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Designing the Interactive Model of Operational Strategic Factors of Production Companies- SSIM Approach

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ABSTRACT

The purpose of this research is to understand the quality of the interaction between operational strategic factors in the manufacturing firms. Given the multiplicity of strategies in the area of operational strategy, to implement or design the strategy, companies need to know the most important and influential strategic factors in the organization. In this study, nine important strategies are selected from the operation field and entered the analysis process to study their interaction type with each other. Research method is the use of SSM approach that is considered as cognitive mapping construction towards the problem. In addition, nine operations strategy factors were classified into four levels using reachability matrix (R) and the quality of the interaction among the elements with each other was identified. The results achieved in the research introduce the most effective and dependent strategic elements of an organization in the area of operations and the most important operational strategies for manufacturing companies.

Key words: *operation strategy, reachability matrix, SSIM, cognitive mapping*

Introduction

In today's world, the number of businesses has caused production companies to turn to strategic management to survive in the organization. Therefore, without business strategy, one cannot hope of preserving the business in the current competitive market. It is only with a strategy tailored to the business environment that the status in the business market can be maintained and an appropriate strategy will even be able to change the position of the company from the current position to the few first companies in its domain. After developing the strategies of a company, this question always arises that how is the implementation of these strategies in practice. What steps do company strategies, which are to provide very favorable position in the business environment to the company, have? The answer the researchers of business strategy have submitted is what is known as operation strategy. This type of strategy is outlined in line with the strategy of the company (Shelikel, 2013). To draw elements to be considered in the operation strategy, different theories have been proposed. For example, in a comprehensive study, Nigel and Louise have explained the areas of operation strategy of the organization in nine components .These nine items include quality, speed, reliability, flexibility, development and organization, process technology, supply network, capacity and cost (Nigel and Lewis, 2002). According to the study by Miguel and Lewis, if a company wants to upgrade all nine areas for its progress and achieving a significant market share of customers, it has to pay a lot of cost. It also requires a long time to run all nine areas. The basic question that arises is that in the case of implementation of operations in the company, which strategic factors is the starting point? On the other hand, despite the recognition of the nine areas of strategy, the company is confused and in many cases, the manager may see operation strategy as impossible or refute continuing strategic actions related to operations. In the current situation there are two ways for the companies; they must make all the existing strategies operational simultaneously that they often face a lack of funds and high and numerous costs, or the company totally ignores the implementation of these strategies in which case the company suffers and day by day gets close to its declining phase. This article offers a solution to resolve this crisis, based on which by step by step implementation of the strategies, the company is able to avoid the two risks and at the same time move towards the desired position with high speed. This will happen when by scientific and practical investigation, company strategies are identified and divided into a classification of non-priority and priority strategies. It will also be known for the company to operationalize company strategies with what priorities and order. Accordingly, it is concluded that at present the company needs which strategic factor more and in a comprehensive look, the effects of a strategy on other strategies is known and the most effective and the most dependent strategic factors are identified.

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Thus, research questions are as follows:

1. What are the components of the operation strategy for manufacturing companies?
2. What is the priority of these strategic elements based on their importance in practice?
3. What is the relationship between strategic factors in the area of operations (which strategy will be facilitated by the implementation of a strategy)?
4. What is the rank of each of the strategic elements based on the most effective and dependent ones on other strategic factors?

