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The Study of Agility Factors to Improve the Supply Chain in E-businesses: The Case of Digikala

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ABSTRACT

This thesis studies the agility factors to improve the supply chain in e-businesses with a case study of Digikala, the biggest e-commerce start-up in Iran. The theory of constraint was selected as the theoretical background after a review of the most relevant theories to elaborate, recognize and overcome the constraints during the process of change to an agile supply chain. The main indexes of agility in supply chain were extracted and accordingly used in the research methods. The methods used were mixed method including both qualitative and quantitative approaches. The agility factors that improve the supply chain have been gathered using interviews. A questionnaire was used to evaluate each factor based on its practical performance in the case company. The discussion of the results is about the factors that contribute to agility that advance and improve the supply chain in the case study.

Keywords: Agility, Supply Chain, e-businesses, Agile supply chain

INTRODUCTION

Today, the changing market conditions on the one hand and the diverse demands of customers along with the intensive competition between manufacturers and service providers forces, on the other hand, requires supply chains to reduce the costs and improve quality attitudes, to survive in different conditions (Wu *et al*.2017) The agility of supply chains is an operational strategy that focuses on the speed and flexibility of the supply chain. The key to the success of an agile supply chain is to respond in a timely manner to the demands of customers in different situations (Yusuf *et al*. 2004). Achieving such a capability requires that all physical and logistical facilities in the supply chain act in an agile, precise and efficient way. Agile supply chain in online distributors is a company that delivers customer orders at a low cost and on a timely manner (Christopher, Towil 2001).

The importance of conducting this research is about how e-commerce has become significant in our everyday lives and our purchase behaviour. Customers have several reasons to purchase from the Internet, such as the convenience and availability of the Internet market, the acquisition of information about the product or service and the large variety of products available for purchase. Also, as cities grow and urban housing problems resolves, internet shopping will develop more and more among people. On the other hand, for manufacturers, the low cost of setting up an online store, increasing number of the potential customers and ultimately increasing sales, leads companies to stablish their online stores.

The aim of this study is to identify the effective agility factors to improve the supply chain in the Digikala to expand the sample as a pattern for the similar middle eastern markets to strengthen the supply chain in e-business in order to meet the everchanging needs of the market as well as the increasing number of the customers and to maintain the competitive advantage and market share (Goldman, Nagel 1993) by overcoming the potential barriers and limitations that may occur and cause the company to be less flexible towards changes.

The reason for choosing this study is that, the importance of the internet shopping in the world that we are living in and the influence of the online retailers on facilitating this process of purchase for the buyers. The online retailing is a very sophisticated process and supply chain as the heart of this system is considered vital (Fernie, Sparks 2014). The greatest competitive advantage of these types of businesses is a supply chain that can directly affect the company's success and guarantee its continuation (Wu *et al*.2017). Supply chain for online retailers is a process that requires more

accuracy and coordination (Fernie, Sparks 2014). Customers are waiting to receive their goods after ordering on the website during a specific period of time (Klumpp, Jasper 2008). Any inconsistency in logistics will cause dissatisfaction to the customer. Online retailers from time to time disregard part of their profits to compensate to the unsatisfied customer for the delay in posting the deal and to resolve this dissatisfaction. The logistics system of an online store needs to be coordinated from the variety of aspects. The size, type and the transportation condition of the goods, are all the factors that need to be taken into consideration (Fernie, Sparks 2014). The logistics system of multiple warehouses in different geographical areas doubles the complexity of the work for an online retailer. The volume of the orders in different days of the year is influenced by various factors such as occasions, festivals and promotions, that will have a huge impact on the volume of orders that challenge the supply chain system. To guarantee the obligation to send orders in an efficient way and in a short amount of time, the supply chain system needs to be more flexible and more prepared from every operational aspect before confronting the crisis (Klumpp, Jasper 2008).

Digikala which is the biggest online retailer in Iran, must consider and operate based on the volume of orders and the vitality of the coordination between the organization's sectors. Digikala which in Farsi means Digital Product, has started its business by selling the digital products like cameras, mobile phones and laptops in its online platform. As the first e-commerce company in the area, Digikala grew so fast and absorbed enormous number of customers and they started to provide other products than only electronics, such as clothes, kitchen supplies, books, cosmetics, perfume and so much more. To maintain the brand picture and to avoid the competitors take advantage of the situation and win the market, the research problem (RP) arose as the following:

With the development of the products and the volume of the orders, Digikala finds it necessary to improve its supply chain constantly to be able to process faster and with more flexibility towards the market and demand changes.

For this reason, application of the agility approaches could be the solution for the organizational flexibility and at the end supply chain improvement, with the implication of flexibility and speed as the main keys of an agile supply chain (Swafford *et al*.2006). This study has been carried out to investigate about the tasks below:

1. Find the most effective agility factors that improve the supply chain process.
2. Rate the found effective agility factors based on their practical performance in Digikala.

3. Determine the agility factors which need to be developed and advanced to improve the supply chain in Digikala.

The study will provide the data regarding agility factors for implementation into the supply chain system for the best outcome and will provide the business owners in similar middle eastern markets with the insight of possible changes and improvements regarding their supply chain process.

To accomplish these tasks, the research will be conducted using mixed method, to be able to gather the data related to the subject matter, using the qualitative method, and for the purpose of understanding the practical level of each factor extracted from it, the quantitative method will be used to complete the research in an unbiased and accurate way. The first step of the research is to gather the related literature regarding the supply chain agility and interview the senior executives of Digikala in accordance with that. After interviewing, the author provides the Likert scale questionnaires among the operational staff to rate the extracted factors based on their practical performance in the case company.

This research paper consists of four main parts. The first part provides theoretical background of the topic, introducing the definitions related to supply chain agility, of how to achieve and apply it into supply chain system by studying of the varieties of models and theories. The second part of this thesis focuses on the methodological approaches that have been used to conduct the research. First, the case company has been introduced for better understanding of the Digikala and its components, which are related to the research. After that, the propositions extracted from the interviews are listed and coded based on the main agility factor indexes that have been gathered and classified from the theoretical part. And in the third part, there is a discussion of analysing the interview and questionnaire results. Finally, the conclusion chapter the author of this research will discuss the general subject matter using the gathered information and results, along with the limitations of the current research and proposed ideas to the possible future research on the topic.

I would like to express my sincere gratitude to my dear supervisors, Mr. Mike Wahl and Mr. Diego Navarra, for continuous support of my Master's thesis. I appreciate all the patience, enthusiasm and precious knowledge that they have provided me during the completion of this thesis.

I would also thank my dear family and friends who have supported me in this journey.

1. THEORITICAL BACKGROUND AND LITERITURE REVIEW

This chapter provides an extensive literature review, which needs to be considered about research tasks through theories, models and approaches for developing and extracting the agility factors for improvement of the supply chains.

1.1. The Traditional Supply Chain Concept

Traditional supply chain focuses on activities such as supply, distribution, maintenance, repair and inventory management, hence in modern supply chain model, in addition to all that, activities such as marketing, new product development, financial and customer services are also included among the activities. Supply chain management looks to the whole chain and its organizations as a single set. This management provides a systematic way of managing the various activities needed to synchronize as the flow of products and services with the aim of providing better services to the end customer. This systematic approach provides a framework for responding more appropriately to the needs of the business (Cai *et al.* 2013; Sukati *et al*. 2012; Christopher 2016).

Agarwal *et al* (2007) believed that the shared information between supply chain partners is achieved by means of process integration. 'Process integration' means collaborative working between buyers and suppliers, joint product development, common systems and shared information (Christopher, 2000). In the mid-1960s it became clear that the existence of a structure and objective in logistics and its centralized management could be a competitive advantage for a company (Agarwal *et al*. 2007).

During the 1980s, executives from companies realized that focusing on the total cost of logistics was a positive way of managing distribution channels. By this time, most executive looked at logistics as a tactical activity, and they had a great influence on strategic planning of the company. In the middle of continuous improvement, the process and integration with partners could create a lot of strategic values (Agarwal *et al*. 2007). With the help of information technology, the scope of the supply chain management function has expanded. The goal of creating an electronic supply chain management has been to reduce the cost of data transfer, cost of production on the one hand, and the expansion of business opportunities as well as the opportunity of a more convenient cooperation between companies (Agarwal *et al*. 2007). In appendix 1, the main components of supply chain have been investigated by Christopher (2016).

1.2. The Agility Approaches of the Supply Chain

1.2.1. The Agile Supply Chain

The agility dimensions of the supply chain are mentioned as flexibility, compliance and accountability. In addition to these factors, speed and quality are also considered as the main dimensions of agile supply chain. In other words, agile supply chain looks from the external perspective to flexibility and responds to unpredictable market changes and gets benefit from these changes by rapid evolution and flexibility in volume and type of the products (He, Q. et al, 2013).

According to Sharifi and Zhang (2001), the concept of agility consists of two main factors: responding to changes and turning them into opportunities. Thus, agility is the level of response of a firm to a highly competitive environment that follows four basic principles:

Customer loyalty, change in control and uncertainty, increased human resource abilities and participation for competition with others, have defined the supply chain agility as the capability in accordance with the rapid response to a changing environment in the market. Christopher believes that an agile supply chain must have distinctive features. Thus, agility can be described as "the managerial concept of responding to turbulent and dynamic markets and customer demands." In fact, agility not only relates to relationships by responding to the customer but also associated with the exploitation and benefits from the changes (Sharif, Zhang 2001). The agile supply chain emphasizes adaptability and flexibility and can respond quickly and effectively to changing markets (He *et al.* 2013).

