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Providing a lean and agile supply chain model in project-based organizations

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Abstract

Purpose: One of the differences between project-oriented and routine organizations is the difference in their supply chain. This leads to the use of distinct and new approaches to its management. In this article, according to the existing problems, a conceptual model of lean and agile supply chain in project-oriented organizations is presented by examining the lean functions and agility of supply chain discussion.

Research methodology: This research is descriptive-analytical in terms of method and applied in terms of purpose. This study's statistical population includes all managers and supply chain experts of project-based organizations and the statistical sample includes 105 people who have been selected using a purposive sampling method. After presenting the conceptual model, a researcher-made questionnaire was used to collect information and to examine the intended model, the structural equation approach with PLS software was used.

Results: The research findings indicate that the 114 identified items for the research model significantly explain their related components. The results of the model fit study showed that based on the convergent validity indices, Cronbach's alpha and Cronbach's alpha, and the subscription validity index and the exponential or redundancy validity index, the model is in the desired condition.

Limitation: This research only described Knowledge Based Centre.

Contribution: Organizations realised that relying on existing knowledge alone was not enough to compete in a competitive environment, and went beyond the boundaries of their organization to acquire knowledge. Organizations considered customers as a very useful and knowledgeable resource, and activities should be done to interact with customers in leading organizations.

Keywords: *Customer assisted knowledge production capacity, Customer capital, Intellectual capital, Knowledge management*

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1. Introduction

In order to carry out the main mission and achieve the desired goals, each organization must have the appropriate logistics and operational support and meet all the needs of its operational units so that these units can perform their assigned tasks appropriately and acceptably (Turner, 2020). Accordingly, the quality of provision and support of the main organizational operations has a very important role in achieving the goal and any weakness and progress in this area. It will have its effects on the performance of activities and missions of the organization's operational units. Logistics and supply chain is one of the supporting concepts and includes a set of different activities that are used to manage the flow of materials and commodities during the processes in the industry and the organization; To make the flow

of materials and commodities as smooth as possible (Gaudenzi & Christopher, 2016). In general, the main goal in logistics and supply chain activities is to make effective use of the elements involved in the supply chain, including supplier, manufacturer, distributor and customer, in order to provide value to the organization's end customers (Stock & Boyer, 2009). Therefore, various institutions and organizations, especially project-based organizations, depending on the case and volume of operations, have a wide range of work in the field of logistics and supply chain (M. R. Zahedi & Khanachah, 2020).

In addition, due to the nature of the activities of project-based organizations and the performance of this organization in an environment that always requires the effective use of new organizational and practical tools and approaches, this organization operates in a sector that should always be able to create effective and In this regard, it can be said that the use of new approaches that are used in the industry today and are used to improve the operational capacity of the industry, can also play an effective role in this area, two concepts of agility and purity that are both pillars (M. Zahedi, Akhavan, & Naghdi Khanachah, 2020). They are considered to be effective in improving operational capacity, especially in logistics and supply chain. They are among the new approaches that can be attributed to the second half of the twentieth century and have developed in many areas in a very short time (Loufrani-Fedida & Missonier, 2015). This research also seeks to localise these two and the concept in the supply chain of project-based organizations and design a lean and agile supply chain model for project-based organizations.

2. Literature review

2.1. Lean supply chain

Leanness primarily seeks to optimise performance using available resource controls and is suitable for working in stable and high output environments (Kuruppalil, 2007). A lean strategy aims to perform any operation with the least use of any source, including people, space, storage, tools, time, dgc. In this strategy, the optimal flow of raw materials is organised to create the least waste, resulting in the shortest waiting time, the least number of warehouses and the lowest cost. The basic concepts of lean manufacturing are summarised in 5 cases (Ngwainbi, 2008).

- **Value:** Product design that is valuable from the customer's point of view
- **Value continuity:** Designing the best process for product production by efficiently determining requirements.
- **Value flow:** Creating an optimal flow of raw materials along the production chain in order to reduce waste and prevent interruptions.
- **Traction:** Product production only when there is customer demand using timeliness concepts.
- **Evolution:** It is always to improve to get closer to creating a great process by finding non-optimal neighborhoods and eliminating them.

The concepts of Leanness primarily are categorised into 4 categories. These four categories include philosophy, process, people, and problems (Zhou, 2016).Table (1) shows the demand and supply characteristics that play a role in purity. Applying concepts of glow in which more emphasis is placed on production level results in a fixed or incremental profit (Hummel, 2008). However, supply chain management and close cooperation with suppliers are used along with suppliers' rotational use and focusing on lean concepts in suppliers (Caniëls, Gehrsitz, & Semeijn, 2013).

Table 1: Lean manufacturing specifications (Browning & Heath, 2009)

Distinctive Features	Lean Supply
Soft products	*Operational*
Market demand	*Predictable*
product variety	*Down*
Product shelf life	*Top*
Customer motivation factor	*Price*

profit margin	*Low*
Dominant costs	*Physical costs*
Consequences of emptying the warehouse	*Long-term, contractual*
Purchasing policies	*Buy raw materials*
Gathering information	*Highly needed*
Prediction mechanism	*Rhythmic pattern*

Some characteristics of lean manufacturing from Browning & Heath (2009) point of view include cost reduction, which includes the elimination of value-added activities, reduction of inventory waste and variability, standard operating procedures, error detection, visual control, interoperable staff, continuous improvement, Dynamic learning capability, shared vision of evolution, supplier management, respect for employees, inclusive productivity score, Kaizen, etc. Research results on lean performance in many companies and industries indicate uncertainty and instability as key variables in lean performance (Browning & Heath, 2009).

2.2. Lean patterns and models

Lean production is a conceptual framework based on several techniques and concepts. Some of them directly affect the production process and others cover the company's entire components (Wagner, Herrmann, & Thiede, 2017).