Theoretical basics and research background

Strategic Management

After the sales when the business environment begins to grow and many competitors emerge, a variety of solutions and methods have been created to have a considerable share of the market which are known as strategic management (Lima et al., 2009). Today, strategic management has been used in various areas and experts in this field have studied on it. Research in the field of strategic management is often conducted to improve the position of the organizations or companies. For example, Kim et al. (1994) offered their theory on building a new role and position on the market using data mining techniques (Kim et al., 1994). For this purpose, Kerichmer stated some of the criteria which companies observe in their strategic planning to get a high position for the organization (Kerichmer, 2009). Lima et al., offer an ideal strategic solution in order to gain a favorable position in the business environment with evaluation of the company status quo (Lima et al., 2009). Another group of studies in the field of strategic management have attempted to theorize from performance improvement angle. For example, Samson and Simpson have referred to recognizing variables and their impact on the better performance against competitors so that most variables are environmental variables that are relevant to customers and competitors (Simpson and Samson, 2008). In another study in 2010 on product strategy, some strategies have been provided to improve the company's performance in product strategy based on which the effect of three factors: cost leadership, differentiation and product-market domain on architectural and specialized marketing capabilities have been assessed and finally the final version of product strategy has been designed (Hajipour et al, 2010).

In general, studies of strategic management generally emphasize the principle that to compete companies set themselves as the best suppliers in the competition through the development and design of strategy (Ritson, 2011).

Operation Strategy

With the passage of time and the emergence of complexity in the field of strategic management, different branches have emerged in this area. One of the major branches that has many applications and is taught as a course in universities is operation strategy. Operation strategy is a part of strategy concept and must be consistent with organization's overall strategy (Asghari, 2008).

Contrary to the strategic management, operation strategy (OS) becomes meaningful in business environment, whereas strategic management is not limited to the business environment and is a general concept (Tan and Robert, 2009). A number of studies conducted in OS have tried to offer models that based on the classification by Nir and Bolton different models of OS are divided into typology and rankings (Nir and Bolton, 2008). For example, in one of the models, which is in the category of ranking research, Sam and others introduce effective innovators and differentiation factors as the most effective factors influencing OS based on structural aspects of corporates including bureaucracy, specialization and integration of sectors (Sam and et al, 2004). The models designed by Miller and Roh, which is among typology models, refers to those aspects of OS in which products, markets, products, investments and infrastructure costs are included in OS (Miller and Roh, 1994) . In another model, by studying product strategic capabilities, Xiao and colleagues attempted to model OS based on whose results, five factors are the core constituent of OS activities, which include 1- Quality customizers, 2- Low emphasizers, 3- mass service providers, 4- professionals 5- contractors (Xiao et al, 2006).

OS Factors

OS Factors are the most important part of the theoretical foundations, because they are strategic factors that have been considered at operation stage. OS Factors are, in fact, guidelines that companies use in order to implement their strategies at operation level. In other words, the items through doing which the company intends to be a leading company in its industry are strategic factors.

Reviewing baskets of OS

To find out what OS factors will help the company's excellence in the business environment, researchers have mentioned a lot factors and actually have introduced a basket of factors for OS. Nigel and Lewis know nine strategic operation factors more important than other factors. These factors include quality, speed, reliability, flexibility, development and organization, process technology, supply network, capacity and cost (Nigel and Lewis, 2002). In another study cost, quality, delivery performance and flexibility are introduced as operational strategic factors (Xiao and others, 2006). New products, after sales service, price, quality, delivery schedule, speed, cost, and flexibility are other factors of operational strategic factors that Casa and Oren have introduced (Casa and Oren, 1989).

Definition of operational strategic factors (OSF)

The researchers of strategy field welcomed the introduction of nine OSF by Nigel and Lewis and other factors by other experts, so that after their recognition, each of the factors was separately subject of studies by a number of researchers. This led to the researchers' community to identify and give importance to OSF more than before. For example, supply network that is one of the nine areas introduced by Nigel and Lewis is studied from OS perspective. Due to all these, supply network has been introduced as a medium for OS. Then the proposed model including the concept and process of OS are offered in supply network environment and its different stages have been clarified (Jafarnejad and Heidari, 2005). In another study associated with the nine area raised, three components of capacity strategy including time, size and type of capacity change have been studied and their relationship with each other has been explained (Soleiman Far et al, 2010). Olhager et al in 2009, have conducted a study on the potential capacities of the company and its impact in management and as a result a framework for managing long-term capacity has been offered (Olhager, Rodberg and Wikner, 2009). In 2010, some studies were conducted on potential dynamic capabilities of OS, which includes one of the nine components introduced by Nigel and Lewis in a way that by designing three-fold scenarios of relationship, flexibility, and existing capabilities of manufacturing companies, it is tried to future study in this field (Arafeh and Almraghy, 2011). Ming Huang and Queen Huang in a similar study have discussed the relationship between technology capability and OS operations (Queen Ming Huang and Huang, 2006).

