stable movement of constants with the structural inertia under a conventional environment therefore it is difficult to change quickly if the environmental change occurs. it becomes the cause of Inconsistencies between external environment. On the other hand, forces acting on an organization can be obtained through experience. Leaving only the concepts tied to success but throwing away the concepts tied to failure and by repeating this, the experience and knowledge of many years becomes referred to as "the dominant logic" as the robust successful experience of each company.

By writing along the passage of time the content of work from development to production assembly manufacturing are as follows: Many of the new products, the

development core of new technology in the early stages are to build in a new mechanism or material. Accordingly, it is a goal to realize the function of high added value by combining the various components. This is then transferred to the production department to design an efficient junction between the components of the product, the improvement of production technology (with the aim of improving competitiveness through quality and cost and rationalization of production).

A company is assigned the functions needed in their activities to each organization. A vertically integrated organization achieves the avoidance of the opportunity loss by internalization of profits.

When the organization structure is a vertical integration, the technical know-how will be accumulation of knowledge performed in the company and it will serve as force of inertia of an organization. It is further going to improve the activity efficiency and in the structure during the stable outside environment. To do this, the time period of work synchronizes both the post-rationality of production control technology and pre-rationality of product design technology, and to improve productivity and optimization of stock, of improving the quality and cost time period of a series of increasing the capacity utilization of production facilities and takes precedence, the speed of productization is a priority. Thus a dominant logic is created by variety of repeated success experiences. With the changes in the external environment, Priority of time concept changes to the period of investment recovery from the speed of productization attention on the quality and cost of the product.

On the other hand, in terms of a horizontal dispersion type organization, a priority of time concept is cycle of business models including sales and product maintenance. Individual products are regarded as part of the unique business model and with a time concept to the entire its business model. The essence of transition to a horizontal dispersion type organization from vertically integrated organization is not a change of manufacturing process itself, but it is the transition to the activities in a business model development from product development and manufacturing methodology.

4. The way of thinking of the value creation process

4-1. Time context of research and development

Regarding the way of thinking of the value creation process, these are the two different processes of value creation shown on figure 2, the former is engineering thinking, and the latter is bricolage thinking. One of these processes is cultivated by each company's experience and then generates a dominant logic. Therefore if the change to another value creation process, which means the opposite way of thinking, discard current logic

to recreate another at all times, there must be acceptance of a new logic. In the product life cycle, diversification of product quality, improvement of products, expansion of the product by market segment, such as the development of the successor model is carried out. Thus, in this method, it must be placed in the emphasis of order of time and context. This time concept is contextual and sequential. The task of the individual work is a separate configuration. The number of tasks is fixed with linear and has a sequential relation between times. Determined length of term, but to increase the number of tasks, it is necessary to shorten the time for each task. In general, the process for companies to promote the development is as follows:

Determining the concept previously to set the goal, by selecting the optimum solution, then to breakdown each task. This is the engineering thinking method, and in order to draw a means to achieve the purpose, while a final purpose is divided to the still smaller purpose and the selected means visualizes achieving the "purpose", it is the technique of advancing gradually and moving forward. On the other hand, a method of research results and stored in the system already exists or have been provided to the public widely, to use existing material not prepared for the specially. By using the observed experience, sense, and inspiration by the "tacit knowledge", to discover a new feature, in a variety of contexts the information already at hand, and reused as a material of different features in each case, to propose a new concept, connect to commercialization, bricolage thinking is possible to deploy without the emphasis placed order of time (context). That task is configured assuming a non-linear relationship between time and the number of tasks is advanced in parallel various tasks. Thus inevitably organizational structure also becomes flat.

