

# A Comparison of linear and non-Linear regression to study the effect of a supply chain agility on competitive advantage

## An analytical study

<sup>1</sup>Dr. Raghad Yousif Gabrow, <sup>2</sup>Dr. Abdulhakim j. skukri, <sup>3</sup>Dr. Muthanna Alobaidi

**ABSTRACT**—The purpose of this study is to explain the importance of Agility in supply chains and how it is critical for competitive advantage. The study proved that the agility supply chain helps the company to explore and exploit opportunities in fast changing markets.

**Keywords**—Supply chain agility, competitive advantage.

## I. INTRODUCTION

This study will clarify the effects of using supply chain agility on the competitive advantage in company against its rapid changes in the environment, by depending the analytical method (Linear and non- Linear regression) to study these effects.

Supply chain agility is becoming demand- driven rather than for cost- driven in order to effectively respond in real- time demand.

The study aims to comparison among Linear and non- Linear regression models to choose the best model which reflects the Largest effect of supply chain Agility on the competitive advantage by using (Linear, Logarithmic, Inverse, Quadratic, Cubic, Compound) which affect on the Independent variable (Competitive advantage).

### 1. The Methodology of the study 2-1: Importance of the study

The study pointed the reason behind the need of supply chain agility for enterprises which prove it by the importance of the ability to unforeseen and fast changes to attained the competitive advantage.

## II. OBJECTIVES OF THE STUDY

---

<sup>1</sup>Assistant prof, Department of Tourism, College of Tourism Siences, AL-Mustansiriyah University, Baghdad – Iraq, [dr.raghad1965@uomustansiriyah.edu.iq](mailto:dr.raghad1965@uomustansiriyah.edu.iq)

<sup>2</sup>Department of Hoteles management, College of Tourism siences, Al- Mustansiriyah University, Baghdad- Iraq, [rt210h@uomustansiriyah.edu.iq](mailto:rt210h@uomustansiriyah.edu.iq)

<sup>3</sup>Department of Tourism, College of Tourism siences, Al-Mustansiriyah University, Baghdad- Iraq, [muthanna.alobaidi@uomustansiriyah.edu.iq](mailto:muthanna.alobaidi@uomustansiriyah.edu.iq)

The study examined the Relationship between the supply chain agility and competitive advantage to stated the importance in today's continuously increasing competitive environment.

**1-2 : The Research problem:**

Our study made several key contributions:

1. To search for the reasons of poor management of supply chain agility in Iraqi companies.
2. Use the traditional methods to build supply chains in companies.

**1-3 : The Society and Sample of the study**

As the study related to the marketing and supply chain agility, it had to be that includes a Society of study: the managers of sales in the super marketsin Baghdad city, the study based on intention sample consisted of (36) sales manager in the super markets selected by depending on the law (Krejcie & Morgan) of the total of (40) super markets.

### **III. LITERATURE REVIEW**

**2-1 : The concept of supply chain Agility**

**A) The meaning of supply chain:**

Supply chain means all activities necessary to turn raw materials into a good or service put it in the hands of the consumer or business customer

(Solomon et al,2008, p: 468)

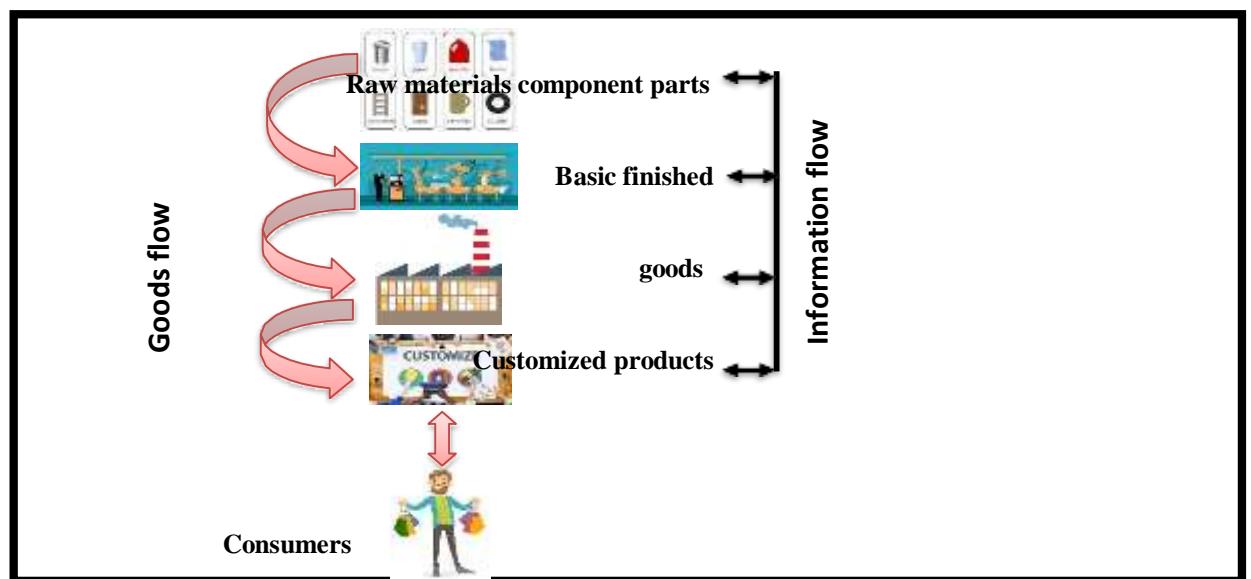
But (Reid & Sanders,2010, p: 93) defined the supply chain as a network of all activities involved in delivering a finished product or service to the customer.

**B) The global supply chain management:**

Supply chain management: is the coordination of flows among the firms in a supply chain to maximize total profitability. These "flows" include not only the physical movement of goods but also the sharing of information about the goods- that is, supply chain partners must synchronize their activities with one another. (Solomon et al,2008, p: 469).

Supply chain management is a vital business function that coordinates and manages all the activities of the supply chain linking suppliers, transporters, internal departments, third party companies, and information systems.

(Reid & Sanders,2010, p: 94)



**Figure1:** Clarify the basic supply chain

**Shipping schedules items and quantities**

**Master production schedule Shipping schedule**

**Daily production**

**Inventory status Custom configuration**

**Point of –sale data Promotional plans Inventory status Custom product req's**

**Source: Reid, Dan, Nada R. Sanders, (2010), "operations management", p: 94.**

(David Boddy) explain the term (supply chain management) in his book titled: "Management An Introduction", that the supply chain Management refers to managing the sequence of suppliers providing goods and services so that the independent organizations work collaboratively for mutual gain.

(Boddy,2017, p: 589)

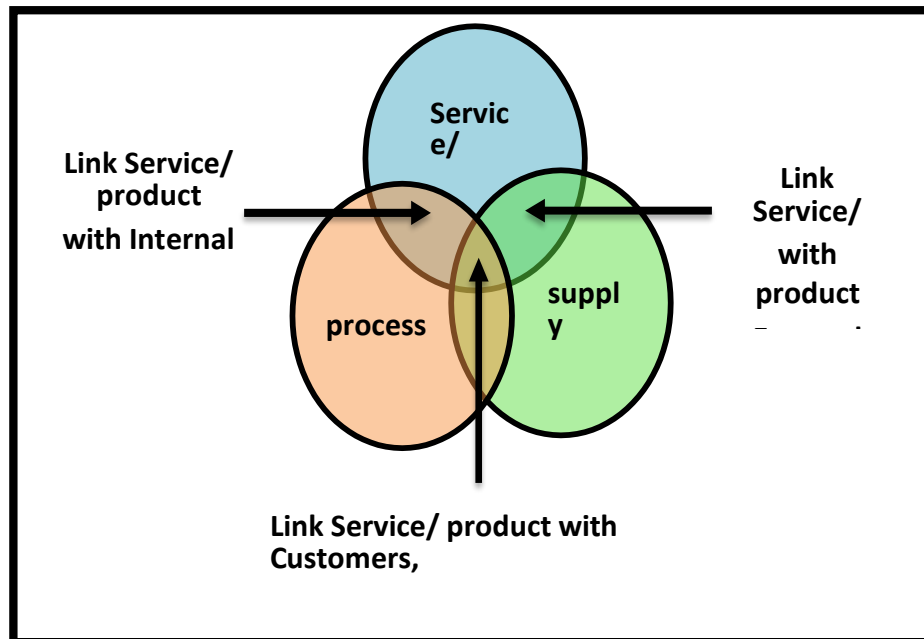
(David Goetsch) Explain in his book titled: "Quality Management", the key Issue in supply chain management was increased speed- get the product produced and in the customer's hands as fast as possible, like most quality related concepts, supply chain management is still evolving and being improved on as organizations learn more about it.