Definition of strategy factors in the area of operations After review OSF of manufacturing companies, identifying each of the factors discussed in the research becomes important. Given that the factors presented by Nigel are more comprehensive compared to other studies, items chosen for the study are the factors presented by these two researchers that include elements of quality, speed, reliability, flexibility, development and organization, process technology, supply network, capacity and cost. The following is a brief and accurate explanation of each of these points.

Quality: The meaning of quality is the existence of features in it based on which the customer can be satisfied or dissatisfied. Due to this, high quality is not necessarily a good option, but to the extent the of customer satisfaction with the product or service the quality has been achieved. Today, the subject of quality has extended to non-product (Ivarden et al, 2006).

Speed: Due to the changes in organizations and manufacturing companies environment the need for rapid changes within the company towards the new demands of the market seems necessary, so the speed with which the company could apply changes in its output (product, service, etc.) is very important (Slack and Lewis, 2002).

Reliability: When a customer buys a product, he can have certainty or uncertainty from various aspects of the product purchased. Two of the most important of which is to ensure that the product purchased can meet their needs in the long run and that in the event of failure or malfunction could easily find the after-sales service makes the product ready to use again (Slack Lewis , 2002).

Flexibility: This refers to the changes that company can make, and this is not the concept of speed where the rapid speed of changes is important, while in the flexibility, the issue is whether the company can adapt to the changes in the environment or not. In other words, to the extent that the company can apply different management practices based on its ability is called flexibility (Nandakomer, 2014).

Development and organization: Development is important to the companies even in the best and least turbulent state of environment because the products or services provided lead to the formation

of corporate reputation so that it can be said that good product or service is equal to good organization. Accordingly, there is always the problem to the company that what new products or services should it provide and offer. This is what is referred to as development and organization (Slack and Lewis, 2002).

Process technology: Process technology can be considered as the scientific tool to perform company processes. In other words, knowledge and technology level of the company process to produce or deliver the desired outputs is called process technology. To the extent that the process technology has a better status, production costs decrease and time will be saved and the amount of damage will decrease (Vesk, 2007).

Supply network: One of the main realities of the business environment is the dependence of the businesses to each other. This dependency is achieved in various ways, most notable of which are time and functional dependencies between firms. Functional dependency includes relationships that are created due to the nature of the activities, and time dependency refers to ranking or historical connection between the activities of the firms in an operation network (Jafarnejad and Haider, 2005).

Cost: Cost includes all items whose reduction could be useful for the company. Therefore, cost may include financial issues, time and so forth (the Slack and Lewis, 2002).

Capacity: Capacity in operation is the highest value added a company creates as a result of a specific time period of activities under normal conditions. Capacity includes creating and modifying of the capacity. In other words, the ability to change the current capacity is considered as the company's capacity (Bin Sahel et al, 2009).

Research methodology

In this study, problem-structuring methods (PSM), which are of the methods related to cognitive mapping, are used. One of the most widely used methods of such methods is SSIM method. In this method, relations between different variables are discussed. So that all the relationships between variables are known and they are leveled. Then using MICMAC analysis table, it can study the most effective and most dependent variable. SSIM method standard is to assess the influential variables of each variable on other variables. This study is of applied research and the required data was extracted through voting the comments of business experts. Voting experts is the base for SSIM method and the criteria for selecting the experts are knowledge, experience, willingness to cooperate, and enough time for the company. Further analysis of this approach, to determine the amount of dependence and influence of each element more precisely is done by MICMAC matrix.