The agile supply chain includes of companies that are separate from one another, but operationally dependent on each other. These companies can perform as suppliers, designers, manufacturers, and distribution centres. These companies are driven by the flow of the materials and the flow of information by interacting to one another. The agile supply chain ignores the linear and traditional organizational structure and by using network technology, forms a group of firms. The organization's scarcity will cause and prepare the company for a more competitive position and thus enables it to respond more quickly and more effectively to market changes and other uncertainties (Narasimhan *et al.* 2006). In addition, firms that have an agile supply chain process are more sensitive to the market, have more capability to match supply and demand and can achieve short-term cycles in an efficient way (Swafford *et al.*2006). Considering agility in the organization's supply chain directly affects the production of innovative products and their

delivery to customers, it can be concluded that supply chain agility is a critical factor affecting overall competitiveness (Swafford *et al.* 2006).

Perhaps one of the reasons for choosing agility in the supply chain is the role that it plays in advancing supply strategies and achieving its goals. As Goldman (1995) stated that agility is a construct with strategic dimensions including: enriching the customer, cooperation to enhance the competitiveness, organizing to adapt and thrive on change and uncertainty, and leveraging the impact of people and information. The supply chain provides a functional ground for evaluating agility capabilities (Van Hoek, R.I 2001). Distinctive features like sensitivity to market changes, virtual presence, process integration and networking can be observed in mostly all the agile supply chains (Gunasekaran, Yusuf 2002). Parallel advances in agility and supply chain management have led to the emergence of agile supply chains (Christopher, 2000). Agility has become an effective strategy for corporate growth and the basis for survival in business environments that has been accepted by the public. Agility supply chain development has become an effective step in logistics and corporate performance (Ismail, Sharifi 2006).

1.2.2. Agile Capabilities in the Supply Chain

Van Hoek *et al* (2001) measured the agility of the supply chain according to the model presented in Figure 1.

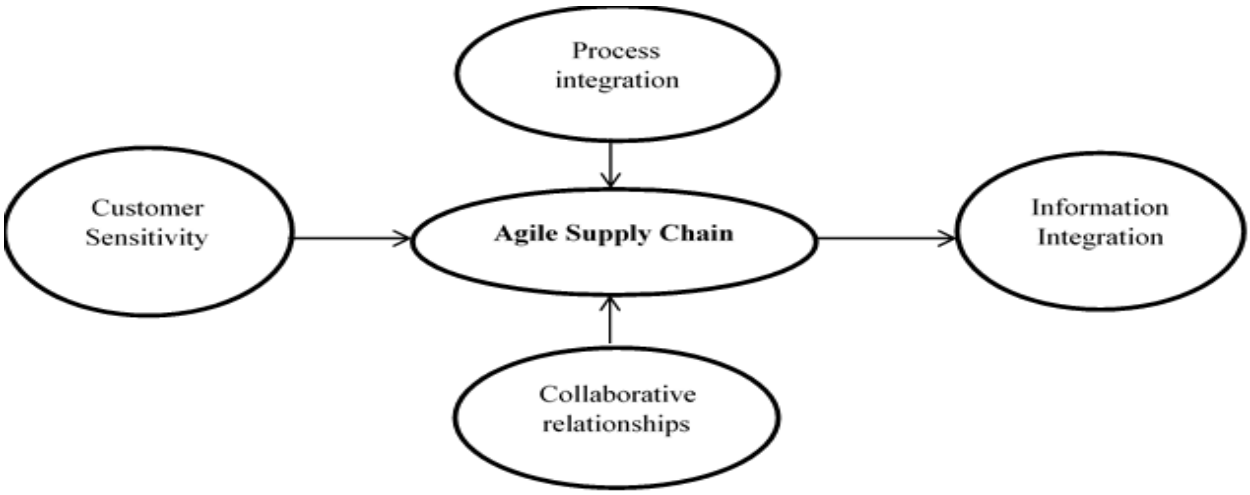

Figure 1. The pillars or features of the agile supply chain (Van Hoek *et al.* 2001).

In this model, the capability of a supply chain to be agile is based on four elements.

Collaborative relationships: This supply chain strategy is the ability to attract buyers and suppliers for work in partnership, and jointly develop products and information systems.

Process integration: Process integration as the basis of the supply chain means that the supply chain is a central core of the partners that connects them into a network and pursues a specific goal by doing certain activities.

Information Integration: This case as a supply chain infrastructure embraces the ability to use information technology to share data between buyers and suppliers, and thus efficiently create virtual supply chains. It is evident that the virtual supply chain is based on information and not based on stock inventory.

Customer Sensitivity: This item, as the basis of the supply chain, includes the ability to perceive or recognize and meet customer's current needs, as well as comprehensive change and uncertainty.

1.2.3. Conceptual Framework of Agile Supply Chain

Parallel advances in agility and supply chain management have led to the introduction of an agile supply chain. While agility is widely accepted as a winning strategy for growth, it is even considered as a basis for survival in certain business environments and the idea of creating an agile supply chain is considered as a logical step for the organization (Ismail, Sharifi 2006). Agility in a supply chain according to Ismail and Sharifi (2006) is the ability of the entire supply chain and its members to quickly coordinate with networks and operations to meet the dynamic and requirements of the customers and market. The main focus is on implementing business activities in network structures and taking into account the sufficient level of agility to respond to changes in a way that, it is capable of foreseeing change and looking for emerging opportunities. Based on an overview of existing research literature, (Lin *et al*. 2006) have developed a conceptual framework of the agile supply chain. This model is shown in Figure 2.

The main goal of agile supply chain is to enrichment and satisfy the customer (Gunasekaran, 1998). Within the framework of Lin *et al* (2006), customer satisfaction has been shown from four perspectives, including cost, time, performance and sustainability. The force behind agility is the force of a change. Agility stimuli include changes on business environments that force firms to seek new ways of doing business that can maintain their competitive advantage (Bal *et al*.1999).

(Sharifi, Zhang 2001) described the practical stimulants of the change, as changes in customer requirements and demands, changes in competitive market, technological changes and changes in social structures.

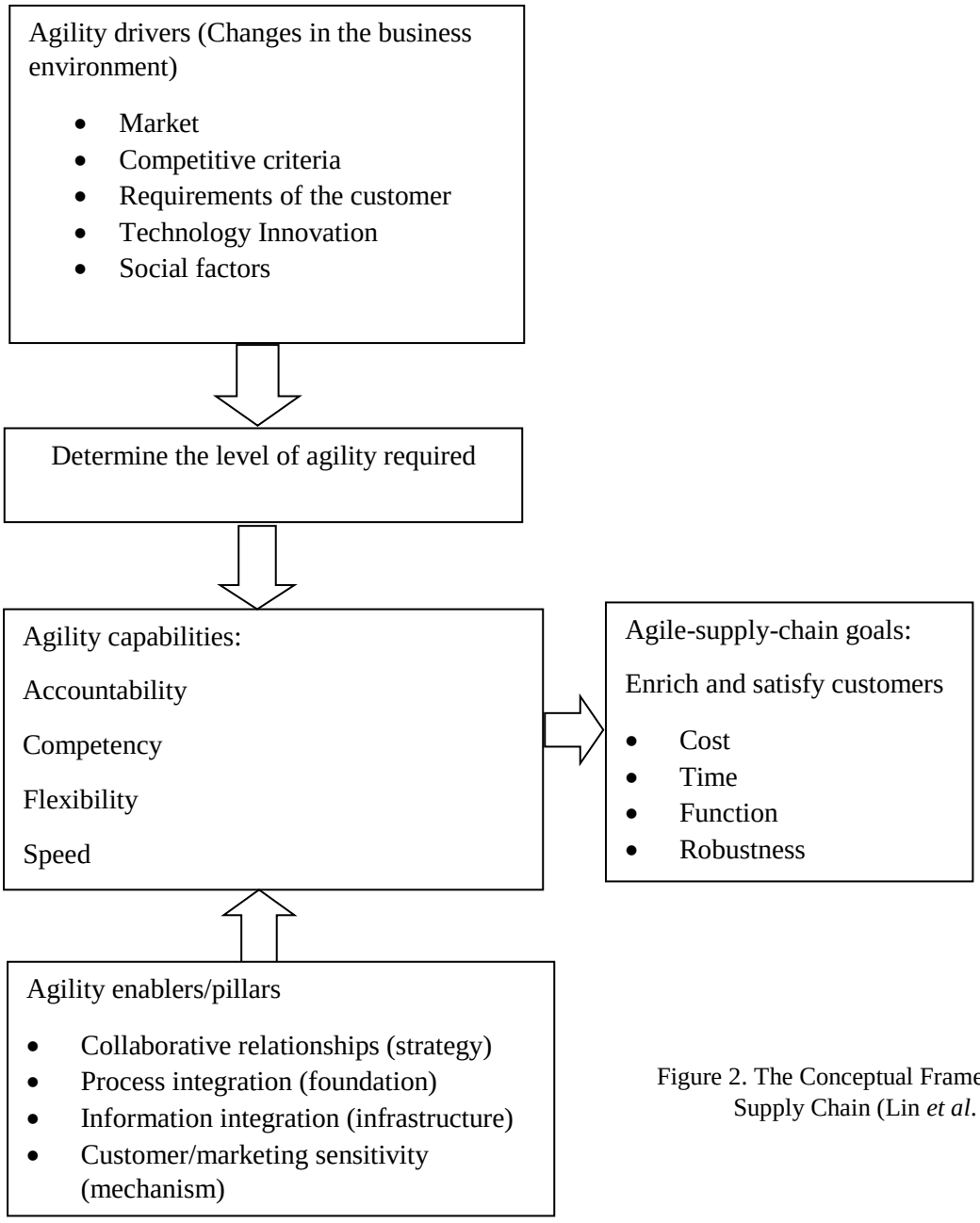

Figure 2. The Conceptual Framework of Agile Supply Chain (Lin *et al*. 2006).

Based on the conceptual framework of Lin *et al*. (2006) shown in Figure 2, an agile supply chain has the capability to be able to enrich and satisfy customers. These key features include four basic elements of:

Responsiveness: It is the ability to identify changes and response to them, whether tensile or reactive, as well as coverage of conditions resulting from the change.