Emerging issues in supply- chain management include the following:

\*Security \*Adaptability \*Globalization \*Technology \*Crisis Management

(Goetsch & Daivd,2006, p: 157-158)

The Agility of supply chain Application needs to attained the global supply chain involves more than supply chain managers designing the infrastructure or finding the best suppliers. The firms operations strategy and competitive priorities guide its supply chain choices. (Krajewski et al,2013, p: 380) figure (2) shows the three major areas of focus in creating an effective supply chain.



**Figure 2:** Creating an effective supply chain Source: Krajewski et al, (2013), "operations management", p: 380.

There are three different ways for organizations to be considered (Global), organizations are considered globally if they exchange goods and services with consumers in other countries, such:

1. Marketplace globalization is the most common approach to being global.
2. Use managerial and technical employee talent from other countries.
3. Use financial resources globally. (Robbins et al, 2017, p: 83)

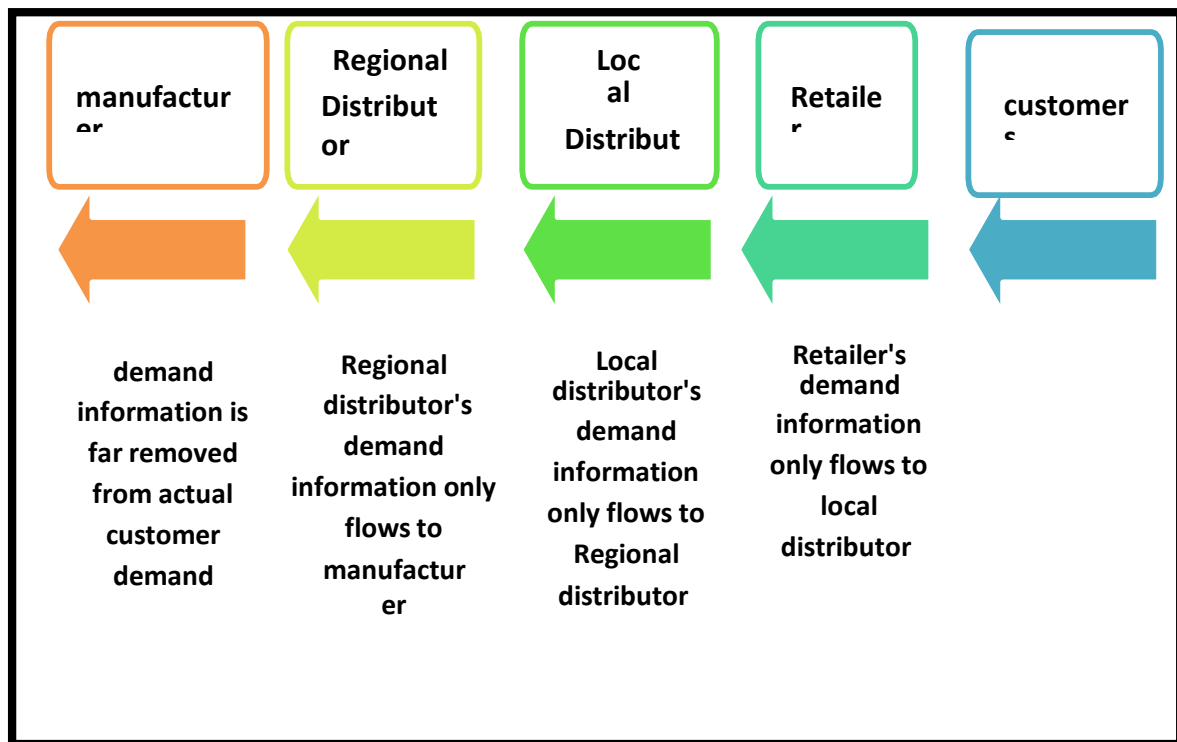
But (Gareth Jones) Explain in his book titled: "organizational theory, Design and change", the Global supply chain management as: a coordination of the flow of raw materials, components, semi-finished goods, and finished products around the world. (Jones, 2013, p: 83)

Thus, supply chain management is the coordination of flows among the firms in a supply chain to maximize total profitability. (Soloman et al, 2008, p: 469)

### ***C) The components of supply chain management:***

A company supply chain structure has three components:

- \* external suppliers \* internal function of the Company
- \* and external distributors. (Reid & Sandars, 2010, p: 95) Figure (3) shows the supply chain information flow.



**Figure 3:** Supply chain information flow

Source: Reid, Dan & Nada, Sanders, (2010), "operations management", p: 97.

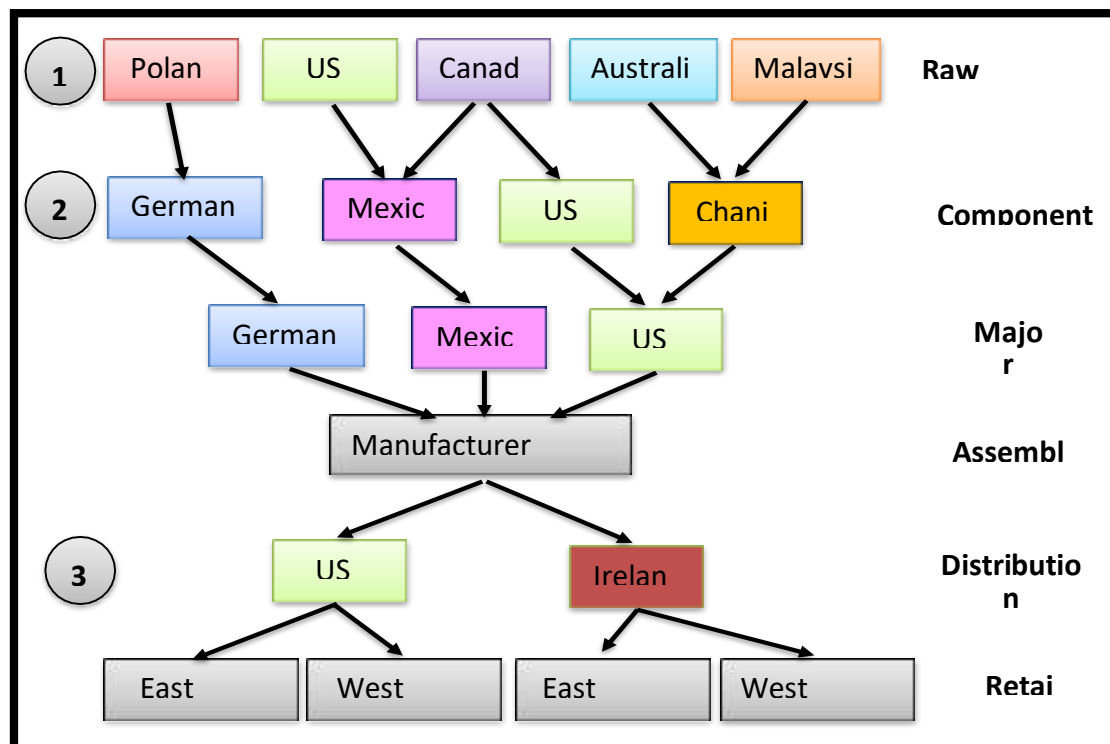
Global supply chain management offers many examples of how companies can reduce transaction costs and avoid bureaucratic costs: A transaction cost approach sheds light on why and how organizations choose different mechanisms to manage their interdependencies. It improves the ability to understand the process that organization use to manage their environment. (Jones,2013, p: 107-108).