Data analysis: Due to the introduction of the nine areas of OS based on Louis and Nigel studies, in this article, we have dealt with creating a connection between them and determining different levels of relationship between them. Method is so that all nine areas of strategic operational fields are compared in terms of their impact on each other. In this comparison signs associated with SSIM model are defined as follows:

V: indicates element *i*'s being functional to element *j*

A: indicates element *j*'s being functional to element *i*

X: indicates the two-way functionality.

O: indicates the lack of relationship between the two elements.

Table 1 called SSIM matrix is formed in a way that reflects the functionality of each element towards the other. For example, the speed of delivery is the element to make the customer sure while reliability is seen as having no functionality on fast delivery. SSIM matrix that is Table 1 is gathered according to the experts. Clearly, due to self-interactivity every element will have X sign in SSIM matrix.

Table 1. SSIM matrix showing the functionality of strategic elements in their mutual contrast

Strategies	Quality	Speed	Reliability	Flexibility	Cost	Capacity	Supply network	Process technology	Development and organization
Quality	X	O	V	A	X	A	A	A	A
Speed	O	X	V	A	X	A	X	X	X
Reliability	A	A	X	V	X	A	O	A	O
Flexibility	V	V	A	X	V	A	A	X	A

Cost	X	X	X	A	X	O	A	A	X
Capacity	V	V	V	V	O	X	A	X	X
Supply network	V	X	O	V	V	V	X	V	V
Process technology	V	X	V	X	V	X	A	X	A
Development and organization	V	X	O	V	X	X	A	V	X

For a deeper understanding of relationships and the extent of the impact of an element on other elements of reachability matrix, which is Table 2 is prepared. Designing method is that in case of effectiveness of factors on another factor, one is considered and otherwise zero is used. Reachability matrix can be written from SSIM matrix. For example, Table 2 shows the capacity factor has functionality in seven cases of the components and is affected only by four out of the nine factors. It is natural that between every element with itself, there is a functionality (the circular effect), so the relationship is shown with 1 in the reachability matrix.

Table 2: Reachability Matrix (R) indicating the presence or absence of a relationship between two elements

Strategies	Quality	Speed	Reliability	Flexibility	Cost	Capacity	Supply network	Process technology	Development and organization
Quality	1	0	1	0	1	0	0	0	0
Speed	0	1	1	0	1	0	1	1	1
Reliability	0	0	1	1	1	0	0	0	0
Flexibility	1	1	0	1	1	0	0	1	0
Cost	1	1	1	0	1	0	0	0	1
Capacity	1	1	1	1	0	1	0	1	1
Supply network	1	1	0	1	1	1	1	1	1
Process technology	1	1	1	1	1	1	0	1	0
Development and organization	1	1	0	1	1	1	0	1	1
Total	7	7	6	6	8	4	2	6	5

In the next stage of the table related to alignment is extracted from reachability matrix (R) and designed as Table 3. This table shows the output elements set, input set, common elements set, output and common set, and the total number of output and common elements. Output elements set are shown by *Leads to* in the matrix, and input elements set are shown by *Leads on*. The column 5 in this table out of the total set of two columns is determined as follows: Output elements= set of common elements+ set of output elements (Leads to) The purpose of forming this table is to reach the data related to the elements leveling column. According to what has been achieved in Table 3, nine elements are placed next to each other at four levels in the final version

.