- **Eliminate value-added activities**
  One of the lean goals is to eliminate all factors that do not add value to the product or service. These types of activities exist throughout the company, but in this model only production-related activities were considered. Inventories are usually the main source of inefficiency in industrial companies. Storage generally does not add any value to the product and should be removed where possible. There are several techniques for removing or reducing inventory: One is to reduce the downtime of machines due to breakdowns, and this is done using preventive maintenance support; Another technique is the simultaneous reduction of production volume and commissioning time, and the third technique is the use of common parts in the production of different products (Hanckmann, Schutte, De Penning, & Burghouts, 2017).
- **Continuous or continuous improvement**
  A feature of lean search production is the continuous improvement of products and processes. This process requires the cooperation of all production staff and senior managers. Both are needed to build and improve teams. Another technique used for continuous improvement is the use of the production line staff themselves in diagnosing defective parts so that they do not enter the quality department.
- **Multi-application teams**
  Organising tasks in a multi-application team improves workflow and provides flexibility in the face of changes at the production level. According to a study by an Italian company, more teams have been employed to solve problems, workers have done more work types, and the number of realised offers is higher than non- lean companies.
- **Production and delivery on time**
  The timeliness philosophy is to deliver the necessary items and parts at the right time and to the right extent where it is needed. This philosophy has been explored in the case of a tire manufacturer. For example, a survey of suppliers by a Spanish automaker found that 63% of suppliers ship parts and commodities to the automaker at least once a day. It is a key factor in creating a lean manufacturing process in most companies.
- **Integration of suppliers**
  Supplier integration is a Lean component that affects many parts of the company, including R&D and logistics. The supplier plays a role in product design to reduce prototype manufacturing time, thus reducing costs and creating a competitive advantage. If suppliers do

not participate in the design of parts, the company will have to spend a lot of time and money to solve manufacturing parts that the suppliers do not design. Another advantage of working with suppliers is reducing their number and the extension of the contract period with them. This continuity and stability in the cooperation allow the supplier to reduce the unit production and increase the delivery rate.

2.3. Agile supply chain

2.3.1. Agility approaches and theories

Waters points out that agility has two aspects. The first is the speed of reaction, agile organizations have a close relationship with the customer and respond quickly to customer demands. The second is the ability to connect logistics to specific customer demand. This principle is based on the customer's importance, obviously without the customer there will be no sales organization, no income, no profit, no business and will no longer be an organization (Moore, 2000). Charles (2010) in his doctoral dissertation inspired Humanitarian organizations have sought to find effective factors in agility in commercial organizations (Neumar et al., 2010). A step-by-step outline of Charles's research solution is shown in Figure (1). He has argued that working intermittently in environments with a high degree of uncertainty has made humanitarian organizations specialise in agile systems. Profitable organizations have ten things to learn from these organizations. Demand fluctuations, imbalances between production and demand, and uncertainty are factors that have adverse effects on commercial supply chains, necessitating a high level of agility (Sidah, 2017).

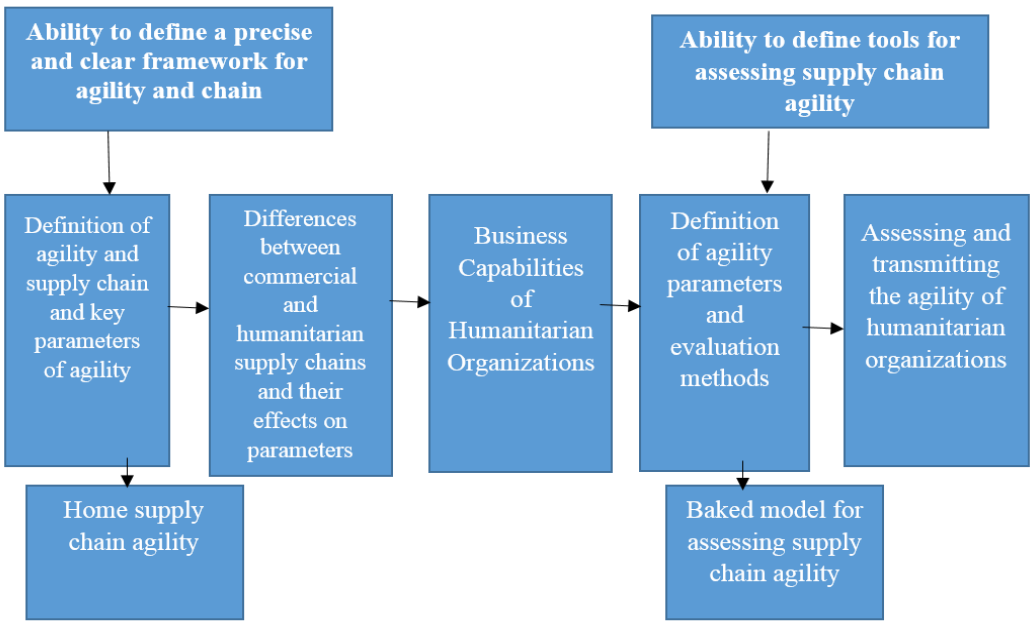

Figure 1: Step-by-step diagram of Charles's research solution(Neumar et al., 2010).

In the model of Wilding et al. (2012) presented (Figure 1) to identify the variables of supply chain agility and to find virtual connections, the consensus of the company's partner experts has been used (Wilding, Wagner, Gligor, & Holcomb, 2012). In a supply chain management meeting, five supply chain experts were identified who had each been involved in purchasing and managing the supply chain for more than 10 years, and then a list of agile supply chain variables was distributed among them. After 15 sessions of the think tank, agility variables were identified, introduced and selected.

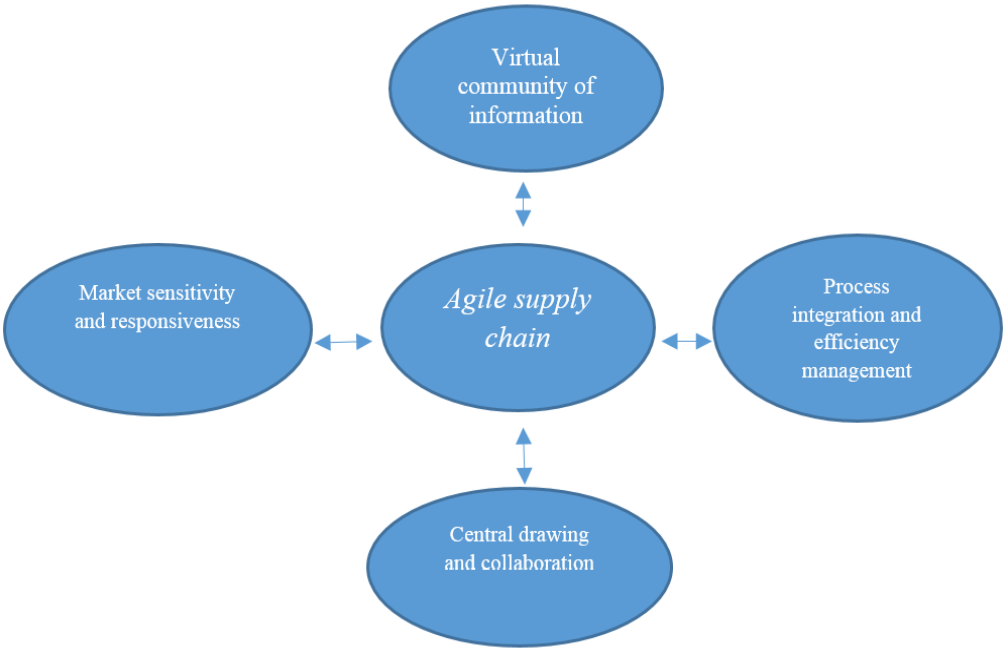

Figure 2: Characteristics and characteristics of agile supply chain (Ismail & Sharifi, 2006).