#### ***D) The Globalization of supply chain:***

The trend of Globalization the supply chain in the factories of the future, design and business processes will be performed where it's most efficient and effective to do. (Robbins et al,2017, p: 487)

Creating a global supply chain involves more than supply chain managers designing the infrastructure or finding the best suppliers. A fundamental purpose of supply chain design for manufacturers is to control inventory by managing the flow of materials. (Krajewski et al,2013, p: 381-382)

Figure (4) illustrated the globalization of supply chain for a manufacturing firm.



**Figure 4:** A globalization of supply chain for a manufacturing firm

Source: Krajewski, Lee, et al, "operations management", (2013), p: 383.

#### *E) The Global supply chain strategies:*

In the area of global supply chain strategies, the manufacturers use the following methods to stay ahead of the competition:

- Collaborative planning
- Forecasting
- And replenishment. (Goetsch & Davis,2006, p: 64)

#### **2-2 : what is Agility?**

**A) The term agility means:** the collaboration among the five objectives of performance:

\*Quality \*speed \*Flexibility \*cost \*and dependability.

The Agility collaborates between the process and supply chain which concentrate on the (Responsiveness) of the organization. (Slack,1998, p: 163)

So (Steve Berczuk) defined (Agility) in his book titled "Agile Code line Management", as: "Agility is the ability to both creat and respond to change in order to profit in a turbulent business". (Berczuk,2006, p: 261)

According to (Meyer et al,2020, p: 1): agility is an emerging and important dynamic capability within the current business environment. Agility is one of the most noteworthy issue in contemporary supply chain management.

(Arno Meyer) Explain the concept of Agility in his research titled (supply chain Agility) as the term flexibility which it's synonym as opposed to agility while describing flexibility as the ability to diminish risks which are associated with uncertainty. (Meyer et al,2020, p: 2)

In addition, some researchers consider agility as an important dynamic capability because it is higher- order capability that enables firms to acquire, integrate and reconfigure resources and dynamically position themselves competitively.

(Zhou et al,2019,

p: 1-2). According to (Agarwal et al,2007, p: 1-2) Agility is the fundamental approach to volatile markets, Agility further helps the organization to attained the objective by using:

\* modeling \* interrelationships of the variables \*enhancing supply chain agility. These variables have been categorized according to their driving power and dependence. (understanding) Agility requires an overall frame work ... considering agility within dynamic capabilities framework will help managers make higher- quality decisions. (Zhou et al,2019, p: 1)

(Marc Wins) shows in his research titled: (Boosting supply chain Agility for competitive advantage) that organizations need to embrace the concept of agility in their quest for sustainable source of competitive advantage. (Wins,2017, p: 1)

According to (Hughes,2018, p: 1) Agility (or the ability to move quickly and easily) is a desirable trait in almost any situation- particularly as it relates to supply chain.

### ***B) Supply chain Agility?***

The concept of agility and agile in this study for a sustainable source for competitive advantage. Supply chain agility has emerged as a dominant competitive vehicle for organizations operating in uncertain and ever- changing business environment. ([www.planettogether.com](http://www.planettogether.com),2020, p:1) According to (Meyer et al,2020, p:1) supply chain Agility is the ability to respond rapidly to external change, But is breaking up big supply chains, with their in built economics of scale, the best way to make them more responsive.

(Hillsdon,2019, p: 2)

### ***C) The definition of supply chain agility.***

(Arno Meyer) define supply chain agility as a network of independent organizations which are integrated and interlink with the efficient flow of \* financial \* information and material while focusing on performance and flexibility. (Meyer et al,2020, p: 2)

Supply chain agility come with a cost and sometimes that cost might be huge enough to turn down the profitability. (Garg,2012, p: 2-3) As a result supply chain agility can easily be categorized and described as the company's ability to adjust tactics and operations within its production process.

([www.planettogether.com](http://www.planettogether.com), p: 2) Thus advanced sensing, Flexibility, Coordination, and Velocity are four pillars for achieving supply chain Agility.

$$\text{Agility} = \text{Advanced sensing} + \text{Flexibility} + \text{Coordination} + \text{Velocity}$$

(Garg,2012, p: 1)

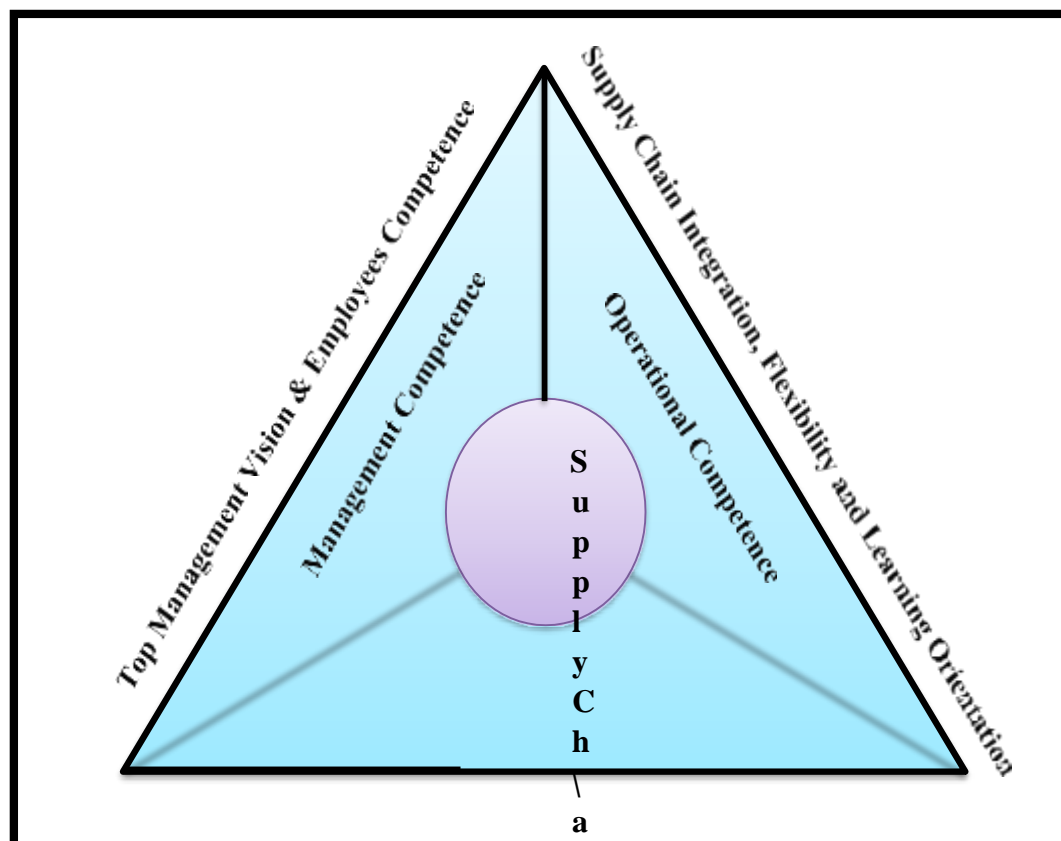
### ***D) Dimensions of supply chain agility***

The dimensions of supply chain agility are important to understand the areas that related to applicating these dimension such as: \* Market trends

\* Listening to customers \* information with suppliers \*Monitoring demand, etc.