Table 3. Elements ranking matrix

	Leads to	Leads on	Total common elements	Number of output elements+ common	Leveling
Quality	1,3,5	1,4,5,6,7,8,9	1,5	5	1
Speed	2,3,5,7,8,9	2,4,5,6,7,8,9	2,5,7,8,9	11	4
Reliability	3,4,5	1,2,3,5,6,8	3,5	5	1
Flexibility	1,2,4,5,8	3,4,6,7,8,9	4,8	7	2
Cost	1,2,3,5,9	1,2,3,4,7,8,9	1,2,3,5,9	10	3
Capacity	1,2,3,4,6,8,9	6,7,8,9	6,8,9	10	3
Supply network	1,2,4,5,6,7,8,9	2,7	2,7	10	3
Process technology	1,2,3,4,5,6,8	2,4,6,7,8,9	2,4,6,8	11	4
Development and organization	1,2,4,5,6,8,9	2,5,6,7,9	2,5,6,9	11	4

After forming the table above, the relationship between elements is made clear. In Figure 1, these relationship are clearly shown. Mapping the relationship between strategic elements in the operation level and company's processes derived from SSIM matrix can be represented as Figure 1. Before reviewing processes, by using Table 3, the number of levels are determined, so four levels can be drawn with certainty. It should be noted that the general rules and principles existing in designing and geometry is that the specified relations can only be in corresponding levels so from Level 1 to Level 3 and 4 and vice versa contrary, there should be no direct relationship. The relationship between variables can be one-way or two-way. In outlining the overall geometry, whether the type of relationship is one-way or two-way is determined by SSIM matrix.