The most popular supply chain model that many researchers have cited is the Harrison, Christopher, and Van Hook models, including the four main features listed in Table (2) (Mathur, Gupta, Meena, & Dangayach, 2018).

Table 2: Models of Harrison, Christopher and Van Hook (Mathur et al., 2018).

Characteristic	**Operational indicators**
Market Sensitivity and responsiveness	Daily sales feedback - Paying attention to customer demands - Understanding emerging market trends
Process Integration and Performance Management	Product design based on collaboration-on-time supply-inventory management
Proportional Planning	Focus on core competencies - leverage the capabilities of partners to play the role of orchestra leader in the network
Supply Chain Virtualization	Collaborative-based product design-Collaborative planning Based on a holistic perspective

In an article entitled Designing an Agile Supply Chain Model, referring to the main success factors in the agile supply chain, he states that among the researches, only one research seeks to achieve the main success factors in the agile supply chain comprehensively and the rest of the researches emphasise There is a certain aspect of agility; Therefore, according to the necessity of work and achieving the main success factors in the supply chain, a comprehensive research was conducted in the literature on the issue of supply chain agility, as a result of which eleven factors were identified, which are:

1. Development of staff skills
2. Application of information technology
3. Process integration
4. Market sensitivity and responsiveness
5. Proportional planning
6. Flexibility
7. Introducing a new product
8. Reduce costs

9. Delivery speed
10. Product quality
11. Customer satisfaction

2.3.2. Integration of purity and agility in the supply chain

The concepts of purity and agility, although fundamentally different, have, in some cases been integrated to form a successful supply chain (Mishra, Hopkinson, & Tidridge, 2018). Table (3) shows the characteristics of agile lean supply chains (Charles, 2010).

Table 3: Distinguishing properties of lean, agile and lean-agile (Charles, 2010).

Distinctive features	**Agile**	**Lean**	**Lean - Agile**
Market demand	*Non-fixed*	*Predictable*	*Unstable and unpredictable*
product variety	*Much*	*Low*	*medium*
Product life cycle	*Short*	*Long*	*Short*
Customer motivations	*Waiting time and availability*	*Cost*	*Service level*
profit margin	*Much*	*Low*	*medium*
Dominant costs	*Adaptation costs for the market*	*Physical costs*	*both*
Consequences of emptying the warehouse	*Instantaneous and unstable*	*Long-term contract*	*There is no place to empty the warehouse*
Purchase rules	*Capacity building*	*Buy equipment*	*To sales management*
Information upgrade	*necessary*	*Very acceptable*	*Necessary and essential*
Prediction mechanism	*Consulting*	*Algorithmic*	*Both / each*
Common products	*Fashion products*	*Commodities and accessories*	*Products to customer demand*
Reduce waiting time	*acceptable*	*Necessary*	*acceptable*
Eliminate redundant process	*Necessary*	*Necessary*	*Optional*
Quick adjustment	*Necessary*	*acceptable*	*Necessary*
Strength	*Market determinant*	*Optional*	*Market determinant*
Quality	*Market determinant*	*Market determinant*	*Market victory*
waiting time	*Market determinant*	*Market victory*	*Market determinant*
Service level	*Market victory*	*Market determinant*	*Market victory*

2.3.3. Investigating the function of Lean-Agile supply chain in another research

Shekarian et al. (2020) examined the parameters of lean, agility and lean agility in the supply chain. This paper presents a framework that examines and measures market sensitivity, process integration, information factor, and supply chain flexibility. Also, the relationship between waiting time, quality cost and service level with speed and agility in a rapidly changing supply chain has been investigated. Finally, a framework for analysing the effects of market winners and market determinants on three different types of lean, agile and lean agile from the supply chain is provided. Within the proposed framework, resource flexibility, manufacturing flexibility and delivery flexibility, indicators of flexibility dimension, electronic information exchange, information concept and information accuracy,

information factor dimension indicators, cooperation between core business process, company specific issues from the perspective of demand and company specific issues Dimensions of process integration and finally delivery time, new product introduction and responsiveness are among the indicators of market sensitivity (Shekarian, Nooraie, & Parast, 2020).

Altay et al. (2018) examine the effects of design and performance of distribution centers in the agile supply chain in his doctoral dissertation. As a result, the study shows that distribution centres' main role as a product warehouse is compatible with the concept of breakpoints. Other plans of distribution centers in an agile supply chain include docking of delay and return processes. In this study, 5 types of agility are mentioned: time volume, unit amount, presentation and information. Responding to these can be in a set of different levels (supply chain, business unit, distribution network and distribution centers) based on the various resources used building land, tools, personnel and system process and how they are used (additional capacity, additional resources). Categorise when needed and flexible resources (Altay, Gunasekaran, Dubey, & Childe, 2018).

Asbjørnslett (2003) has managed the project supply chain from agile to lean. This study considers the use of the concepts of purity and agility in the Norwegian oil and gas industry. The result of this research is a methodology for supply chain management. In this dissertation, the capabilities of an agile supply chain are divided into three categories: flexibility, dependence, and adaptability of factors affecting purity, including customer, simplicity, observability, normalisation, traction, waste, process, prevention, time, improvement, and collaboration(Asbjørnslett, 2003).