([www.planettogether.com](http://www.planettogether.com),2020, p:2) In addition, IT systems can greatly help in strengthening all pillars of agility. It would need business process Re-engineering (BPR) along with best of breed IT systems to achieve and choosing a right transformation partner which is the key towards building a supply chain agility. (Garg,2012, p: 1) Information technology, operational, and management competencies for supply chain agility is the more importance framework on dynamic capabilities. Technical fitness capture how effectively a capability perform its function. (Gligor et al,2016, p: 25)

Figure (5) illustrates the importance of (IT) as one of components of the framework of supply chain agility.



**Figure 5:** framework of supply chain competence for supply chain agility

source: [www.semanticscholar.org](http://www.semanticscholar.org),2011, p: 2.

The dimensions as following:

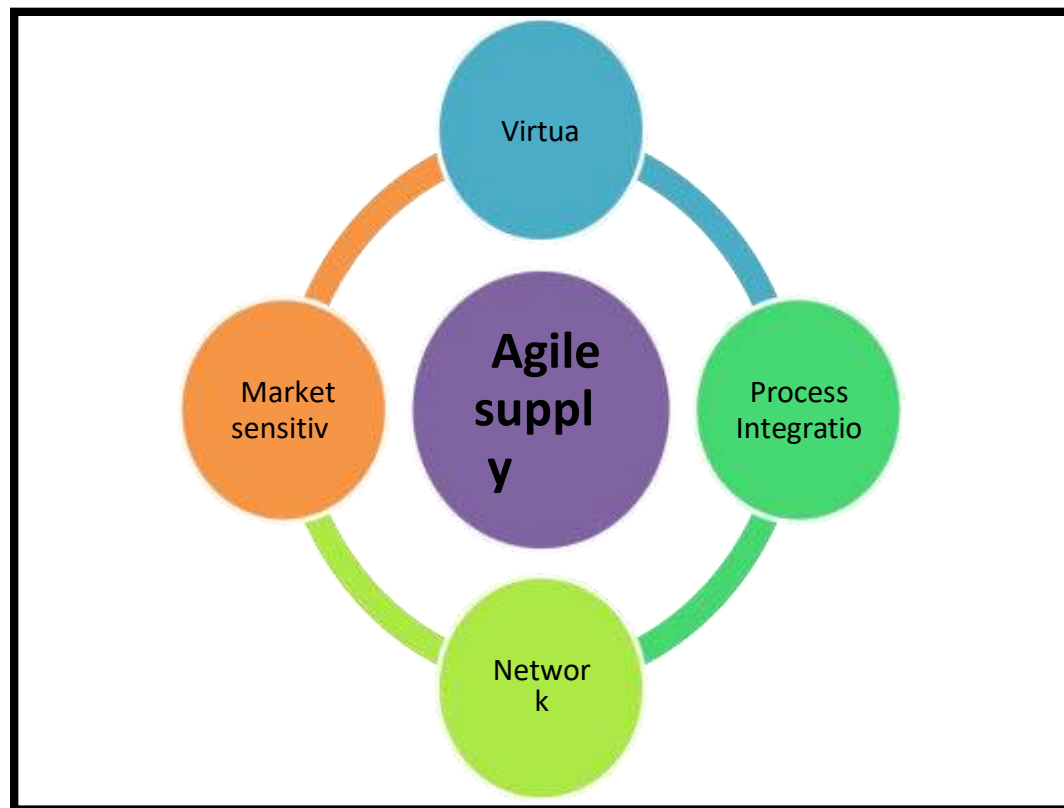
1. Accessibility: the company needs to be able to access relevant data within a timely manner and decide how to act. Information access across the supply chain is a key requirement for supply chain agility.
2. Decisiveness: Speeding up the decision making process through ridding the complexity will aid the supply chain of a company to becoming much more agile and efficient.
3. Swiftness: once a decision has been made about quickly responding to change, agility is depending on a company's swiftness. Speed is at the core of supply chain agility.
4. Using a software to fill gaps where the systems lack planning and scheduling, flexibility and accuracy.



Implementation of (Advanced planning Scheduling) (APS) software will providing greater agility in supply chain.

(www.planettogether.com,2020, p: 2-

3) Figure (6) shows the theoretical framework for develop supply chain agility.



**Figure 6:** theoretical framework for develop supply chain agility

**Source:** Iskanius et al, 2006, "Theoretical framework for develop agile supply chain", [www.reseachgate.net](http://www.reseachgate.net), p:2.

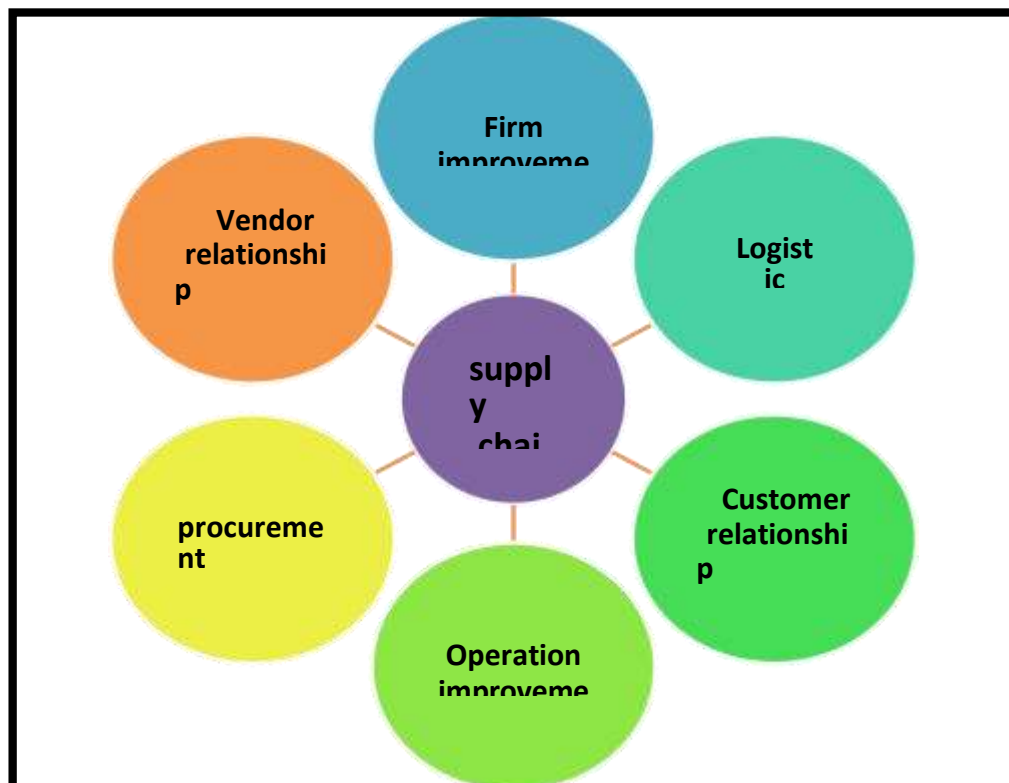
Agility can be something which organizations might attain without comprehending. Supply chain agility is constructed on the foundation of the well known lean concept, the supply chain agility firm is (a firm's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats in its environment).

(Arno Meyer) stated the (Leanness) may be a component of agility in specific situation (Meyer et al,2020, p: 4)

The key to supply chain agility and tackling complexity is to be able to have real- time visibility of what is happening on the ground at local level.

(Hillsdon,2019, p: 5) Supply chain agility is constructed on the foundation of the well-known lean concept, the combining between agility and leanness which has resulted in the

term (Leagile supply chains), state that Leagility Leverages Leanness for efficiency and agility for responsiveness. (Meyer et al,2020, p: 6-7) Figure (7) illustrate the framework for Leveraging supply chain agility



**Figure 7:** framework for Leveraging supply chain agility

Source: [www.semanticscholar.org/2008](http://www.semanticscholar.org/2008), p: 2.

