

Flexibility in Supply Chain Management

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Abstract: For organizations, flexibility is becoming more important. All executives would like their organizations to perform better, and most seek ways to make that happen. This publication focuses on flexibility, as a key dimension of competitive strategy. Important issue concerning flexibility is for organisations to be able to understand and manage it strategically. We outline the definition and dimensions of flexibility, including a literature review.

Keywords: *supply chain, flexibility, performance*

1. Introduction

A supply chain is a system of people, activities, information, and resources involved in creating a product and then moving it to the customer. Many organizations attempt to integrate and closely coordinate the various elements of their supply chains in order to enhance efficiency. Indeed, minimizing cycle time – the time it takes to fulfill a customer's needs – has been a central goal of executives in recent decades.

2. The three A's

Nowadays supply chains, not companies, compete for market dominance. But companies often have diverging incentives and interests from their supply chain partners, so when they independently strive to optimize their individual objectives, the expected result can be compromised. The best efforts of one company could be wasted if its supply chain partners do not synchronize their efforts accordingly.

To respond to the high degree of uncertainty associated with product variety proliferation and disruptions due to unexpected crises, supply chains need to be agile and flexible to match demand with supply. And companies need to develop supply chains that are adaptable, that respond to the systematic changes of the market and the customer.

In addition, companies must be ready to adjust their supply chain structures and strategies when change occurs. Given the potentially diverse interests of the many

players in the value chain, companies need to align their incentives so each acts in the best interests of the whole and the total supply chain is optimized.

2.1. Agility

Agility is the supply chain's relative capacity to act rapidly in response to dramatic changes in supply and demand. Agility can be achieved through the use of buffers. Excess capacity, inventory, and management information systems all provide buffers that allow a best value supply chain to provide better service and be more responsive to its customers. Rapid improvements and decreased costs in deploying information systems have enabled supply chains in recent years to reduce inventory as a buffer. Much popular thinking depicts inventory reduction as a goal in and of itself. However, this cannot occur without corresponding increases in buffer capacity elsewhere in the chain, or performance will suffer. A best value supply chain seeks to optimize the total costs of all buffers used. The costs of deploying each buffer will differ across industries; therefore no solution that works for one company can be applied directly to another in a different industry without adaptation. Agility in a supply chain can also be achieved or improved by co-locating with the customer. This arrangement creates an information flow that cannot be duplicated through other methods. Daily face-to-face contact for supply chain personnel enables quicker response times to customer demands due to the speed at which information can travel back and forth between the parties. Again, this buffer of increased and improved information flows comes at an expense, so executives seeking to build a best value supply chain need to investigate the opportunity and determine if this action optimizes total costs.

2.2. Adaptability

Adaptability refers to a willingness and capacity to reshape supply chains when necessary. Generally, creating a single supply chain for a customer is desired because this helps minimize costs. However, adaptable firms realize that this is not always a best value solution. For example a customer requires one type of products to be repaired in less than eight hours, while another type of products can be repaired and returned within one month. In order to service these varying requirements efficiently and effectively, the company (whose supply chains maintain the equipment) must devise adaptable supply chains. In this case, spare parts inventory is positioned at close proximity to the type of products requiring quick turnaround, while the less time sensitive products are sent to a centralized repair facility. This supply chain configuration allows the company to satisfy customer demands while avoiding the excess costs that would be involved in localizing all repair activities. In situations where the interests of one of the firms in the chain and the chain as a whole conflict, most decision makers will choose an option that benefits their firm. This creates a need for alignment among chain members.

2.3. Alignment

Alignment refers to creating consistency in the interests of all participants in a supply chain. In many situations, this can be accomplished by carefully written incentives into contracts. Collaborative forecasting with suppliers and customers can also help build alignment. Taking the time to sit together with participants in the supply chain to agree

on anticipated business levels permits shared understanding and rapid information transfers between parties. This is particularly valuable when customer demand is uncertain, such as in the retail industry.