Qrunfleh & Tarafdar (2013) provide a framework for supporting and designing a lean and agile supply chain to improve logistics efficiency. To achieve this goal, questions have been raised to identify the factors affecting logistics efficiency and use them to improve a lean and agile supply chain's ability. The framework refers to the fact that a warp logistics system creates the optimal flow of raw materials along the supply chain. This is done by eliminating waste, minimising warehousing and costs, and reducing downtime and creating a timely process. In the production of warp, the achievements are divided into five types. Value Chain Value, Value Flow, Traction and Purpose of Evolution In this study, the factors that must be considered to create an agile product have been examined, including synchronisation of network-based processes, market sensitivity and virtualisation. And Qrunfleh & Tarafdar (2013) has proposed a structure to measure the supply chain performance to implement lean production in an organization. In this dissertation, a set of appropriate indicators for each level of supply chain management and each process's length is prioritised. The dissertation results confirm the effective emphasis on customer-related indicators, financial indicators (such as net profit and cash return period) and scheduling along the supply chain(Qrunfleh & Tarafdar, 2013).

Tallon (2019) et al,. have measured the radiance and agility index of Sazehgostar company. Using available resources and research background, the researcher has classified agility indicators into four components: responsiveness, flexibility, speed and competence. Each of these components has different indicators. Speed component indicators include speed in operations, speed in on-time delivery and speed in introducing new product, Flexibility component indicators including resource, market, system and logistics, Competency component indicators including communication, learning encouragement, integration mechanisms, culture and decision-making and commitment And trust and responsiveness indicators include planning, sensitivity to change, and virtual enterprise. On the other hand, a model for lean system management has been introduced in which lean components are classified into three dimensions: strategy, capability and structure of lean indicators in this model are called nine keys of development, which include customer orientation, leadership, lean engineering, lean process management. The service is a culture of improvement, organization, participation and information architecture. It is pointed out that in order to achieve a holistic approach to policy development, a lean management system should be designed with these keys and metrics in mind (Tallon, Queiroz, Coltman, & Sharma, 2019).

Yesmin & Hasin (2012) have studied and compared the lean and agile patterns of supply chain and determine the optimal pattern using a genetic algorithm. The similarities and differences between these two approaches have been identified by examining and defining lean and agile supply chains. Common

features of lean and agile patterns include market knowledge, value flow integration, reduced delivery time, elimination of waste, and rapid structural change. Differences in the characteristics of purity and agility are also expressed as follows: uniformity of demand and smooth timing and survival strength (Yesmin & Hasin, 2012).

Goldsby (2006) et al., In an article entitled Modeling Lean, Agile, and Lean-Agile Strategies, examine these strategies' characteristics. The study suggests that each strategy has the right place and time to apply. Each strategy has advantages over other strategies in different market conditions and financial conditions. The lean strategy has the best efficiency in serving the customer based on the time of order to send. This is true as long as demand is soft and almost accurately predictable. The implementation of different models highlights differences in strategies in the areas of customer service, forecasting solutions, production philosophies, logistics network design, information exchange, inventory planning, and transportation methods (Goldsby, Griffis, & Roath, 2006).

2.3.4. The importance of logistics and supply chain management in the project
In recent years, effective logistics has been recognised as a critical element in improving companies' profitability and competitive performance. From the early 1980s to the early 1990s, customer service dominated many organizations; Even organizations that previously attached great importance to the concept of marketing were forced to re-try what was meant by the concept of customer orientation (Dirisu, Iyiola, & Ibidunni, 2013). The trend towards a strong customer focus continues in this era. In this regard, the core market and operational efficiency and effectiveness allow organizations to achieve competitive advantage (Vorhies, Orr, & Bush, 2011).

On the other hand, marketing, distribution, production planning and purchasing of organizations are traditionally done independently. As a result, each of these components of the organization has its own goals, and often these goals are in conflict with each other. Marketing goals are to provide excellent customer service and maximise cash sales; While many manufacturing operations are designed to maximise performance at the lowest cost. Therefore, it can be easily understood that marketing goals are in conflict with production and distribution goals. Purchasing contracts are often done with very little information and in traditional ways. The result of this factor is that there is no unified program in the organization (D. P. Baker, Day, & Salas, 2006). It is clear that there is a need for a mechanism that can integrate these different functions. Supply chain management is a strategy that achieves such integration. Supply chains are very complex operations and their analysis requires a well-defined approach. In addition, with the increase in technological complexity, supply chain solution has become very dynamic and complex. As a result, it is very easy to get lost in the details and take up a large supply chain analysis (CHRISTOPHER, 2017).

2.3.5. Supply chain management in the project
Supply chain management is a systematic approach to managing all flows, information and capital of suppliers and manufacturers through distributors and project organization to customers and end users (T. K. Gupta & Singh, 2015). In a more comprehensive definition, project supply chain management is a concept that features Meets the supply and logistics chain management requirements to align supply and demand in the context of project product development and operation to increase project value as a business opportunity (Schönsleben, 2016).

The principles of the project supply chain in one definition are:
• The project is a business opportunity
• The supply chain is a competitive entity in the project

Wuttke (2013) et al., have also identified the following as value-added factors in the project supply chain; Customer; The end customer at the end point of the project supply chain Cost; The total cost at the end point of the supply chain Flexibility; The ability of the project supply chain to identify and respond quickly to changes in customer needs Timely delivery and timely delivery of the project to end customers Quality; Meeting customer expectations or taking steps beyond that The distinction between project supply chain management features and supply chain operations is listed in Table (4) (Wuttke, Blome, Foerstl, & Henke, 2013).

Table 4: Project supply chain management characteristics

Aspect	Property	
	Project	**operation**
Project life cycle	*Development*	*operation*
Supply chain focus	*One-time type*	*Repetitious*
Logistic stimuli	*Demand chain management*	*Supply chain management (meaning procurement)*
Organizational processes	*Agility*	*Purification*
Quality of service	*flexible*	*Static*

2.3.6. Project supply chain management

Different classifications of models are presented. One of the types of models is a conceptual model that expresses the concepts and relationships between components within the modelled range. Conceptual modelling is the process of understanding and conceptually interpreting the modelled parts of reality. In a conceptual model, the model maker examines what components the system should maintain or provide. The conceptual model should be completely independent of the implementation and understandable to users (Pyrcz & Deutsch, 2014).