#### **E) The goals of supply chain agility**

The agility of supply chain stated by (John Hughes), It is a philosophically concept, but difficult to execute on a consistent basis. The philosophy would fall into three main groups:

1. The ability to respond easily to opportunities facing the operational side of the enterprise.
2. The supply chain should provide a cost- efficient engine for growth formed by a solid infrastructure of both partnerships and technology platforms.
3. Establishing a competitive advantage is having an efficient and agile supply chain that can support customer. (Hughes,2018, p: 1-2)

(Arno Meyer) illustrated the framework for supply chain agility by figure (8)

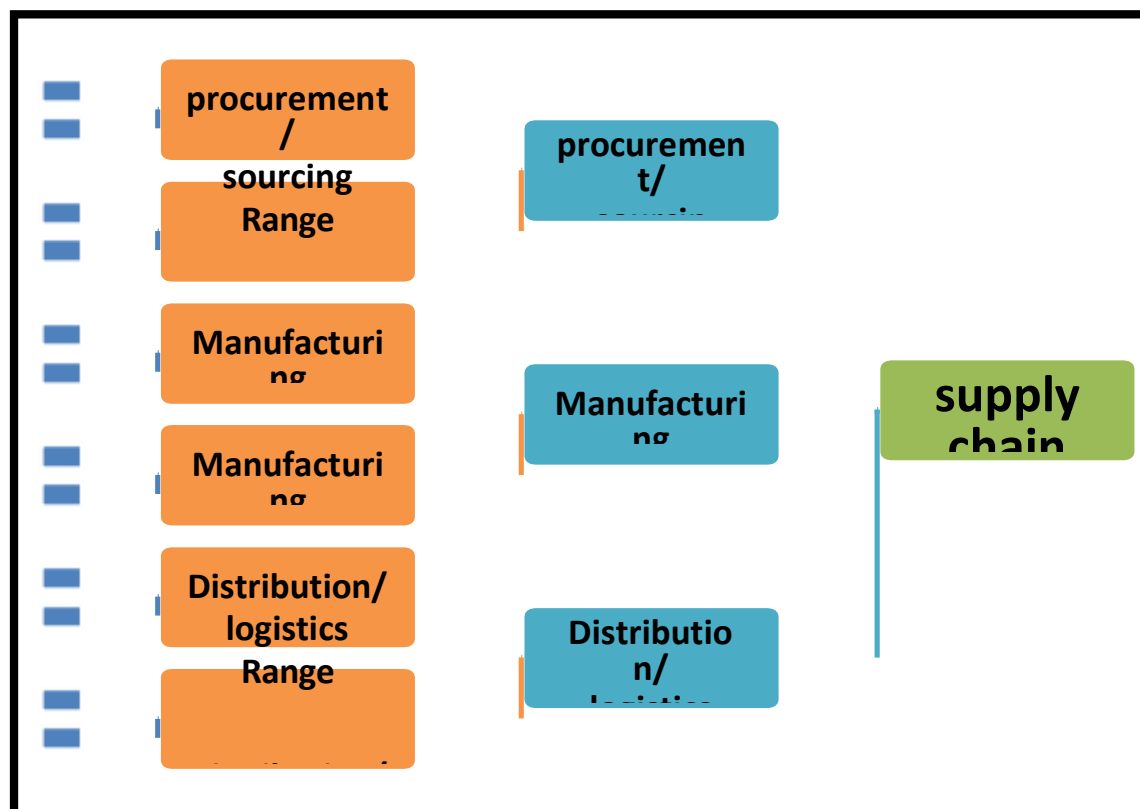


Figure 8: A framework for supply chain agility

Source: Meyer, Arno, et al, (2020), "supply chain agility: a conceptual framework towards leagility", p: 6.

F) What leads to the supply chain agility

The supply chain agility requires an appropriate blend of coordination, communication and speed in procurement, inventory, assembly and delivery of products and services. That would leads to:

1. Investing in the right training.
2. Responding to demand in real time.
3. Utilizing technology to gain visibility. (Wins,2017, p: 2)

## 2-3 : Competitive advantage

A) *The definition of competitive advantage?*

It means superior performance relative to other competitors in the same industry or superior performance relative to the industry average.

(Jurevicius,2013, p: 1) Therefore a competitive advantage is an attribute that allows a company to outperform its competitors. This allows a company to achieve superior margins compared to its competition and generates value for the company and its shareholders, thus a competitive advantage must be difficult, if not impossible, to duplicate. ([www.corporatefinanceinstitute.com](http://www.corporatefinanceinstitute.com),2020, p: 1). A competitive advantage is the unique ability of a firm to utilize its resources effectively, managing to improve customer value and position itself ahead of the competitive.

In other words, it's something that a company does better than its competitors because of some proprietary, service, or brand. ([www.myaccountingcourse.com,2020](http://www.myaccountingcourse.com,2020), p: 1)

**B) *What does competitive advantage mean?***

A competitive advantage is the attribute that allows an organization to outperform its competitive, therefore a competitive advantage may include access to natural resources such as: \* a low-cost power source \* highly skilled labor \* geographic location \* high entry barriers \* and access to new technology.

([www.en.wikipedia.org,2020](http://www.en.wikipedia.org,2020), p: 1) Every company must have at least one advantage to successfully compete in the market. If a company can't identify one or just doesn't possess it, competitors soon outperform it and force the business to leave the market.

(Jurevicius,2013, p: 1) A competitive advantage is found in cases where the organization has the capacity to provide the comparable added benefits as rivals but at a competitive price (cost advantage), or offer advantages that go above and beyond those of competing products and services (differentiation advantage). (Rao,2017, p: 1)

But (Kumkale,2016, p: 121) explained the meaning of competitive advantage for business, As the ability of over performing (more profitability, higher market share etc.) than its rival. Thereby continuously analyzing the market and organization and developing implementations and actions according to this analysis are gaining importance.

**C) *Constructing a competitive advantage***

Before a competitive advantage can be established, the company must know:

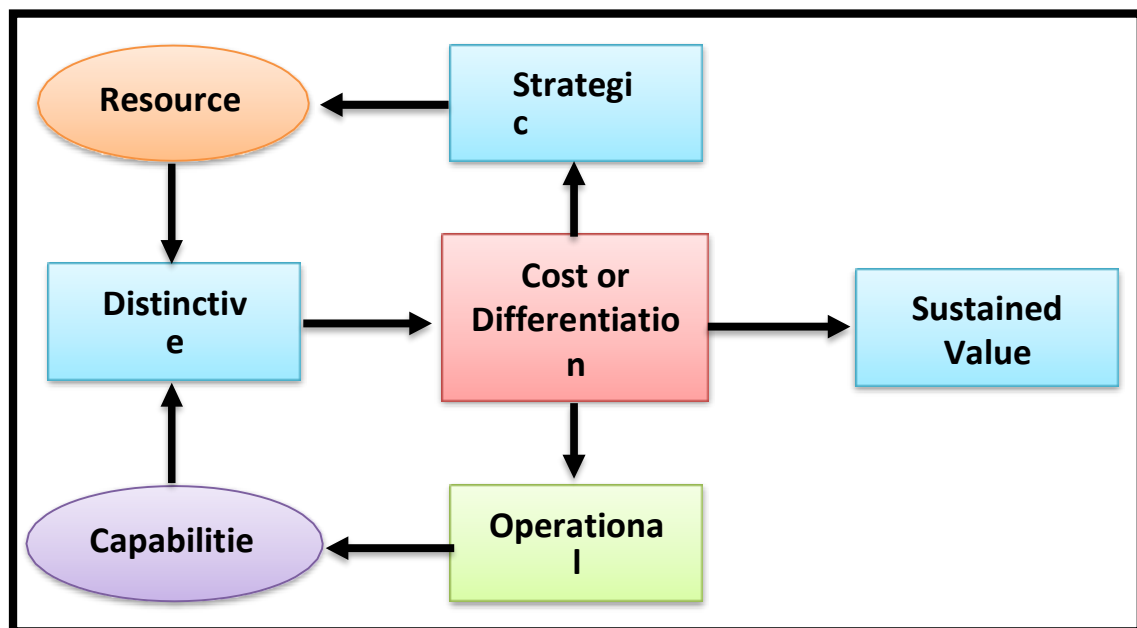
1. Benefit: A company must know what benefits their products or services, It must offer real value and generate interest.