Competency: It is the ability to understand efficient and effective organizational goals. The Appendix 2 provides the more details regarding the competency by view point of (Spekman *et al*. 2002) in supply chain

Flexibility and Adaptability: The organization's ability to implement various processes and the use of various facilities to achieve the same goals. In appendix 3, the five-dimensional flexibility has been elaborated by Swafford *et al*. 2006.

Speed: This is the ability of an organization to perform an activity as quickly as possible. To have a truly agile supply chain, key elements must be classified into four categories:

- Cooperative relationships under the Supply Chain Strategy

- Process integration as the basis of the supply chain

- Integration of information as the supply chain infrastructure

- Customer and market sensitivity and marketing process as a supply chain mechanism

1.2.4. Characteristics of Agile Supply Chains

Agarwal *et al* (2007) believed that the concept of Agile supply chain is a combination of several variables, which is described briefly:

"Process integration and performance management" is about shared information between supply chain partners that has been achieved by means of process integration. 'Process integration' means collaborative working between buyers and suppliers, joint product development, common systems and shared information.

"Market Sensitiveness and Responsiveness" that means the agile supply chain is sensitive to the market, which means that the supply chain can recognize and respond to real demand. In the past, organizations anticipated market demand by examining documents over the past decades and years, checking out the point of sale and market demand but today it has changed. In an agile supply chain, organizations can Listen to the voice of the market and immediately respond to it in an efficient way (Chan, A.T 2017).

In Appendix 4 the responsiveness in the supply chain has been elaborated by Handfield *et al* 2002 focusing on the role of trust and relationships.

"Centralized and Collaborative Planning", that is focusing on the total cost of logistics negotiated by the parties involved for managing distribution channels. By this time, most executive looked at logistics as a tactical activity, and they had a great influence on strategic planning of the company. In the middle of continuous improvement, the process and integration with partners could create a lot of strategic values (Agarwal *et al.* 2007).

"Information Driven Virtual Integration", that with the help of information technology, the scope of the supply chain management function has expanded (Bal *et al*. 1999). The goal of creating an electronic supply chain management has been to reduce the cost of data transfer, cost of production and the expansion of business opportunities as well as the opportunity of a more convenient cooperation between companies (Agarwal *et al.* 2007).

1.2.5. An Integrated Model for the Design of Agile Supply Chains

In a model presented by Christopher and Towil in 2001, they introduced a hybrid model for agile supply chain design.

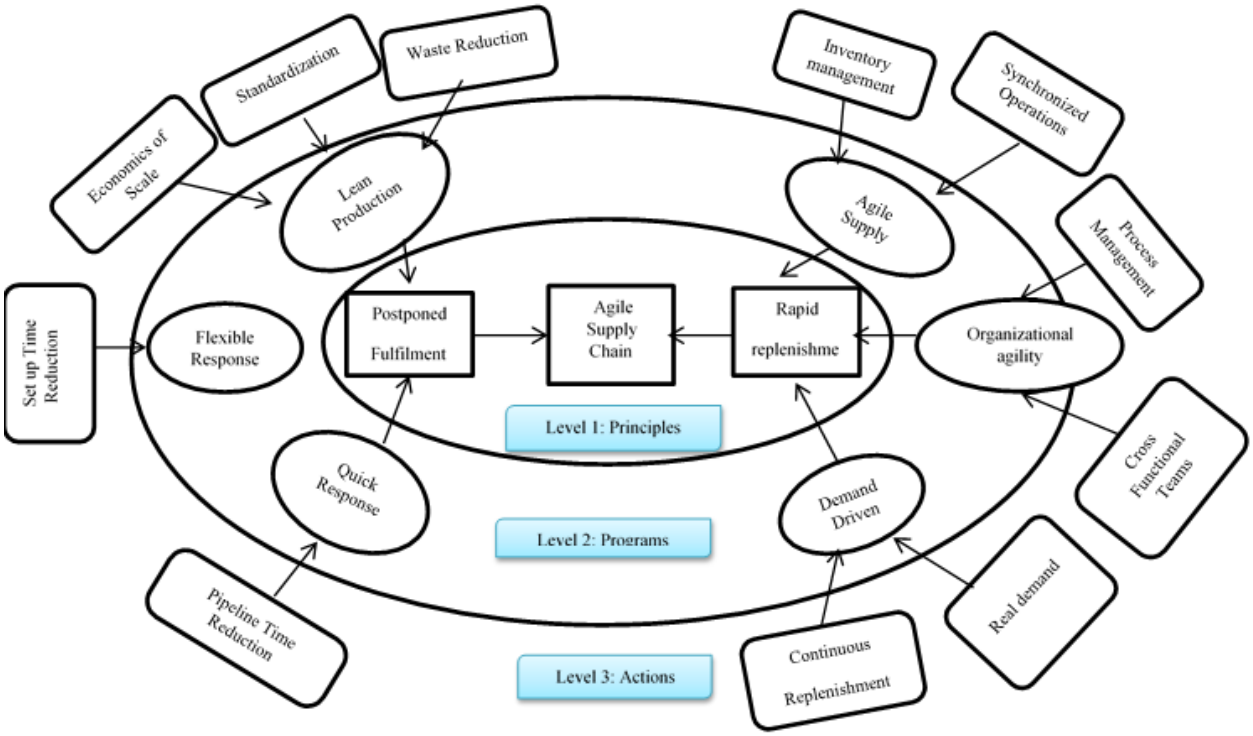

Figure 3. A hybrid model for agile supply chain. (Christopher, Towil 2001).

As shown in Figure 3, it is a three-level model that summarizes the concepts associated with agile supply chain. The first level incorporates the basic concepts of agile supply chain. The second level includes separate programs such as pure production, organizational agility, and rapid response, which are intended to achieve the principles set at the first level. The third level is a separate measure to support second-level programs. All components shown in this model may not be necessary in a market or field of production. However, most of the agile supply chains, may include these components to be recognized as agile system.

1.3. Theory of Constraints

The Theory of Constraints (Goldratt, E.M 1990) is a theory that has been developed by Goldratt explaining that each system has very few constraints that limits a system from achieving higher performance versus its goals.

1.3.1 The Five Steps of Focusing

The process of implementing this approach consists of applications of five key steps that ensure the on-going improvement in the system. The five steps consist of; (1) identify the system's constraints , (2) decide how to exploit the system's constraints, (3) subordinate everything else to the decision in step two, (4) elevate the system's constraints, and (5) if, in a previous step, a constraint has been broken go back to step one (Goldratt, E.M 1990). In short, the five steps of the theory of constraint focus on identifying the bottlenecks at the very beginning and prioritize them based on their effect on the organizational goal. In step two after managing the constraints, it's time to exploit them in a way that to exploit the entire constraints' capabilities in order to achieve organizational improvements. The third step is to subordinate everything in system based on the decisions made in step two. In the fourth step of the theory, the focus is on the elevation of the constraints which means the organization put more resources to limit the bottleneck and finally if the constraint is broken, the organization will focus to recognize the other constraints and repeat these five steps to minimize the limitations to achieve the goal.

The benefits of adopting theory of constraints are stated as reduction in lead-time, cycle time, better inventory management and improving the productivity and the quality of the system (Goldratt, E.M 1990). The outcomes of the application of this theory is pretty much like the

concept of the agility in the system which focuses on the less lead-time and being more effective and productive at the same time.

1.3.2. The Process of Change

The theory describes that agility occurs from organizations' reaction to needs for a change which could be a result of market pressure and exceeded demand of the customers. for this reason, organizations seek for the improvements. In the theory of constraints, it has been mentioned that constraints could be broken by application of specific stages and go back to the first step and repeat the five phases all over again for the next constraints. In the process of change instead, the goal is to implement the process of ongoing improvement, where the change is not an exception but rather a norm (Goldratt, E.M 1990).

To approach the improvement process itself, we need to understand how the process of change would lead to the ongoing improvement. It is obvious that every improvement is a change but not every change is an improvement. It is not possible to improve something without changing it in some way. And as Goldratt states "every change is a threat to security of current situation", that this might lead to emotional resistance from the people that are involved in the process, which this emotional resistance could be suppressed by the application of a stronger emotion like fear and insecurity (Goldratt, E.M 1990).

In the process theory of change, fear and insecurity has been used to demonstrate and overcome the potential insecurities resulting from the change in advance, by provoking the long-term insecurity of what might happen if the organization don't change. For instance, if the organization don't decrease (improve) in the cycle-time, the competitors might take over the market as they are performing better than the mentioned organization (Goldratt, E.M 1990).

Since process theories are about how entities change and how teams, objects and processes change and how these changes affect each other and the organization itself, the process theories seem particularly appropriate for understanding agility (Wufka, Ralph 2015).

To summarize, it is possible to explain the Theory of Constraints, which is equivalent to the above five steps, but are expressed in the terminology of the Process of Change which is related to ongoing improvement (Goldratt, E.M 1990). Merging the two parts of this theory leads to understanding of these three questions;

1. What to change? Pinpoint the core problems!

2. To what to change to? Construct simple, practical solutions!

3. How to cause the change? Induce the people to invent such solutions!

1.4. E-business and Supply Chains

The internet has a significant impact on how firms interacting with each other and their customers. The variety of challenges for supply chain integration such as high transaction costs among partners, information availability and the challenges of managing complex interactions between organizations can be resolved and simplified using the internet (Johnson, Whang 2002).

The management of information have always been a key aspect of supply chain management, the need of web-based information transfer between companies, their suppliers and their customers has increased the importance of information management in creating effective supply chains (Johnson, Whang 2002). The electronic commerce has been identified as one of the factors that supply chain process depends on it (Gunasekasekaran 1998). Johnson and Whang define e-business as the linkage between the Internet and supply chain integration which leads to transforming many processes within the supply chain from procurement to customer management and product design and they classify the e-business into three major categories: e-commerce, e-procurement, and e-collaboration (2002).