The main purpose of the conceptual model is to achieve a common understanding of a particular phenomenon. Therefore, the conceptual model does not seek to design or define a phenomenon. The use of a conceptual model can be useful in current concepts or in joint activities such as supply chain, where it is important to gain a common understanding of a concept and the relationships between components. Basu and Wright. This model is developed by combining six basic elements as follows (Campos & Vazquez-Brust, 2016):

- ✓ Focus on the customer and stakeholders
- ✓ Time and cost management
- ✓ Focus on the supplier
- ✓ Supply management
- ✓ Construction and installation

Delivery and inlay These basic elements are integrated by the following three multitasking processes:

- ✓ Systems and procedures
- ✓ Regular reviews
- ✓ Quality and performance management

Also, the chains in this model are:

A) Project planning chain:

The flow of basic elements is considered with project planning activities and information flow. The basic elements in this process are(Parraguez, Eppinger, & Maier, 2015):

Customer and Stakeholder Focus, Resource and Time Management, and Supplier and Procurement Focus (Figure 3).

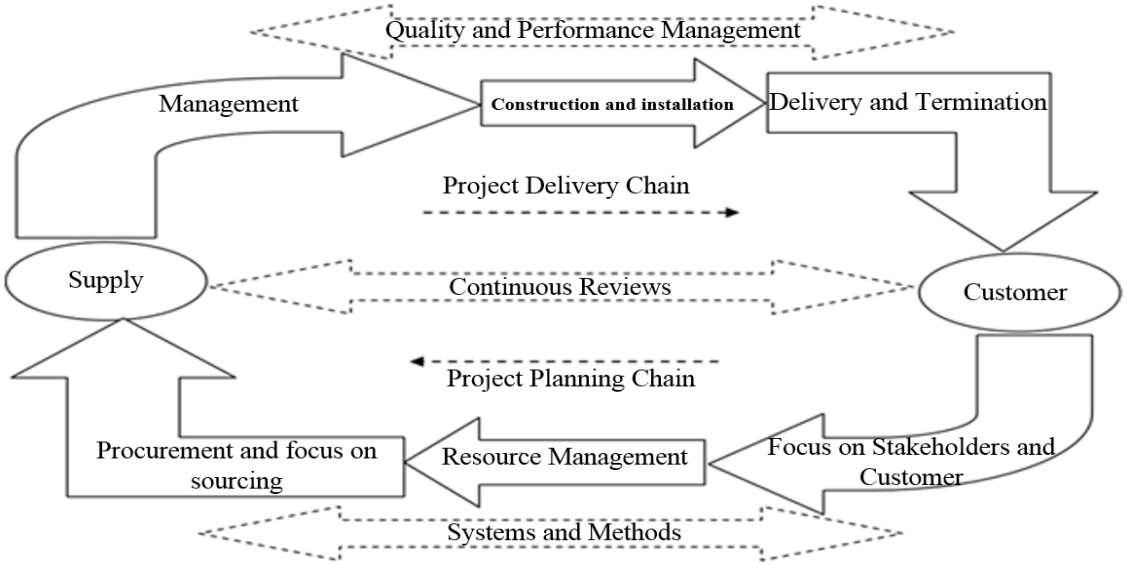

Figure 3: Basic elements of the project supply chain (Basso & Wright, 2008)

B) Project delivery chain:

In this chain, the basic elements related to the execution and termination activities and the physical flow of materials are in place. The basic elements in this process are(Stadtler, 2008):

- ✓ Supply management
- ✓ Construction and installation
- ✓ Delivery and termination
- ✓ Regular reviews and quality and performance management (Figure 1).

C) Project integration chain:

At this stage, project supply chain processes act as integrators of other key elements in different project life cycle stages. These processes include (Prajogo & Olhager, 2012):

- ✓ Systems and procedures
- ✓ Regular reviews
- ✓ Quality and performance management.

In the proposed conceptual model, it is assumed that the project-oriented organization outsources its significant activities.

Reviewing previous research, one of the most critical challenges identified in the supply chain is correctly identifying customer requirements and coordinating the chain based on these needs. These requirements can include product-related technical requirements or timely delivery requirements, quality with timely demand satisfaction. These include the research of Nitschke and O'Keefe, Wellman and Caledon in the supply chain of operations and research, and in the form of Asbjørnslett, Bassu & right in the supply chain of oil projects.

Another identified challenge is the issue of transparency in project objectives and its alignment with the project organization strategy. This lack of transparency can lead to challenges in project implementation and slow down the process of providing resources in the project. Among the researchers who have studied this issue, we can mention a study by Bjornzelt in the Norwegian oil industry, which has identified the challenges identified and its proposed strategies in the previous sections(Frolick & Ariyachandra, 2006). This issue has also been mentioned in research with Su and Wright as one of the main challenges of projects. Considering that in Basu and Wright researches, the project supply chain is examined more from the point of view of the general contractor and this aspect of his research is shared with the present dissertation, more attention can be paid to the alignment of

goals with the organizational strategy in the field (Touboulic & Walker, 2016). Another issue to consider is fluctuations and changes in the project. These fluctuations and changes occur in different layers of communication between members of the chain, as in the model of Angulo(2019). The main focus is on the relationship between the consultant and the project designer to other members of the chain. Design changes and redesigns have been identified as one of the main challenges (Fernandez Angulo, 2019). This is clearly seen as one of the main challenges in the project supply chain in Bojorzenzelt research, and these fluctuations and changes may be rooted in another challenge called the lack of integration between chain members. As in most studies conducted in the supply chain of operations and project supply chain, lack of integration in the exchange of technical information, communication tools, transfer of project requirements, exchange and application of project lessons learned, coordination between members, etc. are the main challenges that are considered(Segerstedt, Olofsson, & Eriksson, 2010).

Supply chain agility is also one of the challenges identified in the project supply chain. Agility means speed and flexibility simultaneously, which can be used as a competitive advantage in the supply chain to increase the value of the whole chain. Flexibility and compliance with customer needs are common in almost all research (S. Gupta, Drave, Bag, & Luo, 2019).

And by summarising the above factors in reviewing the background, the challenges in the supply chain can be expressed in the form of the following factors (Hassini, Surti, & Searcy, 2012):

1- Communication and information integration between members of the chain, including supply, manufacturing and distribution.
2- Identifying stakeholder requirements and translating them at different levels of the supply chain.
3- Clarifying goals and aligning them with strategies at the chain level.
4- Fluctuations and changes including technical information, customer requirements, etc. in the supply chain.