2. Competitors: It is important for a company to understand other competitors in the competitive landscape.

To construct a competitive advantage, a company must be able to detail the benefit that they provide to their target market in ways that other competitors cannot. ([www.corporatefiniceinstitute.com,2020](http://www.corporatefiniceinstitute.com,2020), p: 1-2).

**D) *The model of competitive advantage:***

3. A competitive advantage is the leverage a business has over its competitors.  
([www.en.wikipedia.org,2020](http://www.en.wikipedia.org,2020), p: 1) Diagram (9) shows the resource- based and positioning perspectives to demonstrate the model of competitive advantage.



**Figure 9:** A model of competitive advantage

**Source:** Rao, k.s, (2017), "Resources and capabilities; cost and differentiation; value creation, p: 2.

Figure (9) shows that the resource- based perspective, to be able to build a competitive advantage the organization needs to have sufficient resource and capabilities that are preferable over its rivals. Thus capabilities promote the organization's potential through the effective utilization of its resources.

(Rao,2017, p: 2)

#### **A) Strategies for competitive advantage**

The are three strategies for establishing a competitive advantage:

\* Cost leadership \* Differentiation \* Focus

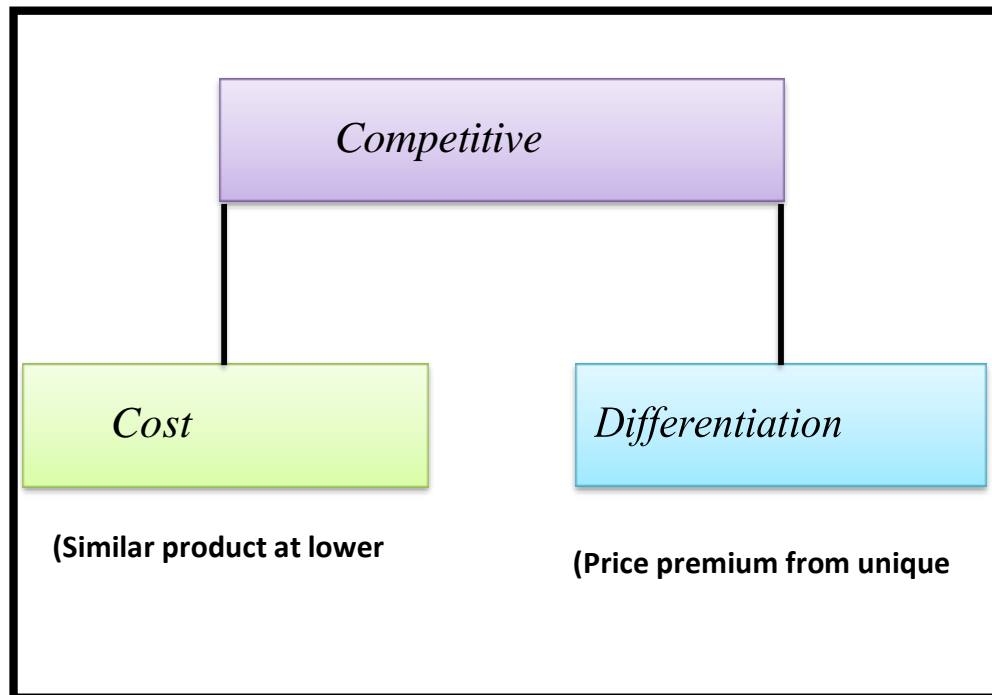
([www.corporatefinanceinstitute.com,2020](http://www.corporatefinanceinstitute.com,2020), p:3) But (M. porter) identified (2) basic types of competitive advantage: \* Cost and \* differentiation advantage

1. Cost advantage: porter argued that a company could achieve superior performance by producing similar quality products or services but at lower costs.

2. Differentiation advantage: is achieved by offering unique product and services and charging premium price of that.

The cost leadership and differentiation strategies are not the only strategies used to gain competitive advantage. Innovation strategy is used to develop new or better products, processes or business models that grant competitive edge over competitors. (Jurevicius,2013, p: 3-4)

Figure (10) shows the strategies for competitive advantages of porter.



**Figure 10:** strategies for competitive advantages of porter

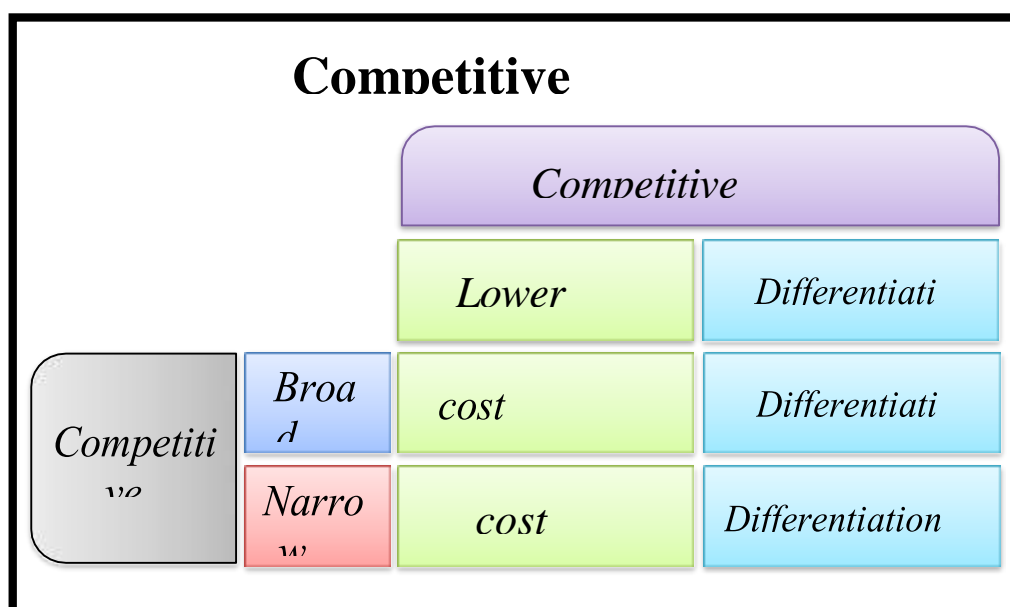
Source: Jurevicius, Ovidijus, 2013, "Competitive advantage", p: 4.

3. Focus strategy: focus strategy tries to get business to aim a few target markets rather than trying to target everyone.

This strategy can also be called the (Segmentation strategy, which includes geographic, demographic, behavioral and physical segmentation).

([www.en.wikipedia.org](http://www.en.wikipedia.org), 2020,

p: 3) Figure (11) illustrate the three types of competitive advantage strategies.



**Figure 11:** Strategies of competitive advantages

Source: Rouse, Margret, (2018), "Competitive advantage", p: 6.

**B) How a company can achieve?**

An organization can achieve an edge over its competitors in the following two ways:

1. Through external changes: when (PEST) factors change, many opportunities can appear that. A company can also gain an upper hand over its competitors when its capable to respond to external changes faster than other organizations.