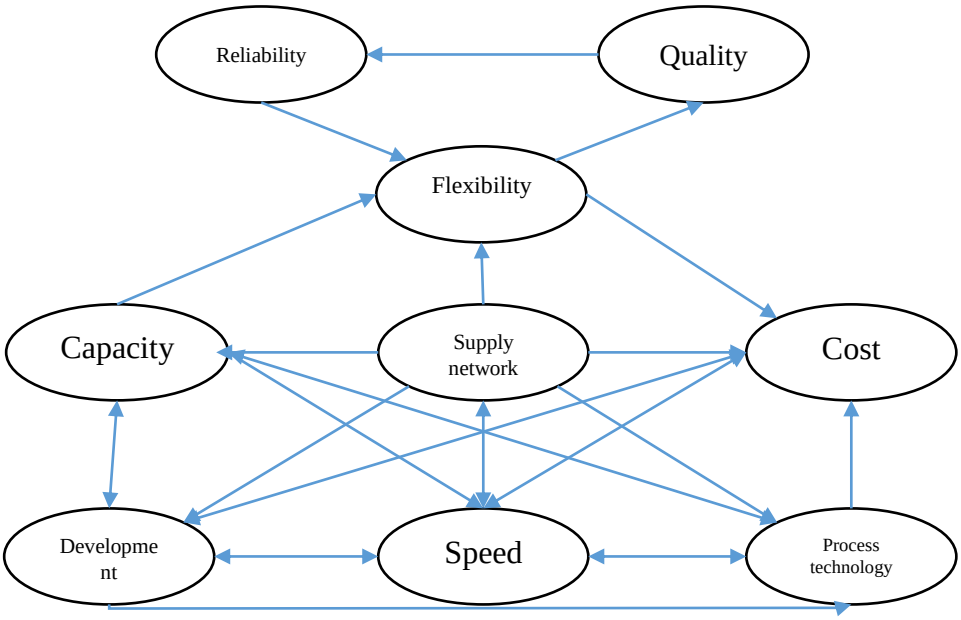


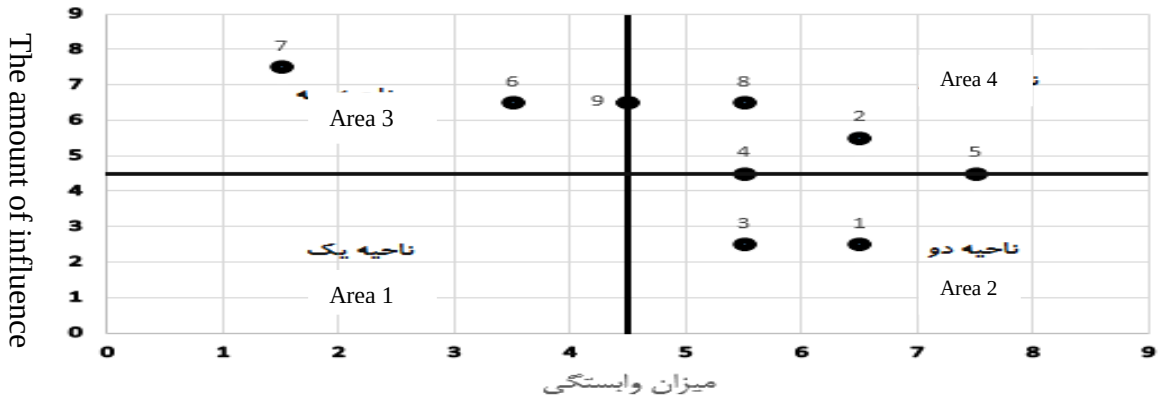
Figure 1: Geometric design of the strategic elements of the manufacturing companies in the area of operations

Based on the analysis resulting from Table 3 and drawing Figure 1, it is concluded that strategic elements of a manufacturing organization are placed in four levels as follows:
Level 1: includes elements of quality and reliability
Level 2: includes elements of flexibility
Level 3: includes elements of cost, supply network provisioning and capacity
Level 4: includes elements of process technology, speed and development and organization

Positioning based on MICMAC matrix

MICMAC matrix is prepared based on Reachability Matrix so that the horizontal axis is Dependency and the vertical axis is the amount of influence.
The matrix is divided into 4 equal squares so that four meaningful areas will be formed. Based on the classification by Barfeed the four areas are as follows. Figure 2 shows the location of each of nine elements on the basis of existing numbers of each element in the reachability matrix.

Designing the Interactive Model



Area 1: The elements that are in this area are called Autonomous elements and have low influence and dependency. This area contains none of the elements 9.

Area 2: This area is known as Dependency area. This area includes two elements of quality and reliability, which have a high dependency and low influence rate.

Area 3: The elements that are in the area are known as Driver elements. The most important elements are placed in this area. From among the nine elements capacity, it can be said that supply network, and by extension development and organization are in this area that have high influence and low dependency.

Area 4: Elements that are in the area are called Linkage elements that have high influence and dependency.

From among the nine elements, speed and process technology are in this place.

Elements 4 and 5 that is cost and capacity are placed between areas two and four.

Conclusion

Based on the research conducted on the relationship between strategic elements of manufacturing companies and drawing the final geometry, the following results are achieved. Nine elements of OS that include quality, speed, flexibility, reliability, supply network, development and the organization, cost, capacity and process technology are classified into 4 levels and from Level 1 to Level 4 their severity of the importance and influence on other elements is reduced. From among the nine elements, quality and reliability are the most important options that are placed as the priority for the company to enter into OS. Results from reachability matrix (R) represent that two components of strategy are supply network and quality and have the highest and least impact among nine elements, respectively. Moreover, elements of cost and supply network have the most and the least dependency, respectively. It can be stated with certainty that from among the nine elements of OS, supply network will have the highest promotion and development in the collection of the company due to improvement.

Based on MICMAC analysis, it can be said that there are no autonomous (minor) elements among nine elements, and from among them two elements of speed and process technology have high influence and influenceability that actually have the most interactions.

Reference

Jafarnejad, A and Haidari, A. 2005 "OS in the context of supply network ", management knowledge, No. 70, pp. 3-43, Tehran University,.

Hajipoor, B, Darzian A, Abdul Hadi and Shamsi Kushaki, S. 2012 "Explaining product-market strategy and company's marketing capabilities on the market," Business Administration Investigations, No. 7, pp. 56-87, Yazd University,.

Khalili Shourini, S. Soleiman, H, 2011 "The strategy and operations of the business strategy (2)", Tadbir, No. 232, pp. 86-89, Tehran,.

Azer, A. khosrovani, F. and Jalali, R.. 2013 “Research on soft operation, problem-structuring methods (PSM) approaches the structure, Industrial Management Institute, Tehran,.