1.4.1. E-commerce

The e-commerce term can be defined as initiation, negotiation and implementation of commercial activities in the sales division by using the internet. (Klumpp, Jasper 2008). e-Commerce has had a profound impact on the supply chains of many products, both information goods and physical products while the supply chains of information goods have gone through lots of changes (Dewan *et al*. 2000). Manufacturers of physical products also considered the Internet as a direct channel of distribution. The channel differs in customer types, cost structure, profit contributions, controlling, logistical condition, service quality, market segmentations, supply and demand information and returns policies (Johnson, Whang 2002).

1.4.2. E-procurement

Due to being competitive, manufacturers must be flexible, fast changing and shorten the product life cycle. This is the reason why that efficient material procurement could form a pillar to support

flexible manufacturing, which the internet in this case offers a broaden online platform that connects the suppliers to buyers and based on what they are looking for in the simplest way possible. There's a difference between e-commerce and e-procurement in variety of aspects. As one example could be that, e-commerce often deals with the large number of individuals and works as a network, while e-procurement focuses on connecting companies together (Johnson, Whang 2002).

1.4.3. E-Collaboration

Johnson and Whang (2002) defined the e-collaboration as business to business interaction which has been facilitated using the internet. They define the interactions as not simple as only buy/sell transactions, but relationships among the businesses. Activities such as information, process and decision sharing and their integration would be the means to strengthen the relationship of the businesses involved in e-collaboration. Many researchers including Lee *et al* (2004) provide the information regarding quantifying and examining the bullwhip effect, which is related to measuring the benefits of information sharing.

The agile supply chain perspective of the e-collaboration focuses on the rate of collaboration in managing the product design and engineering transformations using the internet. some examples of the software engineering used in the process of the agile supply chain could be mentioned as; Extricity Inc which facilitates the integration of the businesses; SeeCommerce and WooCommerce which simplify the information integration to facilitate the supply chain metrics (Johnson, Whang 2002).

1.5. Summary

At the beginning of this chapter, the concepts and approaches of the supply chain and the agile supply chain have been explained using the related existing models and theories that has been summarized in Figure 4. In addition, the role and the position of the supply chain in e-business has been elaborated by means of e-commerce, e-procurement and e-collaboration. In further investigation, Theories of Constraints have been used to elaborate the need of agility for having a more effective supply chain and to prove that what steps must be taken to achieve the agile system which in this study is "Supply Chain". The theory of constraints explains the steps that must be

taken when a sudden change or bottleneck occurs in the system and how to break the constraints by exploiting from the constraints itself and the process of change in return tries to avoid the constraints to happen by application of the sense of insecurity in the organization, in a way that, if they don't response quickly to the changes or constraints, accordingly what type of difficulties they might face in the system.

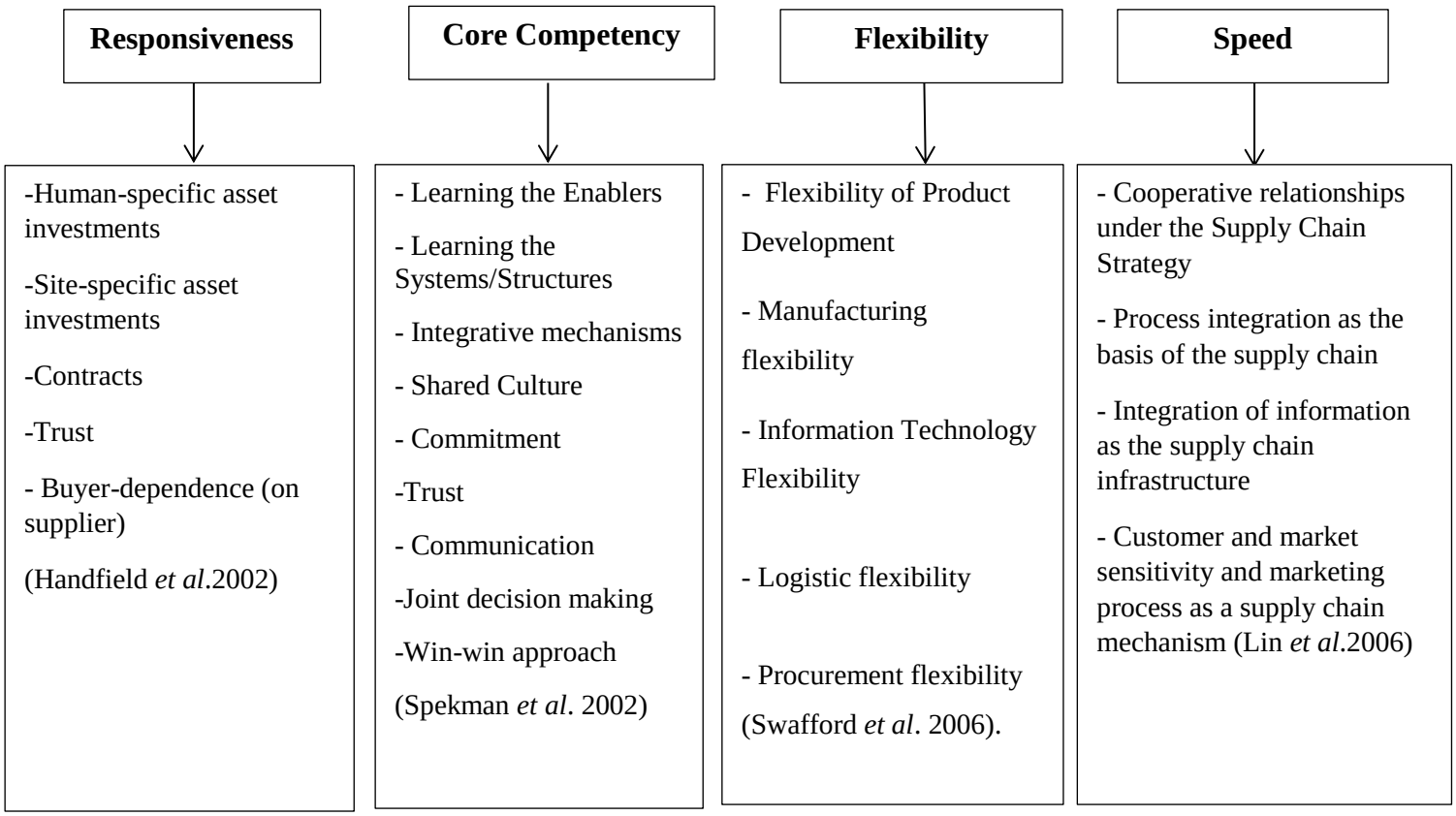

Figure 4. Summary table

This chapter illustrates that with the implication of agility factors gathered from theoretical background shown in Figure 4, a firm could constantly improve its supply chain performance due to the existence of the potential challenges such as unpredicted market demand situations (Sanchez, Nagi 2001), changing number of the customers and external and internal changes. For this reason, a supply chain must apply flexibility, Speed, Core Competency and proper Responsiveness to be able to respond to the unpredicted changes through agile capabilities (Lin *et al*. 2006).

These four main indexes of agility in supply chain shown in Figure 4, together with their sub-indexes will be used to conduct the methodology part of the research, to have a solid explanation

of agility based on theoretical background and literature review. This helps to have a more structured and legitimated research that can rely on for explanations to this research respondents and readers.

2. METHODOLOGICAL APPROACH

One of the characteristics of a scientific study is that, it aims to be realistic with the use of a suitable research method and the choice of appropriate research method depending the goals, nature and subject of the research. The purpose of the research is to provide an accurate and easy approach to the research tasks. In this section, by using the mixed method, semi-structured interviews and Likert scale questionnaire are designed to accomplish the research tasks on the case company.

2.1. Research Design

As the aim of this Thesis is to investigate about the agility approaches which can improve the supply chain process, the mixed-method (qualitative and quantitative) approach based on its correlation with research purpose have been chosen. The qualitative approach mainly focuses on words rather than numbers in the collection and analysis of data (Bryman, Bell 2015). Qualitative method has many advantages including its flexibility as a research strategy (Marshall, Rossman 2014), its broad applicability and ability to gather the profound data that is not possible to achieve through quantitative methods. Disadvantages, on the other hand, has been viewed for its time-consuming nature and the excess of empirical data (Saunders *et al*. 2009).
Among the qualitative methods, the author of this research uses the semi-structured Interview to let the experts in the case company speak freely and share their experiences and opinion towards improvement of the supply chain process.

The Likert-scale questionnaire will be used as this study's quantitative method, to investigate more around the primary data extracted from the semi-structured interviews. In this part of the research, the aim is to rate and prioritize the agility approaches that executives mentioned in a more practical way, by gathering information from a larger number of operational staff dealing with the different parts of supply chain system in the case company.

2.1.1 The Case of "Digikala"

Case study is one of the most used approaches of the qualitative method. In the research, among qualitative methods case study method is used, since it ensures that the issue is not explored through only one perspective, but rather a variety of perspectives, which allows to understand and reveal the multiple layers of the phenomenon (Baxter, Jack 2008). Case studies are considered suitable when

the research area is rather unknown because a case study approach is often used for a new theory building by describing, explaining, developing, contemplating or questioning a case that can be used as a sample to answer to relevant issues around the case matter in similar environments (Yin, R.K 2017). In case studies the research problem or question are investigated by gaining comprehensive understanding of the case. A case can be, for example, a phenomenon, a region, a temporal process, a group that contributes uniquely to our knowledge of individual, organizational, social, and political phenomena. (Yin, R.k 2017). In this study the single case study approach is used as the purpose of this research is to gain a profound understanding of one particular case; in this instance the experts' opinions around supply chain agility improvements in Digikala company. The aim of this thesis is to cover the previous theory and meanwhile extend the theory, through describing the experts' opinions in the case company regarding the agility factors that can improve the supply chain process in e-businesses.