3. Literature review on flexibility

Flexibility can be often viewed as an adaptive response to environmental uncertainty. In the entrepreneurial literature flexibility is also viewed as being adaptive. “The high levels of uncertainty and very rapid rates of change that characterize new ventures require fluid and highly adaptive forms of organization. An organization that can respond quickly and effectively is a must. Successful entrepreneurs are adaptive and resilient” [8]. Similarly, in the supply chain literature, flexibility is seen as a reaction to environmental uncertainty. Flexibility is a key dimension of competitive strategy. Japanese manufacturers are turning their attention to flexibility, having achieved mastery in quality. As companies place more and more strategic emphasis on flexibility, enhanced performance seems likely to tend to follow. Customization is another form of flexibility that is becoming increasingly important. There are five major types of supply chain flexibility; 1) product, 2) volume, 3) launch, 4) access, and 5) responsiveness [9]. Product flexibility is defined as the ability to handle difficult, nonstandard orders, to meet special customer specifications, and to produce products characterized by numerous features, options, sizes, and colors. Product flexibility is a value-adding attribute that is immediately visible to the customer. Volume flexibility is the ability to effectively increase or decrease aggregate production in response to customer demand. Launch flexibility is the ability to rapidly introduce many new products and product varieties that requires the integration of numerous value activities across the entire supply chain. Flexibility in production of type of cars for example can lead to consumer perceptions of technology superiority for the given company based on their introduction of several varieties of the new product. Access flexibility is the ability to provide widespread or intensive distribution coverage and responsiveness flexibility captures the overall ability of the firm to respond to the needs of its target markets. Much of the literature on flexibility is limited to operational issues in the supply chain and does not specifically address purchasing. Since the purchasing function is a vital part of the supply chain it must provide support to enhance these flexibility strategies. Secondly, the current literature does not address the specific skills necessary to attain these levels of flexibility.

Flexibility is not a new concept; it has been researched in business by economists for over 60 years. The early focus of research is on the ability of a production facility to produce something other than originally intended. The acceptance by management of the importance of flexibility is demonstrated as early as 1975. At that time it became clear that flexibility was the evaluation criterion most used to assess organisational effectiveness. The long established recognition of the importance of flexibility is further supported by another authors who argues that capitalist industry has always combined flexibility with inflexibility, and what are possibly emerging now are new permutations of each rather than a simple trend towards greater flexibility. The literature shows that flexibility is seen as a ‘good thing’. However it is not a ‘free good’. Specifically, it has been shown that production plants that wish to have the ability to produce more than

one good will have a higher unit cost curve than a plant specialising in the production of a single good. More recently, it has been outlined that there can be disadvantages to strategic flexibility in the form of increased costs, increased stress on employees and a lack of organisational focus. While flexibility may have associated costs, organisations continue to seek it in order to increase competitiveness. Flexibility, especially in the guise of adaptive manufacturing technologies, has become as important a determinant of competitiveness as costs. However, there is evidence that greater flexibility is needed in the strategic process now compared with the 1970s: flexibility has become so important to organisations that it may have a role as a critical success factor in its own right. There is no doubt about the importance of flexibility and believe that today's world demands more flexibility. The real issue concerning flexibility is for organisations to be able to understand and manage it strategically.

4. Definition of flexibility

While use of the term 'flexibility' is ubiquitous, its meaning is not always clear. One reason why flexibility is so difficult to define is that definitions are often coloured by particular managerial situations or problems. Definitions available propose that flexibility is an ability or capability which an organisation possesses to change or react. Flexibility is multi-dimensional in that an organisation can be very flexible in some ways and less flexible in others. Consequently, they argue, it is not entirely appropriate to talk simply of a 'flexible system'. Moreover, flexibility is polymorphous, having different meanings in various contexts. In order to progress research on flexibility, identification of the multiple types of flexibility is required so that they can be split into component parts which can be prioritised, measured and improved. Here, flexibility is defined as 'the capacity to adapt'. Capacity is chosen in preference to capability because it better characterises the multi-dimensional element of flexibility.

5. Dimensions of flexibility

Flexibility can be defined as consisting of two dimensions, temporal and intentional. In expanding the framework we identify four dominant dimensions of flexibility in the literature. The first is temporal; how long it takes an organisation to adapt. The second is range; the number of options that an organisation has open to it for change that was foreseen and the number of options it has available to react to unforeseen change. The third is intention; whether the organisation is being proactive or reactive. The final dimension of flexibility is focus; specifically whether the flexibility is gained internally to the organisation or by managing external relationships with trading partners.