5- Agility, including maximum speed and flexibility in the supply chain

2.3.7. Summarise the concepts and provide a framework of lean and agility supply chain

Table 5: Lean supply chain conceptual framework

Dimension	**Component**				**Reference**
		Control	*Organizational Culture*	*Decision making and problem solving*	**(**T. K. Gupta & Singh, 2015; Hassini et al., 2012; Hummel, 2008; Loufrani-

Management	*Manpower*	*Organizational*	*Planning and time management*	*Leadership*	Fedida & Missonier, 2015; Moore, 2000; Parraguez et al., 2015; Prajogo & Olhager, 2012; Vorhies et al., 2011; M. Zahedi et al., 2020)
Production and operations	*Process and waste*	*Production / service systems*	*Net*	*Quality management*	
	Technology	*flexibility*	*value creation*	*Strategic planning*	
Suppliers	*Selection*		*Relationships*	*Quality management*	(P. Baker, 2008; Browning & Heath, 2009; Campos & Vazquez-Brust, 2016; Caniëls et al., 2013; Dirisu et al., 2013; Fernandez Angulo, 2019; Gaudenzi & Christopher, 2016)
Customer Orientation	*Send commodity*		*Customer cooperation*		(D. P. Baker et al., 2006; P. Baker, 2008; Browning & Heath, 2009; Caniëls et al., 2013; Gaudenzi & Christopher, 2016; Goldsby et al., 2006; Moore, 2000; Parraguez et al., 2015; M. R.

			Zahedi & Khanachah, 2020)

Table 6: Conceptual framework of agile supply chain

Dimension	Component			Reference
Management	*Organizational*	*Manpower*	*team work*	(Altay et al., 2018; Caniëls et al., 2013; Dirisu et al., 2013; Parraguez et al., 2015; Wagner et al., 2017; Wilding et al., 2012)
Production and operations	*flexibility*		*commodity / Services*	(Dirisu et al., 2013; Fernandez Angulo, 2019; Gaudenzi & Christopher, 2016; Goldsby et al., 2006; S. Gupta et al., 2019)
	Process		*inventory*	
Customer Orientation	*Sensitivity to the market and the environment and proportional change*	*Responsiveness and speed*	*product*	(Caniëls et al., 2013; CHRISTOPHER, 2017; Fernandez Angulo, 2019; Gaudenzi & Christopher, 2016; Goldsby et al., 2006; Moore, 2000)
Strategic	*Capabilities*		*Strategic Management*	(Asbjørnslett, 2003; Caniëls et al., 2013; CHRISTOPHER, 2017; Dirisu et al., 2013; Fernandez Angulo, 2019; S. Gupta et al., 2019; Hummel, 2008)
virtual organization	*New technologies*		*Information and knowledge management*	(Campos & Vazquez-Brust, 2016; CHRISTOPHER, 2017; Dirisu et al., 2013; Fernandez Angulo, 2019; Goldsby et al., 2006; S. Gupta et al., 2019)

3. Research methodology

In this research, first, a new conceptual model was presented by reviewing extensive scientific sources. This model is then tested from the perspective of the research sample. This research is applied in terms of purpose and descriptive-analytical in terms of method. The statistical population and the sample of this research are all managers and experts in the field of the supply chain of project-based organizations in Tehran. The research sample is a total of 105 people who have been selected by purposeful and available sampling. Relevant components for measuring variables using focal groups and receiving the opinions of professors and experts in this field and applying their opinions, finally the dimensions and components introduced for measuring variables were used as a research model. To measure variables, the method of structural equations and use PLS software has been used. In this study, the questionnaire's internal consistency test was performed after measuring the validity of experts and the value of Cronbach's alpha coefficient for 114 questions designed for the lean-agile supply chain of project-oriented organizations was 0.92.

3.1. Research findings

Smart PLS.2 software has been used to analyse the quantitative data. In Figure 1, factor loads are examined. In this model, 114 observed variables explain 41 hidden variables. The standard value for the significance of factor loads is 0.5 and the value of T is greater than 1.96 at the 95% confidence level. Due to the high number of questionnaire items, the possibility of hiding items in the software has been used to shape the dimensions and adequately provided.