The Reason why the Digikala has been chosen for this study is that, this company is the first business of its own kind and despite the market pressures and emerging competitors, it could survive in a successful way in the field of electronic supply chain. During twelve years of activity, Digikala has been through serious challenges regarding the huge raise in the market demand and the need for supplying the demands with variety of products with special storage and delivery situation requirements, and they found the Flexibility and Speed as the key to their success, which is partly the explanation of the Agile Supply Chain. Digikala is the biggest online shopping platform in Iran. Specialized in selling and merchandising online for different groups of goods, such as digital goods, home supplies, personal belongings, culture and art, sports and entertainment are offered in a variety of unique ways in the online Digikala platform. With a huge share of the online marketplace of goods in Iran, with its diverse portfolio of brands, Digikala is committed to keeping customers in the purchasing process and maintaining an unbiased position among them.

It is always one of the priorities of digital platforms to produce and provide the users with the technical content required with the high levels of standards, to facilitate the process before they make a purchase decision. It's very important for the digital world that millions of users will choose their items correctly, with great accuracy and in a convenient way. Digikala's top priority is to provide the affordable prices, along with the desirable quality of sales service. Delivering the goods from the order point to the end customer in a fast and effective way in a fully competitive market has always been a challenge for online shopping platforms, including Digikala. To stay competitive in ever-changing market and at the same time to absorb and maintain the customers,

an online platform with millions of users requires to have the most agile supply chain strategies to meet the clients' demands as fast as possible (Narasimhan, 1997).

2.1.2. Semi-structured Interviews

An interview is a purposeful discussion between two or more people (Kahn, Cannell 1957). The interviews can help the researcher to gather valid and reliable data that are relevant to its research question/problem and objectives (Saunders *et al*. 2009). Interviews may be formalised and structured, using standardised and specific questions for each research respondent, or they may be informal and unstructured conversations, or they may be a mixture of two approaches. The interviews are categorized by the level of formality and structure as followed (Saunders *et al*. 2009):

• structured interviews;

• semi-structured interviews;

• unstructured or in-depth interviews.

In this research the semi-structured interview has been chosen due to its feature that allows the participants to respond more conveniently and broadly, which gives the researcher a better and more profound understanding of the subject. In semi-structured interviews, the interviewer prepares the interview themes and questions in advance, although the order of questions may be changed during the interview depending on the flow of the conversations. In this type of interview, any specifications or clarifications are allowed from both interviewer and interviewee (Saunders *et al*. 2009).

As an online retailer, Digikala organization includes different departments including executives and experts performing and cooperating as a team to pursue the organization goals. I got the chance to schedule the meetings with different department's middle managers (Senior Executives) and have the interview with them about their experience on supply chain process in the extreme volatile market and how to improve the process and how to stay competitive using the agile approaches which have been implemented into their systems during their professional career period in Digikala. The interviewees were selected in Digikala corporation among the senior executives (Decision makers) who are involved in the supply chain process and their profession is directly or indirectly affecting the supply chain process. To have the better understanding of the subject area

in the case company, 7 interviewees are selected based on their theoretical and professional experience, in a way that Senior Executives of different departments with over 4 years of experience in the case company have been selected for the interview. The interview guide has been prepared in advance for the interviewees due to its convenience to spend less time responding the questions while interviewing and due to privacy matters, that may concern the company's guidelines and needed to be adjusted. The interview guide can be found in the appendix 5 of the research.

The executives which are chosen are under these job titles:

Senior Marketing executive, Purchasing Manager, Information Technology Specialist, Sales Manager, Senior Accountant Specialist, Warehouse Manager and packaging and delivery director.

Interviewees were both male and females in the age group between 30-50.

Each interview took around 15 to 30 minutes and the questions were answered based on the prepared questionnaire. Most of the interviewees would rather to talk about the subject as they knew in advance what the format of the questionnaire is. The interview has taken place by taking notes from the conversations and interviews had the discussion flow which both interviewer and interviewees found pleasant.

2.1.3. Likert-scale Questionnaire

A Likert-scale is a psychometric scale which helps the respondents to choose and elaborate their opinion based on multiple categories of the issue, that deals with their unbiased opinion, attitude and feelings. Likert-scale questionnaires mostly have been used to investigate the personal variables, such as self-confidence, anxiety, gratefulness and motivation (Nemoto *et al*. 2014).

The Likert-scale questionnaire method have been chosen in this study due to its capability for gathering the data fairly quickly form a large number of respondents, the reliability and validity of interpretations and the last but not the least, they provide the data that can be compared, contrasted and combined with qualitative methods, such as interviews and observations (Nemoto *et al*. 2014). For this reason, the Likert-scale technique is suitable for this study as it can be combined with the data gathered form interviews and get expanded to a further level of understanding the issue using the opinions of large numbers of supply chain workers.

In this study, the Likert-scale questionnaire will be provided to the 83 of the operational staff who are working in the supply chain process line in different departments. The questionnaire used for this study, has been provided in appendix 6.

After gathering the primary data from the senior executives, the extracted factors will be represented in a form of statements and in next step, the employees who deal more practically with the subject matter, will rate the statements from a scale of one to five based on the agility factor practical significance for improving the supply chain. In which one represents the Slightly Significant and five represents the Highly Significant shown in Table 2.

2.2. Research Findings

After interviewing the managers of different departments at Digikala and gathering the data from each person in different departments, the answers were coded based on agility approaches gathered and summarized in Figure 4. The purpose of developing the Table 1 is to relate the extracted literature viewpoints with the opinions of the senior executives (Warehouse, Package and Delivery, Finance, Sales, Purchase, marketing and IT) of Digikala regarding the agility in supply chain to have a wider understanding of how theoretical agility factors could be applied as the mechanism for constantly improving the supply chain process in a running business in a more practical way.

	Department	The Interview Propositions	Open coding	Agility Approach
1	Warehouse	The use of information systems that provide fast and up-to-dated reporting for organization's decision makers.	Information systems	Speed
2	Warehouse	Use of new technologies such as search robots, shelf scanners for a more precise and effective inventory management.	New storage technologies	Core Competency
3	Warehouse	Use of artificial intelligence and computational algorithms to predict customers' demand	Artificial intelligence	Flexibility
4	Warehouse	Create a comprehensive database for recording all sales and purchases histories	Database	Speed
5	Warehouse	Creating an appropriate mechanism for identifying goods that are more profitable than storage costs	Identifying goods with more profit	Core Competency
6	Warehouse	Use of mechanisms to prioritize product storage risks compared to their margin of profit	Risk management	Core Competency
7	Warehouse	Use RFID tags to manage timely and fast inventory reports	RFID tags	Speed

8	Warehouse	Compilation of a mechanism for calculating the cost of returning products due to their failure and defect	Waste management	Core competency
9	Package and Delivery	Creating an Intelligent Network to send items to customers by creating branches in different provincial centres	Segmentation	Responsivenss
10	Package and Delivery	Creating a comprehensive information system for tracking and monitoring product delivery	Tracking and monitoring the delivery process of the goods	Responsiveness
11	Package and Delivery	Create a system for categorizing the packets based on size and type	Categorizing by size and type	Speed
12	Package and Delivery	There is a system for specification of the items which needs the faster delivery regardless of the order date.	Manage items based on the priority of delivery and stocking inventory	Core Competency
13	Package and Delivery	Use of environmentally friendly packaging materials	Environmental friendly activities	Core Competency
14	Package and Delivery	Use a database to record all delivery processes to determine the estimated time of delivery.	Time-based systems based on past delivery trends	Flexibility
15	Package and Delivery	Creation of regional warehouses to meet projected needs based on past purchase patterns	Regional warehouse in accordance with the needs of the region	Responsiveness
16	Package and Delivery	Obtaining customer behaviour patterns for managing timelines for receiving and sending the orders	Using the Customer Behaviour models	Responsiveness
17	Finance	Establish a system of monitoring and tracking the changes in product prices in the market and considering the growth rate of prices for setting the selling price of products	Continuous market research to evaluate prices	Flexibility
18	Finance	Creating a database of the price trends provided by all suppliers in the supply chain and calculating the margin of profit for each of their proposed prices and choosing a more profitable option.	Evaluation cycles and choice of supplier with more profit	Core Competency
19	Finance	Using AI algorithms for more sophisticated and comprehensive compilation of information and reporting more efficiently.	Report algorithms based on past approach	Flexibility
20	Finance	Establishing a comprehensive financial management network in the company for better internal collaboration among the departments regarding the financial conditions.	Comprehensive financial management network	Speed
21	Finance	Design a program to calculate the unsold products that remain in the warehouse	Create a cost model for unsold product	Core Competency

22	Finance	Creating a coherent financial automation network for fast reporting of all active sectors in the supply chain to accelerate the process of calculating and presenting financial reports.	Financial automation	Speed
23	Sales	Strengthen the hardware and software infrastructure of the site to increase the ability to respond faster and more effectively to customers	Use of up-to-date and new hardware and software systems	Flexibility
24	Sales	Strengthening the infrastructure for increasing the quantitative and qualitative level of SEO (Search Explore Engines) and Sales Site to make it more visible to the customers by employing skilled and expert staff.	Enhancing the capabilities of search engines	Flexibility
25	Sales	Creating a suitable place for different vendors to supply their products on the Digikala website and to properly monitor their quantitative and qualitative performance	Direct linking of vendors on the website and controlling their performance	Speed
26	Sales	Creating a database of sales of products at different times to predict the sale of products for reporting to the purchase executives and preparation for specific periods (celebrations and national anniversaries) which the sales of specific products will be increased	Demand forecasting at specific time intervals (such as celebrations and ceremonies)	Flexibility
27	Sales	Creating an efficient and suitable communication bridge for reporting and monitoring the sales and purchasing department for more coordination to meet the needs of the sales department and preventing shortages of products at specific time intervals.	Direct linkage of Purchase and Sales department for more coordination	Speed
28	Sales	To monitor potential demand-based market sensitivities for various reasons such as (price volatility, stock market volatility, market popularity and inflation rate, etc.)	Assess current market sensitivities continuously	Flexibility
29	Purchase	Using of interfacing software to facilitate the selection of the most suitable suppliers based on quality, commitment, warranties and after sales services.	Smart Warranty Management	Responsiveness
30	Purchase	Establishing smart mechanisms for monitoring the market surveillance and forecasting market demand for timely-based purchase for ordering the products based on future demands	Creating the smart demand-based structure of ordering	Speed
31	Marketing	Creating facilities on the website for emotional purchase at some time intervals to attract customers to increase website visits and ultimately increase the sales.	Use emotional advertising according to specific time periods	Flexibility