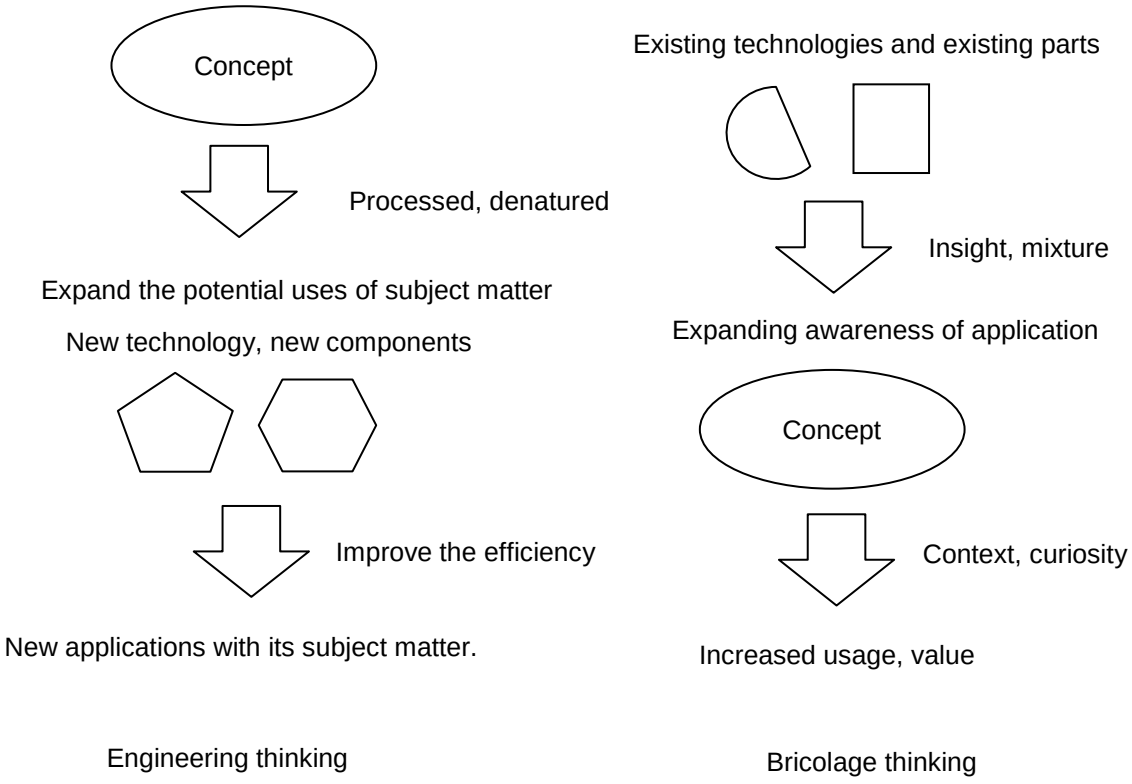

FIG 2. Two different time sequence for technology development

In technology development method based on engineering thinking, the time can be expected and performance outcomes in proportion to the time consuming, and time until the targeted value is achieved becomes a positive proportion. That is, since the time required to achieve the goals to set by way of accuracy in the approach to achieve the objective is increased without fail, efficiency by shortening time is a priority. On the other hand, in research methods by Bricolage thinking, it is not necessarily obtained results, performance in proportion to the time taken. The value of research methods by Bricolage thinking originally is not just in reduced time simply, but the unexpected result is set off, and the width of knowledge to address the uncertainty will be extended. In other words, it is to store the surplus resources to induce innovation in-house, it can be said with the prior investment in order to cope with uncertainty.

4-2. The time concept in product design

The product design is a task for structuring of function according to the results obtained the research and development. In other words, it is a task of translation to describe the assembling each component. Product design facilities will be required to structure the steps that can be migrated smoothly transition from development to production. Assembly and processing type product is a set of plurality of functions as a

basic unit, which includes some knowledge gained by research and development. The step of collectively in association with strong mutual dependency whole system is divided into subsystems of some connection with the subsystem of the plurality, go together to upper system, it will be assembled into the final product. Accordingly in many cases, the design process to gradually assemble into the final product takes a hierarchical structure. Designed such processes is made consciously to improve the production efficiency. Therefore, the interfaces between components, it is necessary to consider the interface of the organization structure for the transfer of information structured in product design. In order to replace and update the function, a modularization is introduced.

The concept of modularization is a method that can be realized by normalizing the boundary between units. B. Clark, is defined modularization as "able to build complex business processes and products by a small subsystem more functions uniformly as a whole and can be designed independently". Even modularization is to allow the time-to-market, to enhance the production efficiency, which may result in a competitive advantage, it must be pointed out problems in the modular in contrast. For example this is a problem in the normalization and standardization for promoting reuse. From its origins standards and standardization can be classified into the following three types. Standards which agreed at international conferences by government agencies, standards which agreed at industry group, and a de facto standard which is determined by the preceding companies to oligopoly in the market. From the standpoint of the decision process of standardization, redundant design criteria are adopted by each of compromise between organizations except De facto standard. Therefore achievement of the standardized interface must relinquish total optimization and efficiency of the whole system, which is necessary to allow a redundant design, otherwise redundancy. It is difficult to implement the surplus capabilities somewhere in the system, and to have the unit between the interfaces that is determined in advance. After all, at this point of view, it is reasonable to identify a surplus resource as the adjustment costs for post-rationality in a standardized interface.