5.1. Temporal

The first dimension of flexibility, that is temporal, can be described in terms of the length of time that it takes an organisation to respond to environmental changes. There exists a typology of environmental change: operational, competitive, strategic. This typology can be mapped onto flexibility to conceive three types: operational, competitive and strategic. It is essential to identify 'the critical time perspective or perspectives'. Flexibility can be divided on a time basis into three categories,

operational, tactical and strategic. Operational problems are short-term, e.g. replanning due to breakdown of a machine or unexpected shortage of a raw material. Tactical problems are medium-term e.g. changes in design or rate of production. Strategic problems are long-term, e.g. investments in machinery or business expansion. There are three degrees of temporal flexibility. Operational flexibility is the ability to change day-to-day, or within a day, as a matter of course. Tactical flexibility is the ability to occasionally change or adapt, say every quarter, and to make changes which demand some effort and commitment. Strategic flexibility is the ability to make one-way, long-term changes which involve significant change, commitment or capital and which occur infrequently, say every few years or so. In the new hyper-competitive markets the length of time, for which a given flexibility will give a competitive advantage, will be significantly reduced. The temporal dimension of flexibility is the ability of an organisation to adapt within a given time frame.

5.2. Range

The second dimension of flexibility is the degree to which an organisation can adapt to foreseeable and unforeseeable changes. On one side, flexibility is a strategic response to the unforeseen. There is an other, which incorporates both foreseen and unforeseen environmental changes. 'A flexible firm' possesses the ability to adapt to ensure its continued viability. One way to achieve this is by planning for developments in the environment which are likely to occur (foreseeable events). A second way is by adapting to circumstances; events taking place in the environment, which were by no means predictable or foreseeable. Two types of flexibility exist: Type I and Type II. Type I flexibility relates to the concept of risk and involves planning for foreseeable events. Type II flexibility relates to uncertainty and how to make good use of new disclosed opportunities and to rapidly respond to uninsurable (unforeseen) changes in the market. The second dimension of flexibility measures the range of options available in responding to environmental change. This dimension comprises two areas, the range which has been planned for and the range which is possible for events that were not planned for. Foreseen to unforeseen represent the two ends of the continuum for this dimension of flexibility.

5.3. Intention

The third dimension of flexibility acknowledges that, while change in the environment is inevitable, organisations are not helpless. This dimension of flexibility is the degree to which organisations take an offensive or defensive stance towards flexibility. Those who take an offensive role attempt to control change in the environment in such a way that they can gain competitive advantage. On the other hand, defensive organisations react to changes after they have occurred and try to minimise the impacts. This attempt to manage flexibility has also been described as active or passive.

5.4. Focus

The fourth dimension of flexibility is the area in which the flexibility is created. There can be two types of strategic flexibility, internal and external. In doing so the earliest reference to this dimension of flexibility is provided. The significant internal areas

which can create internal flexibility are manufacturing, employee flexibility and organisational structure. The main avenues for obtaining external flexibility include suppliers, alliances, and multinational operations. The next section discusses the three internal areas, the subsequent section discusses external flexibility.

5.4.1. Internal

One area in organisations, where it is proposed that the attainment of flexibility is possible, is in the manufacturing process. It is argued that flexibility in manufacturing is a critical source of competitive advantage. This can be brought about by creating the 'flexible factory'. Some believe that new flexible manufacturing technologies will bring revolutionary change by eliminating the manufacturing flexibility advantages historically held by small firms and manufacturing efficiency advantages historically available to large firms. Human resource management is a second area through which organisations can create flexibility. Specific avenues are by permitting teleworking and by substituting part-time, contract, and other 'contingent' workers for more expensive full-time employees. High worker involvement and flexible wage schemes provide manufacturers with more flexibility than the flexible IT they use. Operational flexibility is determined primarily by a plant's operators and the extent to which managers cultivate, measure, and communicate with staff. Equipment and computer integration are secondary. A third route to organisational flexibility is provided through organisational structures. Organisations can obtain the desired flexibility by altering their structure to suit their competitive situation. An appropriate organisational design is based upon the creation of fast feedback loops, enabling processes to react quickly to changes, while retaining reliability.