32	Marketing	Creating an infrastructure to view visitors' opinion about different products and gaining customer behaviour patterns to send targeted ads and suggestions to encourage more purchases.	Preparation of performance reports of goods for future sale and purchase from the customer's view point	Responsiveness
33	Marketing	Use of different areas of expertise for the variety of the products provided on the website to review the products and provide a suitable reference for customers to be informed about the various technical and specialized aspects of the chosen product.	Using the specialized critics to evaluate and rate each product of each brand based on their quality	Core Competency
34	Marketing	Using a specialized team of experts and specialists to work on social networks to attract more audiences	Advertisements on social networks	Responsiveness
35	Marketing	Creating a classification of customers based on their loyalty and the amount they have purchased from the website to provide them with the specific services to increase their satisfaction and loyalty	Customer classification based on their loyalty and performance	Responsiveness
36	IT	Use security software to increase the website's security level and maintain the privacy of its customers and prevent the fraud	Raise the website's security level	Core Comeptency
37	IT	Using backup systems from all website's information to prevent the risk of losing the information	Create Backup Systems	Core Comeptency
38	IT	Using the website's software capability to facilitate the reporting process of all dimensions required by decision makers, which requires the use of specialized programming teams to monitor and develop the website constantly.	Evaluating and controlling customer behavior and patterns of information system	Flexibility

Table.1. The propositions extracted from interviews

After collecting data from 57 questionnaires from qualified operational staff from any department at Digikala, the average final score of each factor has been calculated according to the formula of weighted average shown below, and in according to the calculated mean, depending on the interval of the factor's average it would be accepted or rejected. It should be noted that the mean higher than 3.5 is accepted and lower than 3.5 is rejected as elaborated in Table 2.

$$\frac{\Sigma_i(i \times x_i)}{n}$$

where

n _ total number of people,

i _ factor points

x_i _ number of the people who answered i for $1 \leq i \leq 5$.

One example of how the weighted average formula calculated for each factor:

Sum of the points for **Factor 1** $= (21 * 1) + (2 * 15) + (3 * 13) + (4 * 5) + (5 * 3) = 125$

Average Factor $1 = \frac{125}{57} = 2.1929$

Highly Significant	Significant	Medium Significance	Slightly Significant	Not Significant
4.5-5	3.5-4.5	2.5-3.5	1.5-2.5	1-1.5

Table.2. The ranges of the respondent's answers

The Table.3. is provided based on the weighted average calculation of each factor from Likert questionnaire results to filter the agility factors based on their significance point in the supply chain in practice.

Number	Factor	1 point	2 points	3 points	4 points	5 points	Average	Result
1	Use of artificial intelligence	21	15	13	5	3	2.1929	Reject
2	Time-based systems based on past delivery trends	0	0	8	21	28	4.3508	Accept
3	Categorizing goods by size and type	2	1	12	27	15	3.9122	Accept
4	Comprehensive financial management network	0	3	10	36	8	3.8596	Accept
5	Use of up-to-date and new hardware and software	15	21	15	1	5	2.2982	Reject
6	Enhancing the capabilities of search engines	24	18	13	1	1	1.8947	Reject
7	Direct linking of vendors on the website and controlling their performance	1	0	12	21	23	4.1403	Accept
8	Customer classification based on their loyalty and performance	1	3	8	14	31	4.2456	Accept
9	Creating the smart demand-based structure of ordering	2	5	9	21	20	3.9122	Accept

10	Create a cost model for unsold product	3	5	7	27	15	3.8070	Accept
11	Risk Management	5	6	2	27	17	3.7894	Accept
12	Preparation of performance reports of goods for future sale and purchase from the customer's view point	18	26	2	8	3	2.1578	Reject
13	Identifying goods with more profit	16	27	9	1	4	2.1228	Reject
14	RFID tags	8	7	5	14	23	3.6491	Accept
15	Continuous market research to evaluate prices	5	6	4	22	20	3.8070	Accept
16	Report algorithms based on past approach	2	8	4	32	11	3.7368	Accept
17	Demand forecasting at specific time intervals (such as country festivals and events)	3	1	8	16	29	4.1754	Accept
18	Assessing the current market sensitivities continuously	5	6	8	15	23	3.7894	Accept
19	Evaluating and controlling customer behavior and patterns of information system	15	21	4	12	5	2.4912	Reject
20	New storage technology	9	2	1	23	22	3.8245	Accept
21	Database	19	21	5	7	5	2.2631	Reject
22	Information Systems	2	3	1	8	43	4.5263	Accept
23	Waste management	4	4	8	10	31	4.0526	Accept
24	Manage items based on the priority of delivery and stocking inventory	7	5	3	23	19	3.7368	Accept
25	Environmental friendly activities	8	34	5	7	3	2.3508	Reject
26	Evaluation cycles and choice of supplier with more profit	1	3	6	27	20	4.0877	Accept
27	Use emotional advertising according to specific time periods	26	18	5	5	3	1.9649	Reject
28	Using the specialized critics to evaluate and rate each product of each brand based on their quality	0	2	15	11	29	4.1754	Accept
29	Financial automation	18	26	8	2	3	2.0526	Reject
30	Raise the website's security level	2	3	7	15	30	4.1929	Accept
31	Create Backup Systems	17	24	12	2	2	2.0877	Reject
32	Segmentation	1	2	0	23	31	4.4210	Accept
33	Tracking and monitoring the delivery process of the goods	1	7	5	24	20	3.9649	Accept
34	Regional warehouse in accordance with the needs of the region	2	4	2	18	31	4.2631	Accept
35	Using the Customer Behavior models	3	5	1	24	24	4.0701	Accept
36	Smart Warranty Management	4	1	12	8	32	4.1052	Accept
37	Advertisements on social networks	0	2	1	15	39	4.5964	Accept
38	Direct linkage of Purchase and Sales department for more coordination	0	0	6	10	41	4.6140	Accept

Table.3. Agility factors averages based on their practical significance extracted from questionnaires

After determination of the factors that have scored higher than 3.5, by eliminating the remaining factors that scored less than 3.5 of average, 27 factors remain as the most effective and practical agility factors used in Digikala from the operational staffs' point of view shown in Table.4.

Number	Research subcategory	Unified weights of sub-indexes
1.	Direct linkage of Purchase and Sales department for more coordination	4.614035
2.	Advertisements on social networks	4.596491
3.	Information systems	4.526316
4.	Segmentation	4.421053
5.	Time-based systems based on past delivery trends	4.350877
6.	Regional warehouse in accordance with the needs of the region	4.263158
7.	Customer classification based on their loyalty and performance	4.245614
8.	Raise the website's security level	4.192982
9.	Demand forecasting at specific time intervals (such as country festivals and events)	4.175439
10.	Using the specialized critics to evaluate and rate each product of each brand based on their quality	4.175439
11.	Direct linking of vendors on the website and controlling their performance	4.140351
12.	Smart Warranty Management	4.105263
13.	Evaluation cycles and choice of supplier with more profit	4.087719
14.	Using the Customer Behavior models	4.070175
15.	Waste management	4.052632
16.	Tracking and monitoring the delivery process of the goods	3.964912
17.	Categorizing by size and type	3.912281
18.	Creating the smart demand-based structure of ordering	3.912281
19.	Comprehensive financial management network	3.859649
20.	New storage technology	3.824561
21.	Create a cost model for unsold product	3.807018
22.	Continuous market research to evaluate prices	3.807018
23.	Risk Management	3.789474
24.	Assessing the current market sensitivities continuously	3.789474
25.	Report algorithms based on past approach	3.736842
26.	Manage items based on the priority of delivery and stocking inventory	3.736842
27.	RfID tags	3.649123

Table.4. The filtered most effective and practical agility factors based on their practical significance weight

After gathering the data from interviews and questionnaires, the agility factors that are being used in Digikala company, based on four main agility indexes of speed, flexibility, competency and responsiveness have been founded. The level of each factor's efficiency and performance has been

investigated by the gathering the result of Likert questionnaire from operational staff. In chapter 3, the results of this chapter will be investigated and discussed in more detail.

2.3. Research Validity and Reliability

Reliability and validity are one of the main criteria for measurements when it comes to quantitative researches. A researcher must be certain to develop and authenticate the research in a way to reduce the errors in measurement.

According to Joppe (2000), reliability is "The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable."

The minimum value for the composite reliability and Cronbach's Alpha is considered to be 0.7 (Fornell, Larcker 1981) which is calculated in the Table 5 and the result shows that this research is reliable.

Lincoln and Guba (1985) argue that sustaining the trustworthiness of a research report depends on the issues and subject of the research, discussed as validity and reliability. The idea of discovering truth through measures of reliability and validity is replaced by the idea of trustworthiness (Golafshani, 2003) and establishing confidence in the findings (Lincoln, Guba 1985).

To calculate the reliability of the study's questionnaire, Cronbach's alpha coefficient was used by SPSS-22 software shown in table 5.

Variables and research components	Number of respondents	Cronbach's alpha coefficient	Cronbach Alpha Reliability Index
Alphanumeric questionnaire	38	0.712	Is reliable

Table.5. Cronbach Alpha Reliability Evaluation

According to the table above, and the response of 57 operational staff to 38 questions and the Cronbach's alpha coefficient, it can be concluded that these 57 employees (71.2%) have had same impression and understanding of the study's objective.