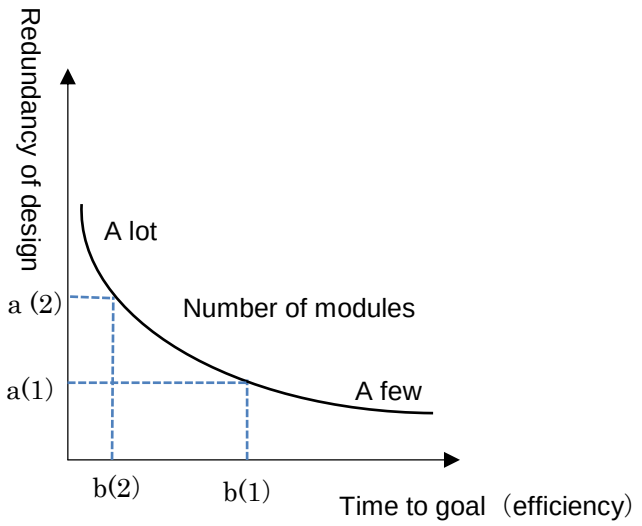

FIG.3 Trade off between time efficiency vs. redundancy

4-3. Conversion of the time concept in production technology

It is safe to say that the production technology is mass production technique of which can maximize profits and increase the production efficiency that generated by the structured functions. It is reasonable to suppose that a production system provides a mechanism for converting from demand information to product supply capabilities and a production management goal is to synchronize demand and manufacturing. It presents efficiently how to produce with high quality, which is a technology developed to create added value by low cost. Therefore optimization of the supply chain is a major challenge in the production process. Above that it is required overall optimization. Namely it should be optimized the production activities while forecast demand at each stage of the distribution channel is essential by inventory management which is a part of supply chain. Consequently it is clear that the procurement cycle of a leading to the procurement of raw materials from demand prioritize for optimization of the inventory. Furthermore, it is certain that an inventory risk increase if a product cycle becomes short.

A build-to-order manufacturing can be fixed its demand scale; theoretically inventory stock is not necessary. Method of inventory reductions called “Kanban method” or just-in-time system has been evaluated as an excellent production method. Just-in-time system is refilled when the parts are consumed as real time, and is controlled all processes are synchronized on time. In order to achieve this, the required number of good have to be always provided 100% timely, the supplier must deliver to the specified time. In other words, prerequisite of this supply chain is time synchronized according to the production plan as necessary stable, based on the demand for the leveled. However it is not a planned activity in the real production. The reasons are as follows.

From the perspective of order side, the essence of just-in-time method is the manufacturing process which delivery timing is difficult to determine until just before. In order to meet the demands of quantity from the downstream process of order side, supply side must be prospect-based production to avoid opportunity loss. Customer demand is rarely completely stable in the market; therefore it is necessary to predict the demand at every time. It is necessary to forecast demand over a long period of time when the production process is long.

Demand forecasting is planned by statistics of past data but it is not completely accurate, but a inventory stock with a margin is require, it is so-called "safety stock". This is one of the surplus resources. Repeat the supply chain on this, an downstream organization changes a data and provides feedback to upstream. it will be amplified in upper process of a supply chain, the upstream process must have larger amount of safety stock more subject to fluctuations in the larger demand. Therefore the upstream has to a large safety stock as surplus resources is required. Aspects of demand increases, the organization of the downstream side is going to increase the order quantity but in the aspect of demand decreases, downstream organization will be order stop or to compress the inventory stock by reducing the order quantity. Therefore it is reasonable that the assembly type manufacturing industry such as automobile which is in the external environment and market demand fluctuation is stable, build-to-order system becomes operational to some extent, however demand fluctuation is unstable such as electric equipment, it is difficult to manage a parts procurement by just-in-time method. In order to avoid the opportunity loss, a business model structure builds a vertical integration the fix of the supply chain, and this relationship is maintained until a major change occurred in the external environment. This situation is only stable as long as the demand is growing steadily but assembly type manufacturing industry is difficult to determine when the production planning for the market environment with frequent changes. It does not want to assume the risk of work-in-process inventory and parts inventory. Nevertheless parts that are essential to achieve differentiation should be in-house production; at least parts of the others are outsourced.

5. Conclusion

It is concluded that the surplus resources caused by changes in the external environment, could be captured in bricolage thinking of research and development, in the form of modularization of the product design and in the form of safety stock of the production. It is naturally important strategic issue whether to be optimized in these surplus resources. If the strategy is focused on the time efficiency and the smallest

possible excess resources, the stability of the external environment is required. On the other hand, in case of the external environment is changed, it is possible to reduce the amount of safety stock with promoting modularity. It could be converted to utilize resources available surplus resources by changes in the external environment that it can decompose the supply chain. During this process, the business model is changed by the decomposition of the supply chain.

After this, a new market is created. For strategic problem of how to handle the surplus resources in this manner, it is necessary to select strategies that observe the changes in the internal environment of the company and the changes in the external environment. In the process, management has to select the variety of decision-making. Regarding enhanced organization and production facilities for new product development, such as the decision-making of business investment, the uncertainty of the business environment of the future is a major problem in particular. Business environment for the future is uncertain, it is not possible to correctly grasp the future value in the practice time of investment.