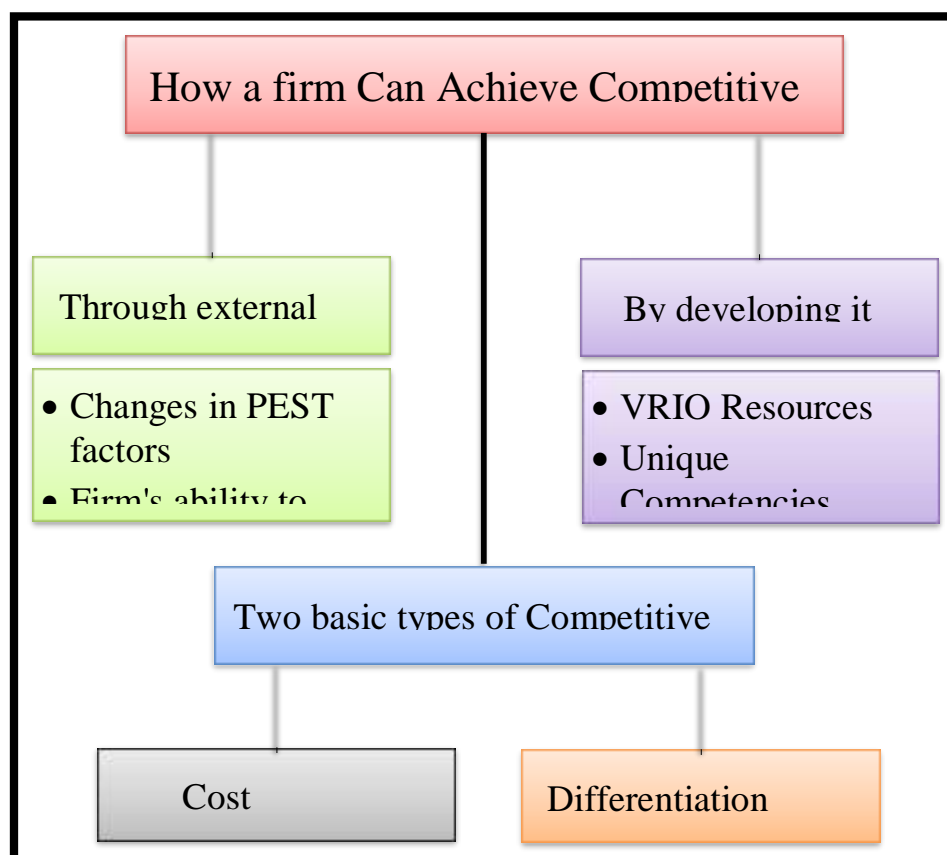
2. By developing them inside the company: A firm can achieve cost or differentiation advantage. It develops (VRIO) resources, unique components or through innovative processes and products. (Jurevicius, 2013, p: 2) (Michael porter) called for generic strategies which have been created to improve and gain competitive advantage over competitors.

(www.en.wikipedia.org, 2020, p:3) In focus strategy, a company focuses its product or services towards a narrow-target market segment. This strategy is successful if customers have different needs and wants, and the company is able to successfully create products\ services that can cater to these customers.

(www.corporatefinanceinstitute.com, 2020, p:3) Figure (12) clarify the competitive advantage model by explaining how a firm can achieve competitive advantage by using the three strategies which have explained above.

**Figure 12:** A competitive advantage model

Source: Jurevicius, Ovidijus, (2013), "Competitive advantage",



(Ambe,2010, p:11) explained that the organization's competitive advantage is built upon a well- planned and executed supply chain management strategy that is sustainable. Therefore, an organization can create competitive advantage through: \*Cost leadership \*Differentiation \*Focus

Which illustrated in table (1).

**Table 1:** Attributes of cost leadership and differentiation strategies

<u><b>Cost leadership</b></u>	<u><b>Differentiation</b></u>
<ul style="list-style-type: none"> <li>● Efficiency</li> <li>● Standardization</li> <li>● Mass production</li> <li>● Process improvement</li> <li>● Reduced service</li> <li>● Stability</li> <li>● Cost accounting skill</li> </ul>	<ul style="list-style-type: none"> <li>● Effectiveness</li> <li>● Customization</li> <li>● Shorter production runs</li> <li>● Product development</li> <li>● Enhanced service</li> <li>● Flexibility</li> <li>● Strong marketing</li> </ul>

**Source: Ambe, Intaher,2010, "Agile supply chain: strategy for competitive advantage", p: 11.**

### **3-2 : The Link between supply chain Agility and Competitive advantage**

**A) Competitive advantage:** A firm's relative position within an industry is given by its choice of competitive advantage (cost leadership vs. differentiation) and its choice of competitive scope. Competitive scope distinguish between firms targeting broad industry segments and firms focusing on a narrow segment. There is a linkage between supply chain agility and the competitive advantage.

The supply chain agility responds rapidly to changes in the business environment, align with the firm's competitive advantage to improve competitive performance.

The bottom line is the cost minimization, improved quality products\ services, gain competency and increase speed. (Ambe,2010, p: 11) (Kumkale,2016, p: 118) explained in his Research titled "organization tool for creating competitive advantage: strategic Agility" that the sustainability of business depends on their quick perception of every kind of change, taking required precautions and implementing before their competitors, which simply means their agility.

Changes in the competition criteria and in the market became prominent as compellers of agility.

So while markets continues to demand greater agility from organization, many of them still depend on how open their managers are to change processes that come with this agility. Based on the above, firm must understand that agility in organization is not only an option or the result of a trend, but a condition to be up to date and competitive. (Perez,2017, p: 3) Agility in the supply chain is critical for competitive advantage as it helps to explore and exploit opportunities under time-to-market pressures, and seeks to provide prompt response to customer requirements at an acceptable cost.

It has gained the significant attentions from both academics and practitioners currently, and it has been main objective for leading companies.



(Wu & Angelis,2007, p: 246) (Sami Cassis) stated in his research titled "Boosting supply chain Agility for a competitive Edge": that the companies can improve supply chain agility in two ways:

1. Speed production cycle times once new demand information works its way down the supply chain.
2. Reduce the amount of time it takes for that information to arrive. Because suppliers will always need a certain amount of time to manufacture, package, and ship items.

Companies wanting to reap immediate efficiency gains will focus on speeding information exchange across the supply chain. (Cassis,2001, p: 1)

#### **B) *Supply chain agility and Flexibility***

In supply chain visions: Agility is described as "the ability to successfully manufacture and market a broad range of Low-Cost, high-quality products and service with short lead times varying volumes". Flexibility is defined as "the ability to respond quickly and efficiently to changing customer and consumer demands".

Wherever agility and flexibility are critical, the company needs quick information from marketplace that is reliable and accurate.

Therefore, creating (glass pipeline) enables supply chain managers to assess customer demand in order to satisfy it. Along with demand planning and inventory optimization, make it possible to drive effectiveness through agility and flexibility. (Uys & Light,2011, p:3) The ability to adapt quickly is the name of the game in today's business climate, thus the team which attained the agility will easily absorb shifts, make change, and innovate.

(Olsen,2007, p: 296) The (Real agility) and (Real competitive advantage) can only be realized when the data that an individual, team, and organization has is accurate, reliable, and available on-demand.

(Saddington,2017, p: 3)

#### **C) *Supply chain Agility and Responsiveness***

By getting the right goods to the right place at the right time the firm can give a product a chance to compete and succeed.

Being able to respond timeously and effectively to fluctuating demand helps to prevent the sales of the firm.