3. DISCUSSION OF THE RESULTS

The results of the study show that, from 38 factors of agility, 27 of the factors have been implemented in Digikala's supply chain and the other 11 factors need to get advanced or developed to achieve the supply chain improvement. By looking at the weighted average of each factor in Table 3, it is conceivable to estimate the weakest to the strongest factor that has been applied inside the supply chain system. For the 27 factors that have received the most scores, it is obvious that this company is doing well with the practical application of them into the system and this data can be useful for the similar start-ups in similar markets to take these vital factors into consideration of running a similar business. Although it is obvious that, all the data prepared in this thesis give the general insight of how agility based on four main indexes indicated in this thesis, is helpful to improve the company like Digikala, and nothing confidential about the business plan of this company is revealed.

For this reason, in this part of the thesis, the author discusses about the 11 factors that have been scored the least among the 38 factors of agility to accomplish the third task of the thesis and to prepare suggestions on how they can be applied into the system.

By identification of the factors that need to be improved and developed in Digikala, in the following the discussion regarding the improvements are provided:

By creating a database of customer behaviour in specific time periods as well as creating smart mechanisms on the website to monitor customer's behaviour in their purchasing processes and analysing this information, it will create an appropriate pattern of customer behaviour for different groups of products.

Since the Digikala daily supplies large quantities of goods depending on different locations, the need for green and environmental friendly thinking in the company is vital. For this purpose, basic measures such as reducing the use of plastic and polyethylene, also using smart box sizes or optimal delivery management to reduce the amount of packaging materials used to counteract with environmental health could be helpful. Recyclable materials could be used for the needs of the process of delivery and company can set policies that replace harmful substances with more sustainable ones.

Due to the increasing daily transactions of customers and audiences of this store, the need to use the modern and up to dated hardware and software infrastructure is important. In this regard, the

company must recruit specialist programmers to identify the weaknesses of the software problems and to develop the better and more effective program with better infrastructure that could improve the customer-responsiveness.

Considering the progress of artificial intelligence platforms in recent years and the usefulness of this technology in reducing human errors, as well as creating proper order in various processes, it can be very efficient and useful to predict all stages of the problems and obstacles. Indeed, the difference between artificial intelligence and human resources is that human resource identifies the problems, but artificial intelligence predicts them.

Since pricing rates vary among companies offering products, due to the economic difficulties that the country is faced, this has led to a big problem for retailers in general. To this end, it is necessary for the companies to create a mechanism for comparing and verifying the prices offered by vendors, which can buy the products at the true price, and on the other hand, increase their power of sale with more profit.

Due to the loss of information in the company, it is essential that data backup systems be carried out in a safe and comprehensive manner.

To be aware of all parts of the company's financial flows and integrate the whole process in an organization, it is necessary to create a comprehensive financial integration in the company.

One of the top selling strategies over the short term is the emotional advertising that makes customers start buying at a high quantity on different events like Christmas or new year’s events which can be with competitive prices for creating gift packages and promotional sales, lottery etc.

One of the most important indicators of electronic stores is the existence of a smart search engine for connecting the customers with their desired product, which can easily be searched in search engines and the search results are relevant. In this regard, company needs the skilful staff to develop Search Engine Optimization (SEO) in the process of affecting the online visibility.

CONCLUSION

Changes in customer demand, market environment, and technological innovation have led companies to face increasing competition. In such a competitive market, the need to create and improve flexibility, accountability and the agility are needed for survival. In this way, companies need to unite the suppliers and customers to surpass competitors in global markets and move operations and activities along together to achieve a level of agility in the supply chain. The agile supply chain emphasizes on the increasing of adaptability and flexibility that can react quickly and effectively to market changes. At the strategic level, the agility of the supply chain is considered as a vital factor. Since agile supply chains predict and respond to changes in demand quickly, easily and with high quality.

According to the need to assess the agility of the supply chain in different periods, it was necessary to identify the strengths and weaknesses of Digikala that will create the pattern for better understanding of the supply chain improvement in e-businesses. Digikala store is a well-known company with a background in this field to study and evaluate the factors affecting supply chain agility in e-businesses. The reason for selecting this company for this research is the breadth of its activity and its fast development and growth over the past ten years with all the difficulties and obstacles that has faced and overcome in each period of growth and development.

Following the study of theories and literature in this area, effective factors influencing on the improvement of the supply chain have been extracted based on four main agility indexes of speed, flexibility, competency and responsiveness. In continue, the senior executives of Digikala have been interviewed in the form of qualitative research to identify the general agility effective factors improving the supply chain. After encoding the senior executives' opinions based on the main agility indexes extracted from conventional and well-known models in this regard, the results of identifying the factors influencing the agility of the electronic supply chain are classified in the form of four main indicators and 38 items shown in Table 1.

To assess the practical state of agility in the supply chain system of Digikala, the author evaluated these 38 factors by providing the questionnaire among 83 operational staff from different departments, which 57 of them filled the questionnaires. After collecting the information from 57 operational staff in various sectors such as warehousing, finance, sales, purchase, package and delivery, marketing and IT, the data analysis revealed that the company was in a good practical position in 27 cases, but in 11 cases it needs to be developed and expanded in order to resolve the

problems and to improve the supply chain through agility factors. The factors are gathered and evaluated in Table 3 with a further discussion in chapter 3.

As the results of the research, the interview propositions have been interconnected with the four main agility indexes and the agility of supply chain as Speed, Flexibility, Competency and Responsiveness and have been explained throughout these indexes. The interview results provided a general view of agility in the case company from the decision makers' overview that gives us a solid picture of agility including all its aspects in the running businesses that can be considered vital as a basic pattern for an agile supply chain. After rating each factor based on their practical performance, the significance of each factor has been provided inside the case company, but this time from an operational workers' overview to indicate the actual usage of these factors. The questionnaire result is valuable, because it takes the theoretical background and supreme decisions makers opinions and adds the practical feature and provides the most accurate result about the agility of supply chain in this specific case company.

In general, the Digikala is performing well in organizational-based aspects of agility in supply chains, such as synchronizing the internal department's together and with the suppliers, developing the number of the customers and planning for their satisfaction, evaluating the market and competitors and performing based on the changes and requirements.

Meanwhile, there are details in the system that must be developed to achieve the organizations goals through agility. This study shoes that in general, the factors that are related to innovativeness need to be developed either through skilled human force or by up-to-dated technologies that are being used globally such as Artificial Intelligence, financial automation, evaluating the customers' behaviour pattern based on database and the search engines and implication of green supply chain with the most sustainability.

For further studies, this study can be conducted but in a lean supply chain, either as online or regular store, as it can be comparable with the result of this study and prepares valuable information regarding the choice of suitable supply chain for a business.

Research constraints of this study include the limitations of membership in Digikala company as it could help to collect more detail information regarding the subject matter as a member. The second limitation is the lack of enough incentives for respondents to answer to the questions for wider and deeper conversations about the subject.

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https://www.digikala.com/

APPENDICES

Appendix 1. The Main Components of Supply Chain

Supply Chain Main Components	
Production	What type of product market needs? How much of what product and when it should be produced? Production planning that consider factors such as factory capacity, line balances, quality control, and equipment maintenance are production activities that the supply chain manager must consider vital.
Inventory	What type of inventory should be maintained at which stage of the supply chain? How much inventory of raw materials, semi-finished products and finished products should be kept? The primary purpose of inventory is to create a reserve to deal with uncertainty in the supply chain. Because keeping extra inventory can be costly, it's important to check how much the optimum inventory level and estimated order points are.
Transportation	How do you transfer inventory from a local supply chain to another location? Air transport or carriage by truck is usually fast and reliable, but expensive at the same time. Rail and sea transport costs less, but they are mostly time-consuming and less reliable. This uncertainty should be offset by storing higher levels of inventory. When is it better to use any of the above shipping methods?
Place and location	Where should inventory equipment be produced and maintained? Where are the best places to spend on production and stocking? Can the current equipment be used, or new equipment should be purchased? After deciding on the above, the possible and available routes for the delivery of the product to the final customer are also determined accordingly.
Information	How much data and information should be collected and shared? Timely and accurate information facilitates better coordination and decision making. With the help of the right information, we can make effective decisions about what to produce and how much we produce, or where to store the inventory and how to transport it in better way.