Asghari, AN. 1387 “Linking strategy to operations”, Accounting, No. 202, pp. 44-52,.

Soleimanfar, VR, Makuyi, A and Naajizadeh, R. 2010 “An overview of the concept and components of capacity strategy”, Tadbir, No. 215, pp. 20-25, Tehran,.

A. Arafa and W.H. Elmaraghy 2011 "Manufacturing strategy and enterprise dynamic capability", Manufacturing Technology,.

Andrea Chiarini 2015. "Sustainable Operations Management: Advances in Strategy and Methodology", Springer,

C. R. Raduan, U. Jegak, A. Haslinda, I.I. Alimin 2009. "Management, Strategic anagement Theories and the Linkage with Organizational Competitive Advantage from the Resource-Based View", European Journal of Social Sciences,.

Dayna Simpson and Danny Samson 2010 "Environmental strategy and low waste operations: Exploring complementarities", Business Strategy and Environment,.

Edson Pinheiro de Lima, Sergio Eduardo Gouvea da Costa, Avides Reis de faria 2009. "Taking operations strategy into practice: Developing a process for defining priorities and performance measures", Production Economics,.

Jan Olhager, Martin Rudberg and Joakim Wikner 2001 "Long-term capacity management: Linking the perspectives from manufacturing strategy and sales and operations planning", Production Economics,.

Kim HH Hau Tan and Rupert L. Matthews 2009. "Operations strategy in action: A guide to the theory and practice of implementation", Edward Elgar.

Linda M. Doherty 1995. "Strategic Management for Senior Leaders: A Handbook for Implementation", Department of the Navy Total Quality Leadership Office,.

M. K. Kim, M. W. Cho and K. Kim 1994. "Application of the fuzzy control strategy to adaptive force control of non-minimum phase end milling operations", Journal of Pergamon,.

Maik. Schlickel 2013. "Strategy Deployment in Business Units: Patterns of Operations Strategy Cascading Across Global Sites in a Manufacturing Firm", Physica- Verlag A Springer Company,.

Mathias. Kirchmer 2001. "High Performance Through Process Excellence: from strategy to operations", Springer,.

Ming-Hung Hsieh and Kuen-Hung Tsai 2007. "Technological capability, social capital and the launch strategy for innovative products", Industrial Marketing Management,.

Neil Ritson 2011. "Strategic Management", Neil Ritson & Ventus Publishing ApS,.

Nigel Slack and Michael Lewis 2002. "Operations Research", Prentice Hall,

Nair, A and Boulton, W.R 2008. "Innovation-oriented operation strategy typology and stage-based model", International Journal of operations and production Management vol. 28 No. 8, pp. 748-771.

Peter T. Ward, Rebecca Duray, G. Keong Leong and Chee- Chuong Sum 1995. "Business environment, operations strategy, and performance: An empirical study of Singapore manufacturers", Journal of Operations Management,.

Robert S. Kaplan and David P. Norton 2008. "The Execution Premium: Linking Strategy to Operations for Competitive Advantage", Harvard Business Press,.

Sachin Jayaswal 2011. "Product differentiation and operations strategy in a capacitated environment", European Journal of Operational Research,.

Yeming. Gong 2013. "Global Operations Strategy: Fundamentals and Practice", springer,.

Jos van Iwaarden, Ton van der Wiele and Roger Williams 2006. "A management control Perspective of quality management", International Journal of Quality & Reliability Management, Vol. 23 No. 1, pp. 102-112,.

M. K. Nandakumar & Sanjay Jharkharia & Abhilash S. Nair 2014. "Organisational flexibility and Competitiveness", springer, p.42,.

Mathias Weske 2007. "Business process Management Concepts, Languages, Architectures", Springer, pp. 3-21,

Nora Bensahel, Olga Oliker, Heather Peterson; "Improving Capacity for Stabilization and Reconstruction Operations", National Defense Research Institute, p. 32, 2007.