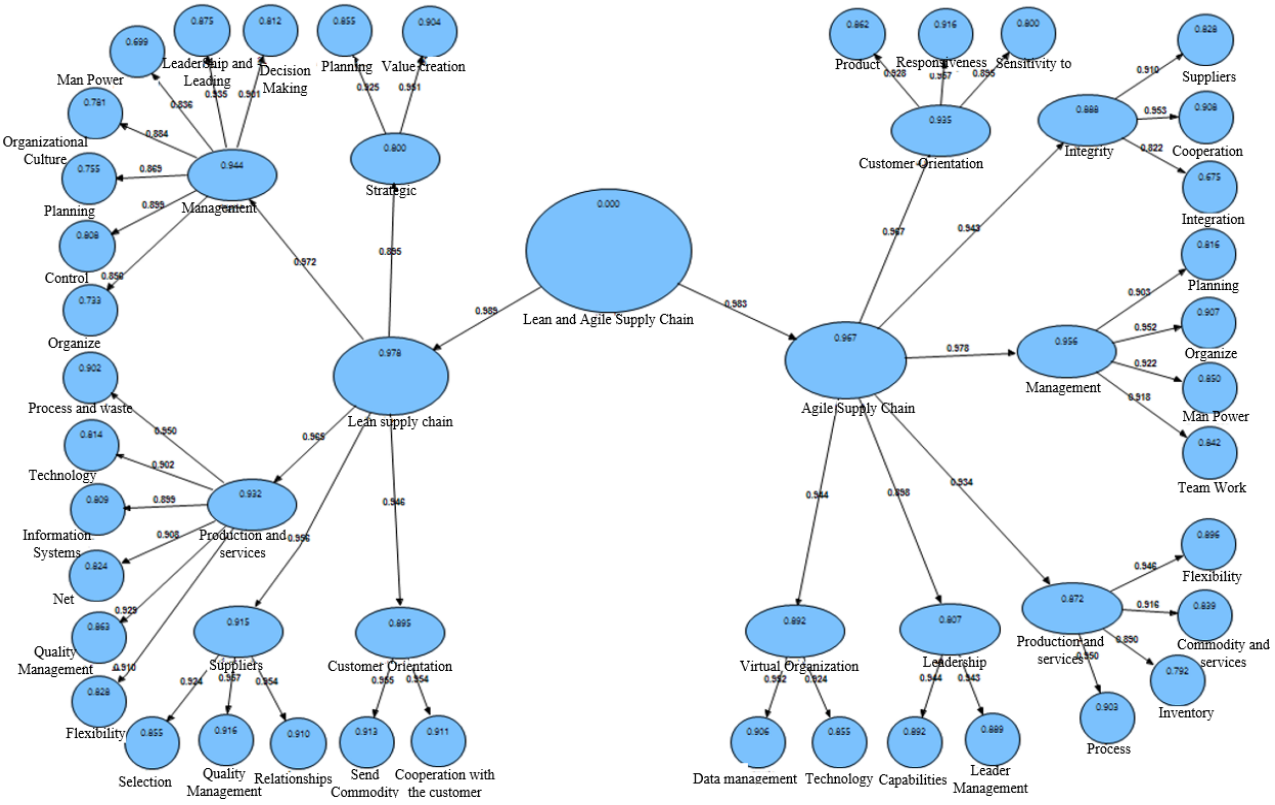

Figure 4: Investigation of factor loads

Due to the fact that the factor load is greater than 0.5 and the t value is greatr than 1.96, all identified items significantly explain their variables (the results are presented in the appendix). The factor loads of each of the identified components are presented to explain the lean supply chain's main variables. The results showed that since the factor load is more significant than 0.5 and the value of t is greater than 1.96, all components significantly explain their main variables.

Table 7: Factor loads of identified components for lean supply chain

Variable	Component	Factor load	standard error	Significance level t
Suppliers	Selection	0.9245	0.0176	52.4846
	Relationships	0.9538	0.0082	116.4445
	Quality management	0.9568	0.0093	102.8024
Production and services	flexibility	0.9098	0.0192	47.4482
	Production and service systems	0.8994	0.0258	34.8915
	Process and waste	0.9497	0.0098	96.6342
	Technology	0.9021	0.0181	49.8995
	Quality management Net Commodities and services	0.9292	0.0151	61.5411
	Quality management Net Commodities and Services	0.9077	0.0163	55.7646
	Quality management Net Commodities s and services	0.9159	0.0171	53.4754
Strategic	Value Creation Strategic Planning	0.9506	0.0086	110.1817
	Value Creation Strategic Planning	0.9246	0.0153	60.3272
Management	Planning	0.8688	0.0256	33.9078
	Decision Making and Problem Solving	0.9011	0.0219	41.056
	Leadership and Leading	0.9352	0.0106	88.4265
	Control	0.8987	0.0203	44.2928
	Manpower	0.8361	0.0378	22.1454
	Organizational Culture	0.8836	0.0225	39.2177
	Organizational	0.8564	0.0279	30.7353
Customer Orientation	Customer Cooperation	0.9543	0.0094	101.6515
	Send Commodities	0.9554	0.0093	102.7352

Table 7 presents the factor loads of each of the identified components to explain the agile supply chain's main variables. The results showed that since the factor load is more significant than 0.5 and the value of t is greater than 1.96, and all components significantly explain their main variables.

Table 8: Factor loads of identified components for agile supply chain

Variable	Component	Component	Factor load	standard error
Customer Orientation	Sensitivity to the Market and the Environment	0.8946	0.0284	31.4483
	Product	0.9282	0.0128	72.6296
	Responsiveness and Speed	0.9573	0.0081	118.7135
Integrity	Suppliers	0.91	0.0249	36.6014
	Cooperation	0.953	0.0106	89.5693
	Integration	0.8216	0.0289	28.381
virtual organization	Technology	0.9245	0.0165	55.9969
	Information and Knowledge Management	0.9516	0.0101	94.2495

Production and services	Process	0.9504	0.0123	77.5236
	inventory	0.89	0.0199	44.7868
	Flexibility	0.9465	0.0126	75.187
Strategic Variable Customer Orientation	Capabilities	0.9445	0.0119	79.236
	Strategic Management	0.9427	0.0117	80.8948
	Planning	0.9034	0.0241	37.4928
	Organizational	0.9524	0.0091	104.2988
	Manpower	0.9222	0.018	51.104
	Team Work	0.9178	0.0141	64.9163

Table 8 examines the research model's validity and reliability based on the validity indices of convergence, divergence, Cronbach's alpha, and combined reliability.

Table 9: Validity and reliability of the research model

Variables	**Convergence validity**	**Combined reliability**	**Cronbach's alpha**
Value Creation	0.7087	0.8793	0.7935
Send Commodity	0.7625	0.9058	0.8431
Inventory	0.5596	0.7284	0.5249
Selection	0.7192	0.8848	0.8045
Lean Flexibility	0.7205	0.8854	0.8055
Agile Flexibility	0.831	0.9365	0.8983
Lean Planning	0.6715	0.8593	0.7547
Agile Planning	0.5533	0.7874	0.6017
Strategic Planning	0.5977	0.8151	0.6557
Lean Suppliers	0.6491	0.9432	0.9321
Agile Suppliers	0.5519	0.7596	0.5368
Decision Making and Problem Solving	0.641	0.8416	0.7159
Lean Production and Services	0.6347	0.9688	0.9655
Agile Production and Services	0.5553	0.9291	0.9082
Sensitivity to the Market and the Environment	0.5028	0.7126	0.4509
Lean Strategy	0.5754	0.8897	0.8499
Agile Strategy	0.6142	0.9045	0.8721
Relationships	0.7434	0.8968	0.8273
Virtual Organization	0.6029	0.8985	0.861
Lean Organization	0.7156	0.8829	0.801
Agile Organization	0.7313	0.8907	0.8153
Production and Service Systems	0.6973	0.8733	0.7818
Process	0.6989	0.8742	0.7839
Process and Waste	0.7891	0.9181	0.866
Organizational Culture	0.7281	0.8889	0.8131
Lean Technology	0.7482	0.8985	0.8298
Agile Technology	0.6257	0.829	0.6907
Capabilities	0.6912	0.8695	0.7712
Product	0.639	0.8383	0.7113

Lean Management	0.518	0.955	0.9478
Agile Management	0.5741	0.9409	0.9303
Information and Knowledge Management	0.7429	0.8965	0.8267
Strategic Management	0.6939	0.8714	0.7796
Lean Quality Management	0.8253	0.9341	0.8941
Agile Quality Management	0.7179	0.884	0.8026
Lean Customer Orientation	0.6884	0.9298	0.9093
Agile Customer Orientation	0.5696	0.9157	0.8895
Net	0.7546	0.9022	0.8374
Lean Manpower	0.572	0.6043	0.2153
Agile Manpower	0.6497	0.8455	0.7205
Leadership and Leading	0.6681	0.8568	0.7485
Cooperation	0.7521	0.9008	0.8341
Customer Cooperation	0.7478	0.8989	0.8312
Responsiveness and Speed	0.8281	0.9353	0.8281
Team Work	0.7589	0.9042	0.7589
Commodity and Services	0.5962	0.7119	0.5962
Control	0.7397	0.895	0.7397
Integration	0.5628	0.7125	0.5628
Integrity	0.5786	0.8788	0.5786

Given that the appropriate value for the two Cronbach's alpha indices and the combined reliability is 0.7, it is clear that the variables under study are in the desired position. The appropriate value for the convergence validity index is 0.5. It is determined that the latent variables (structures) are in the desired condition.