5.4.2. External

One way to obtain external flexibility is to diversify into different products and markets. Subsequently external flexibility is associated with subcontracting production to provide the flexibility to step up or step down production. The trend towards outsourcing coincided with the trend to focus on 'core competences'. In this way flexibility is achieved through 'diverse specialisation'. This occurs where each firm focuses on what it does best and leverages the capabilities of other entities for complementary activities. An organisation obtains flexibility by increasing the levels of external flexibility available to it by increasing its ability to switch, at short notice, between the products its suppliers produce and also the ability to switch suppliers if necessary. The networked organisation is used to describe situations where individual organisations concentrate on their core competences and use other firms where required to enable a complete product to be made. Organisations working together as a network achieve 'flexible integration'. That is, the network provides greater flexibility than that achievable through vertical integration by a single organisation. One main reason for this is that individual firms in the network can be added or dropped rapidly as required. The network implies a narrower range of output at the level of the individual firm, but a great degree of flexibility at the level of the network. Thus, an individual organisation in a network obtains lower internal flexibility while simultaneously obtaining increased external

flexibility. Network forms of organisations may, in fact, be in the process of becoming the signature institutional form of this era – precisely because they offer managers the best working solution to the challenges posed by the increasing need for flexibility. Network form is especially appropriate for attaining flexibility. Fast, flexible and co-operative supply chains are a key issue for the survival of organisations. The idea of the network form and the external flexibility it creates is central to new concepts emerging such as 'adaptive channels' and 'quick response'. Adaptive channels are situations where organisations have worked with their distribution channels to make them more flexible and responsive. Quick response is a strategy for linking retailing and manufacturing to provide the flexibility to respond quickly to shifting markets. The fourth dimension of flexibility, focus, demonstrates that the attainment of flexibility is no longer confined within the boundaries of an organisation. Flexibility can also be obtained externally and one way of achieving this is through external links with other organisations, such as suppliers, customers and distributors. The fourth dimension of flexibility shows that external trading partners and links with them can be a source of flexibility.

6. The need for flexibility

The previous section addressed that changes in the purchasing skill mix are expected to require a more entrepreneurial approach due to the increased competition in today's business arena. It is becoming increasingly difficult to compete on price, quality, and product differentiation. Companies have to compete on service, which means developing a flexible supply chain that is customer focused. Specific purchasing techniques will also permit flexibility. Many purchasing professionals are involved with sophisticated hedging techniques that allow flexibility and risk management in pricing. This flexibility is quite evident in airline tactics for the purchases of oil in the current period of rising prices. Those that hedged more of their purchases such as Southwest Airlines are profitable while competitors are suffering from higher fuel prices that cannot be passed along to consumers. Strategic sourcing enhances the capacity of a plant to be more flexible. The ability of the supply base to respond to the demands made by changes in the buyer's plant contributed to improved change effectiveness in the buyer's plant. The careful selection, development, and integration of suppliers with the necessary capabilities contribute to manufacturing's ability to make changes rapidly and remain flexible. Thus, supplier assessment tools can no longer focus only on price, quality, and delivery but also must focus on flexibility in responding to suppliers as well as customers. The literature described entrepreneurs by their ability to adapt to the changing demands of their customers and their businesses. In this rapidly changing economy, rigidity often leads to failure. As our society, its people, and their tastes change, entrepreneurs also must be willing to adapt their businesses to meet those changes. Entrepreneurs have a high tolerance for ambiguity and changing situations in the environment in which they most often operate. This ability to handle uncertainty is critical because they are constantly making decisions using new, sometimes conflicting information obtained from numerous unfamiliar sources. One trait of the entrepreneur is being 'flexible minded'. This involves being sensitive to the changing marketplace and responding by implementation of new market strategies that address changing customer preferences through innovative products and services. Attaining this operational flexibility requires skills that support the need to be flexible.

7. Conclusions

The definition of flexibility is fraught with difficulties since it has many dimensions. Specifically, here, flexibility is seen as having four dimensions; temporal, range, intention and focus. The temporal dimension is the time which it takes an organisation to react to change. The range dimension is the potential responses that the organisation possesses, first, to changes which were foreseen and, second, to those not foreseen. The intention dimension acknowledges that organizations can either be offensive or defensive in their approach to flexibility. In other words, while change is inevitable, certain organisations manage it to their advantage and others do not. The final dimension of flexibility is focus, which can be both internal and external. The flexibility available is not confined to within organisational boundaries.

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