Appendix 2. The Supply Chain Competency

Learning the Enablers	-Different points of view are encouraged within this supply chain -Developing new insights is important to supply chain -Members of this supply chain develop many new insights -New ideas are generally accepted by members of the supply chain -This supply chain supports experimentation Generating new ideas is whispered throughput this supply chain
Learning the Systems/Structures	-The systems and procedures support innovation transfer between supply chain members -The supply chain supports the development of new ideas -Facilitating the sharing ideas between members -Rewarding new ideas
Integrative mechanisms	-Extent use of electronic data interchange -Integrated business systems -Use of partner as operational part of supply/demand planning -IT integration with all suppliers/customers -Partner personnel involved in product design
Shared Culture	-The company and the partners have a shared continuous improvement philosophy -Similar sense of fair play with the partners -High level of shared understanding about key supply chain issues -Shared vision or mission statement
Commitment	-The commitment of the parties -Sustaining the relationship by extra efforts
Trust	-Choosing the trustworthy partners -Having the complete confidence in the partner's motives
Communication	-Frequent communication between the firms
Joint decision making	-Working with the partner on long-range planning -Managing the relationships by establishing a joint team -Valuing the consensus in decision-making -Individuals throughout this supply chain participate that are critical to its overall success
Win-win approach	-Having a mutual willingness of help when problems arise -Proactively trying to enhance each other's business -Understanding of the partners business and the critical issues that might affect their business

Appendix 3. The Five Dimensions of Flexibility in the Supply Chain

Flexibility of product development:	Manufacturing flexibility	Information Technology Flexibility	Logistic Flexibility	Procurement Flexibility
- The number of technologies used by the current production - Modular level - The number of products introduced each year - The number of different operating systems in the design at a given time - Number of product generations in design at a given time - The number of different projects in design at a given time - Percentage of assets with reuse - Number of technology used in the product - Degree of contribution to each part - Ability to allocate global development resources - Ability to design multiple products - Product Scale Ability - Reduce the life cycle of product development - Ability to perform design activities simultaneously - Ability to postpone product differentiation in the global supply chain - Ability to postpone design decisions - Outsourcing design capabilities - Global product design capabilities - The ability to adapt product designs to global markets	- A range of volume levels in which production can work - Number of available ways to increase capacity - Number of different products manufactured - Number of production options for each product - The number of processes available to produce the products - Number of Goods produced per facility - Number of product changes per month and per facility - A wide range of workforce capabilities - Ability to change volume - Ability to change product composition - The ability to implement ECOs (eco-friendly) virtues - Ability to produce new products quickly - Ability to change the production time - Ability to change the feature and process capability - Ability to change the workforce - Ability to move and relocate products among global installations - Ability to move and relocate processes among global installations	- The percentage of global supply chain that is directly supported by IT - The degree of IT system subscription for product development flexibility - The degree of IT system subscription for logistics flexibility - The degree of IT system subscription for manufacturing flexibility - The degree of IT system subscription for logistics flexibility - The number of IT-based approaches, for analysing global competitive environments - The ability of the IT system to adapt to changing needs - The ability of the IT system to adapt to new products - The ability of the IT system to communicate with other systems - The ability of the IT system to adapt to the use of suppliers around the world - Ability of the IT system in the field of adaptability to support global distribution channels - The ability of the IT system to adapt to new global production facilities	- Number of delivery modes for each product - Global storage capacity range - Number of delivery policies - Number of products per delivery - Number of carriers in each delivery - Number of items per facility - Number of storage facilities worldwide - Range of queuing sectors per order capacity - The number of customers who get served in each centre - Number of distribution channels - Ability to add / remove delivery sections - Ability to add / remove delivery modes - Ability to change delivery policies - Ability to change scheduled delivery modes - Ability to change scheduled delivery time - Ability to track shipments around the world - The ability to change the total storage capacity - Possibility to change the delivery capacity	- Range of order sizes (min., Max) - A wide range of delivery frequencies - Number of suppliers selected per component on a global basis - The number of suppliers (Global or Local) - Number of components purchased per supplier - Ability to receive variable order size - Ability to receive variable delivery schedule - The ability to influence the supplier's performance - The possibility of change suppliers - Ability to get ECOs implemented - Outsourcing technology capability - Ability to maintain suppliers in the long run - World-class logistics

Appendix 4. The Role of Trust and Relationship on Supply Chain Responsiveness

Variables	Range of possible managerial actions	Impact on supply chain responsiveness
Human-specific asset investments	-Supplier colocation -Supplier membership on NPD teams -Information sharing -Communication and visits by buying team	-Better supplier understanding of customer requirements -Reduced use of forecasts -Alignment of buyer/supplier -process requirements -Reduction of unique items with long cycle times -Better alignment of multiple supply tiers
Site-specific asset investments	-Investments in specific equipment, capacity or personnel to support customer relationship -Investment in specific information systems or training	-Reduced equipment setup time -Fewer capacity bottlenecks -Inventory positioning within the supply chain to reduce delays -Better alignment of supplier process capabilities with buyer's product requirements
Contracts	-Specific performance metrics with evergreen clauses -Detailed legal documents -Informal ''hand-shake agreements''	-Clear communication of expectations -Conflict resolution techniques -Less reliance on litigation as a means of resolving issues -Evergreen clauses create incentives for cycle time improvements
Trust	-Detailed precontractual supplier assessment -Dedicated supplier relationship manager -Ombudsman and other problem resolution mechanisms	-Buyer understanding of supplier performance and capacity limitations -Improved communication and information-sharing -Improved forecasts -On-going problem-resolution and communication of information -Paves the way for B2B e-commerce applications
Buyer-dependence (on supplier)	-Reduce/increase dependence through single/multiple sourcing -Supply base optimization -Insourcing/outsourcing Using industry standard products	-Increased competition for business can create incentives for cycle time improvements -Fewer suppliers results in simplified supply chain networks and reduces transaction complexity -Automated purchasing systems -Potentially creates greater supplier loyalty

Appendix 5. The Interview Guidance

Master's Thesis

Roxana Sheykhan

Tallinn University of Technology

Department of Business Administration

Candidate Position:		Date of Interview:	
Interview Start Time:		Interview End Time:	
Work Experience:			
Educational Background:			

Research Questions

1. Please briefly describe about your activities and position in Digikala.
2. What is the main idea of agility of supply chain in your opinion?
3. How do you think the agility can help to improve the supply chain of Digikala?
4. What are the specific agility factors that you think it has been applied and used inside your own department that leads to this improvement in general?
5. In your opinion what can be effective to increase the speed of the supply chain process in Digikala?
6. What factors should be considered to achieve the flexibility in the supply chain process?
7. What capabilities and competencies do you consider significant about Digikala that can influence the supply chain process?
8. In your opinion what are the activities that lead to having a responsive and accountable picture of the company, from customers point of view?
9. Is there something else that you consider important and that has not been asked?
10. Any comments or opinions?

Declaration:

I assure all interviewees that all the personal information will be anonymous, and the information received from this interview will be used for research purpose only.

Roxana Sheykhan

Appendix 6. The Questionnaire

The questionnaire was prepared in the framework of a study titled "The Study of Agility Factors to Improve the Supply Chain in E-business". This questionnaire is set up on the Likert Scale of (1 to 5) in which, (1) means the least value and (5) means the highest value. Please post your comments carefully after studying. The information given is only used for research purposes and the submitted information will remain completely confidential. Thanks in advance for your cooperation and patience in completing this questionnaire.

In this questionnaire the practical performance of each 38 factor in the company Digikala will be evaluated. Please rate each factor based on their significance and practical performance [1]in Digikala's supply chain process.

No	Questions	1	2	3	4	5
1	In your opinion how significant the use of artificial intelligence is in practical performance of Digikala?					
2	In your opinion how significant, time-based systems based on past delivery trends is in practical performance of Digikala?					
3	In your opinion how significant, the categorizing goods by size and type is in practical performance of Digikala?					
4	In your opinion how significant, the comprehensive financial management network is in practical performance of Digikala?					
5	In your opinion how significant, the use of up-to-date and new hardware and software is in practical performance of Digikala?					
6	In your opinion how significant, enhancing the capabilities of search engines is in practical performance of Digikala?					
7	In your opinion how significant, the direct linking of vendors on the website and controlling their performance is in practical performance of Digikala?					

[1] Practical performance is mainly about how effective and important this factor is, in the practical operation of the company. In another word, how much the operations of the company depend on the factor.

8	In your opinion how significant, the customer classification based on their loyalty and performance is in practical performance of Digikala?					
9	In your opinion how significant, the creating the smart demand-based structure of ordering is in practical performance of Digikala?					
10	In your opinion how significant, creating a cost model for unsold product is in practical performance of Digikala?					
11	In your opinion how significant, risk management is in practical performance of Digikala?					
12	In your opinion how significant is the preparation of performance reports of goods for future sale and purchase from the customer's view point in practical performance of Digikala?					
13	In your opinion how significant, the identifying goods with more profit is in practical performance of Digikala?					
14	In your opinion how significant, the RFID tags is in practical performance of Digikala?					
15	In your opinion how significant, the continuous market research to evaluate prices is in practical performance of Digikala?					
16	In your opinion how significant, Report algorithms based on past approach is in practical performance of Digikala?					
17	In your opinion how significant, Demand forecasting at specific time intervals (such as country festivals and events) is in practical performance of Digikala?					
18	In your opinion how significant, Assessing the current market sensitivities continuously is in practical performance of Digikala?					
19	In your opinion how significant, Evaluating and controlling customer behavior and patterns of information system is in practical performance of Digikala?					
20	In your opinion how significant, New storage technology is in practical performance of Digikala?					

21	In your opinion how significant, Database is in practical performance of Digikala?					
22	In your opinion how significant, Information Systems is in practical performance of Digikala?					
23	In your opinion how significant, Waste management is in practical performance of Digikala?					
24	In your opinion how significant, manage items based on the priority of delivery and stocking inventory is in practical performance of Digikala?					
25	In your opinion how significant, Environmental friendly activities is in practical performance of Digikala?					
26	In your opinion how significant, Evaluation cycles and choice of supplier with more profit is in practical performance of Digikala?					
27	In your opinion how significant, use of emotional advertising according to specific time periods is in practical performance of Digikala?					
28	In your opinion how significant, using the specialized critics to evaluate and rate each product of each brand based on their quality is in practical performance of Digikala?					
29	In your opinion how significant, Financial automation is in practical performance of Digikala?					
30	In your opinion how significant, Raise the website's security level is in practical performance of Digikala?					
31	In your opinion how significant, Create Backup Systems is in practical performance of Digikala?					
32	In your opinion how significant, Segmentation is in practical performance of Digikala?					
33	In your opinion how significant, Tracking and monitoring the delivery process of the goods is in practical performance of Digikala?					

34	In your opinion how significant, Regional warehouse in accordance with the needs of the region is in practical performance of Digikala?					
35	In your opinion how significant, using the Customer Behaviour models is in practical performance of Digikala?					
36	In your opinion how significant, Smart Warranty Management is in practical performance of Digikala?					
37	In your opinion how significant, Advertisements on social networks is in practical performance of Digikala?					
38	In your opinion how significant, Direct linkage of Purchase and Sales department for more coordination is in practical performance of Digikala?					