Table 10: Factor loads of research variables

The main variable	Subset variables	Factor load	standard error	Significance level t
Lean supply chain	Suppliers	0.9565	0.0135	70.9024
	Production and Services	0.9654	0.0075	129.5599
	Strategic	0.8945	0.0241	37.0977
	Management	0.9718	0.008	121.6703
	Customer Orientation	0.9459	0.0104	91.1271
Agile supply chain	Production and Services	0.934	0.0161	57.9982
	Strategic	0.8985	0.0264	34.0133
	Virtual Organization	0.9444	0.0124	75.9486
	Management	0.9779	0.0049	198.5714
	Customer Orientation	0.9671	0.0069	139.2809
	Integrity	0.9426	0.0121	77.6671

The results of factor loads showed that management has the highest factor load in the lean supply chain. Also, in the agile supply chain, the management variable has the highest factor load.

5. Conclusion

In organizations with high uncertainty levels, it is challenging to predict changes in supply and demand daily. There are many instances of "events and impacts" that affect supply chain operations. Examples of such organizations are project-based organizations. Thus, logistics in such organizations have created tools and methods to deal with short-term changes in order to improve agility in their supply chain. In fact, in addition to the risk to the coordination of supply and demand, disorder is also a major risk to the supply chain. Due to the nature of project-oriented organizations' activities, this organization is always faced with the possibility of consistent changes in the external environment with which it always interacts. Therefore, in this article, by reviewing previous research in the field of project supply chain, we first examine the important indicators and parameters of this chain; Then, according to these organizations' nature, we tried to integrate lean and agility parameters in this supply chain. Therefore, according to studies conducted in this field, key parameters were extracted, and finally a conceptual model for agile lean supply chain design in project-based organizations given.

The research results from the opinions of managers and supply chain experts of project-oriented organizations that the lean and agile supply chain model of project-based organizations includes 38 components. In the Lean Supply Chain section, what explains the field of management is summarised in seven components. An organization can be successful in this area by paying attention to decision-making, problem-solving, guidance and leadership, human resources, organizational culture, planning, control and organization. In this regard, it is necessary to pay special attention to human resources and strategies such as improving employee motivation, readiness for change, training and promotion of employee empowerment, employee participation in change, employee suggestion system and goal setting for employees. In this area, the organizational culture in which the development and promotion of lean culture, the promotion of the culture of continuous improvement, and the promotion of the culture of responsibility should be considered. In the field of planning, attention should be paid to the continuous reduction of activity time and inter-sectoral coordination should be done to improve the level of planning. The field of control pays attention to the control levels in the areas of process and customer.

Another variable that explains the lean supply chain is production and services. This variable focuses on the six components of process and waste, technology, production and service systems, net, quality management and flexibility. In this regard, factors such as the use of new technologies, rapid exchange of information, research on new commodities or processes, analysis of the cause of failure, cooperation of stakeholders in quality improvement programs, flexibility of product and service, flexibility of time to operate And pay special attention to preventive maintenance. The third variable in explaining the lean supply chain is strategy, which includes two components of value creation and strategic planning. In this area, focus on value-added, value flow planning, value flow identification, integrated planning, strategic goals and plans, and strategic cost management should be on the organization's agenda. The fourth variable explaining the lean supply chain is suppliers, which define the three components of selection, quality management and its relationships. In this area, attention should be paid to indicators such as determining supplier ranking indicators, applying scientific methods to select suppliers, teaching quality principles to suppliers, creating suppliers, managing supplier relationships, and partnering with suppliers. The fifth variable in this area is customer orientation, which explains the lean supply chain. There are two components of sending commodities and customer cooperation in this sector, and in it indicators such as fast and safe delivery of commodities, reducing waiting time for customer orders, receiving fast information from customer needs and creating continuous improvement and continuous response to customer problems are needed to improve the level. It should be considered.

In the field of the agile supply chain, the first explanation of this field is management, which is defined by four components: planning, organizational, manpower and carte blanche. In this field, indicators such as team planning, team goal setting, participatory design and product team, Optimal use of resources, alignment of supply chain partners, use of transportation models, organizational structure, cross-sectoral cooperation, employment of multi-skilled employees, employee participation, quick and smart decision making and reduction of the organizational hierarchy should be considered as components To improve the level of management in the field of the agile supply chain should be

considered. The second explanation in the agile supply chain field is customer orientation, which includes three components of market and environment sensitivity, responsiveness and speed, and the product. In this area, in order to improve the level of customer orientation, it is necessary to improve the indicators of recognising the flows formed in the market, responding to market changes, paying attention to customer needs, fast order processing, efficient use of time, matching product features with market needs and volume. Customer participation in determining product specifications is pointed out. The third explanation is integration, which is described by the three components of suppliers, cooperation and integration. To improve the level of integration in order to improve the performance level of agile supply chain, it is necessary to have coordinated supply indicators, supplier cooperation in product design, trust between suppliers, intra-organizational coordination, information matching within the organization, product design based on interaction and sharing Common interests pointed out. The fourth explanation is the virtual organization, which is defined by the two components of technology and information and knowledge management. Important indicators in this area are the use of Internet services, investment in technology, use of technology to improve knowledge and Skills, data management in the supply chain, automation of administrative activities and the use of information technology infrastructure, which should be considered to improve the level of virtual organization. Service and strategic production variables are the final explanations that in this regard it is necessary to focus on competitive capabilities, providing interactivity, aligning the capabilities of partners, investing in innovation, futures studies, strategic vision, inventory management, Continued improvement and use of quality control systems.

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