If the business fell into unprofitable by changes in the business environment after implementing the investment once, by the irreversibility of investment, a company must be identified the return on investment either to give up or to find a new means to recover the investment cost. In the practice of investment, companies will be forced to decision-making very difficult by irreversibility and uncertainty. Individual products are regarded as part of the unique business model and with a time concept to the entire its business model. The essence of transition to a horizontal dispersion type organization from vertically integrated organization is not a change of manufacturing process itself, but it is the transition to the activities in a business model development from product development and manufacturing methodology. Based on above discussion, the following proposition is led. Transition to a horizontal division of labor organization from vertically integrated organization rather than changes in product process, it is the transition to the business activities mainly in a business model development from corporate activities mainly composed of product development.

The future direction of this study will be time concept is not a business process speed, but a direction of a business process model.

References

Bettis, R. A., and Prahalad, C. K. (1995). *The dominant logic: Retrospective and extension,* Strategic Management Journal, 16, 5-14.

Burns, T., and Stalker, G.M. (1961). *The Management of Innovation*, London: Tavistock Publications

Charles H. Fine (1998).*CLOCKSPEED*, Linda Michaels Ltd.

Chesbrough, H. (2003). Open Innovation: *The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press

Ghemawat, P. and A.M. Spence (1985). *Learning curve spillover and market performance,* Quarterly Journal of Economics, 100, pp. 839-852

Goldman, S,L., R.N.Nagel, and K.Preiss (1995). *Agile Competition : Virtual Organizations Strategies for Enriching The Customer*, International Thomson Publishing Inc.

Hall, E. T., (1983). *The Dance of Life : The Other Dimension of Time*, New York : Anchor Press

Hamel, G. & Prahalad, C.K. (1990). *The Core Competence of the Corporation*, Harvard Business Review, May–June 1990. Vol.68

Hammer , M. , and J. Champy (1993). *Reengineering the Corporation : A manifesto for Business Revolution*, New York : Harper Business

Henry Chesbrough, Wim Vanhaverbeke, and Joel West (2006). *OPEN INNOVATION Researching a New Paradigm*, Oxford University Press

Lieberman, M.B. and Montgomery, D.B. (1988))"First-mover advantages." Strategic Management Journal, 9, pp.41-58.

Lieberman, M.B. (1987),"The learning curve , diffusion and competitive strategy", Strategic Management Journal 8 pp. 441-452

Miller, D. and Chen, M. (1994). *Sources and Consequences of Competitive Inertia: A Study of the U.S. Airline Industry*, Administrative Science Quarterly, Vol. 39, pp. 1–23

Nakura Yoshiyuki, Oohashi Masakazu (2013). *The impact of information technology on the quality management organization in Japan*, CENTERIS 2013 - Conference on ENTERprise Information Systems

Nakura Yoshiyuki, Oohashi Masakazu (2012). *A Dilemma of Japanese distinctive Supply Chain: Assembly type manufactures case*, The 8th International Conference on Knowledge-based Economy and Global Management

Ogawa, Susumu (1998). *Does sticky information affect the locus of innovation? Evidence from the Japanese convenience-store industry*, Research Policy, Vol. 26, No. 7-8, pp. 777-790.

Perrow, C. (1967). *A framework for the comparative analysis of organizations*, American Sociological Review, 32, 194–208.

R. Roe, M. Waller and S. Clegg (2009). *Perspectives on time and the chronometric study of what happens in organizations*, Time in Organizational Research, London: Routledge, pp.291-313.

Schnaars S.P.(1994). *Managing Imitation Strategies*, The Free Press

Shaw, Brian (1985). *The Role of the Interaction between the User and the Manufacturer in Medical Equipment Innovation*, R&D Management, Vol. 15, No. 4, pp. 283-292.

Stalk Jr., G., and T.M. Hout (1990). *Competing against Time,* New York: Free Press

S.L. Brown and K. M. Eisenhardt (1998). *Time Pacing*, Harvard Business Review Mar-Apr 76(2), pp.59-69.

Von Hippel, Eric (1976). *The dominant role of users in the scientific instrument innovation process*, Research Policy, Vol. 5, No. 3, pp. 212-239.

Voss, Christopher A.(1985). *The Role of Users in the Development of Applications Software*, Journal of Product Innovation Management, Vol. 2, No. 2, pp. 113-121.

Whittington, R., A. Pettigrew, S. Peck, E. Fenton and M. Conyon (1999). *Change and Complementarities in the New Competitive Landscape: A European Panel Study, 1992—1996*, Organization Science, Vol. 10, No. 5, 1999, pp. 583—600.