(Uys & Light,2011, p: 2). The ability to adapt quickly means the business reacts and changes its game plan based on either customer feedback or shifts in markets, all while keeping that end vision in focus. A successful business has the ability to assess any given situation and decide how to proceed based on the findings. (Sage,2020, p: 1)

#### **D) *Supply chain agility and change***

Some researchers stressed that dynamic capabilities associated with competitive advantage to create opportunities for change. (Zhou et al,2019, p:1) To take advantage of supply chain agility the firm needs to attain innovativeness, through maximizing firm's competitive advantage, firms should continually adapt to the fast changing business and search for creative ways to satisfy new market need. (Chen,2019, p: 1511) Many firms underestimate the buy-in needed to make change happen. Change initiatives need recognizable support from key leaders and managers.

(Sage,2020, p: 1)

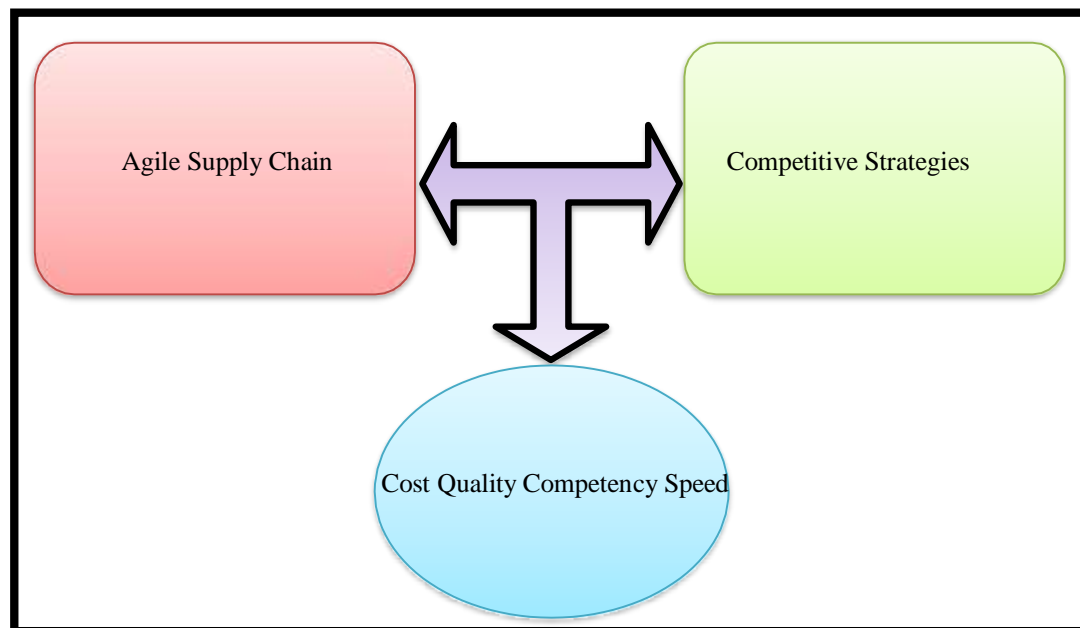
Figure (13) shows the relationship between supply chain Agility and other components of competitive advantage.

**Agile Supply Chain** Customer Sensitivity Virtual Integration Process Integration Network based

**Competitive Strategies**

Cost Leadership Differentiation Focu

**Cost Quality Competency Speed**



**Figures 13:** The link between supply chain agility and competitive advantage

**Source:** Ambe, Intaher,(2010), "Agile supply chain: strategy for competitive advantage",  
**p: 12.**

As a result, the importance of agility in the supply chain of a traditional manufacturing industry. The call for agility for the purpose of enhancing competitiveness has often been associated with the manufacture and supply of innovative products, such as high-tech industry products.

(Iskanus et al,2006, p: 2)

#### **4. The statistical analysis of practical section**

The researchers aims from the practical section to comparison among Linear and non-Linear regression models to choose the best model which reflect the largest effect of supply chain agility on the competitive advantage by using:

(Linear, Logarithmic, Inverse, Quadratic, Cubic, Compound) that effect on the Independent variable (Competitive advantage).

The statistical tests were as below: -

#### **4-1: The tests of Reliability and Validity:**

Table (2) diagnoses the high reliability in the most of questionnaire's statements which reached the value of (Cronbach's Alpha) of the questionnaire to (0.872), that was very high.

**Table 2:** Results of Reliability tests

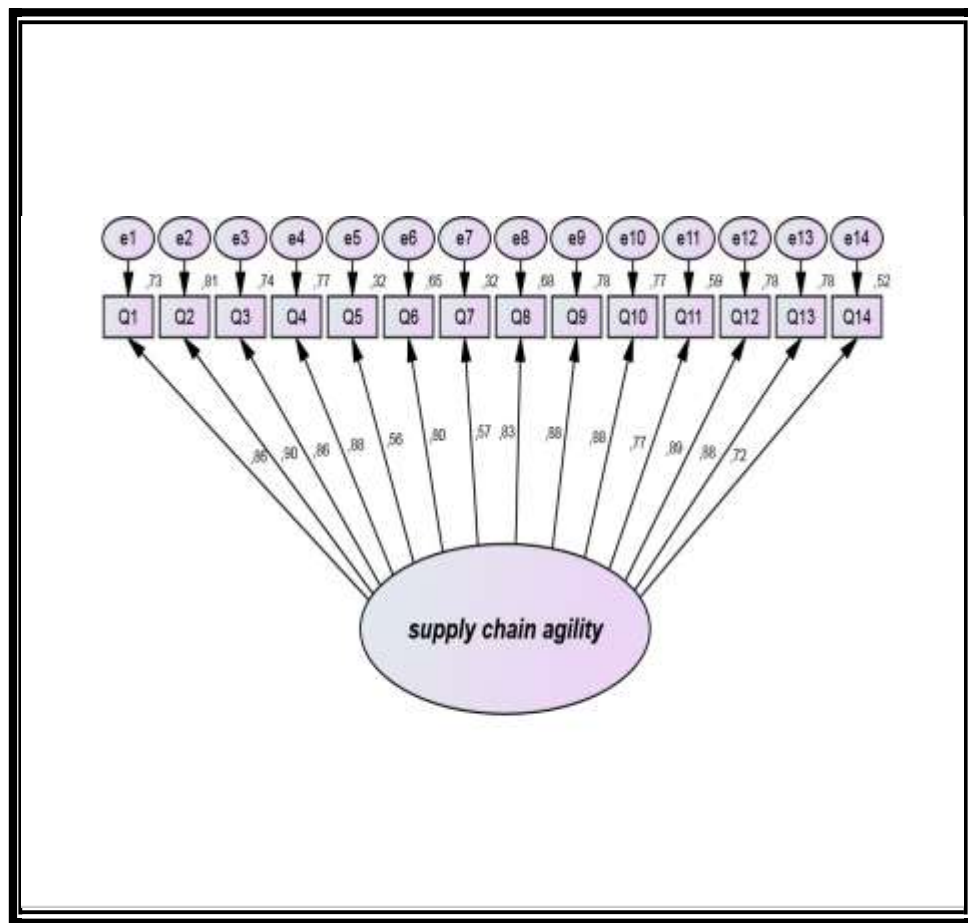
Variables		Cronbach's Alpha	Researchers Explain
<b>Dependent Variable</b>	Differentiation advantage	0.786	High Reliability in the statements of differentiation advantage
	Cost advantage	0.775	High Reliability in the Cost advantage
	Competitive advantage	0.815	High Reliability in the Competitive advantage
<b>Independent Variable</b>	Supply chain agility	0.861	High Reliability in the Supply chain agility
<b>Total of questionnaire statements</b>		<b>0.872</b>	<b>High Reliability in the statements of questionnaire</b>

The researchers documented by using the (confirmatory factor analysis) as a method to ensuring that the conditions of data analysis were implemented, also that the statements related to the Dependent Variable (supply chain agility) represents this variable best representation, and the statements relates to the independent variable represents the (competitive advantage) as the clarification in table (3) and figure (14).

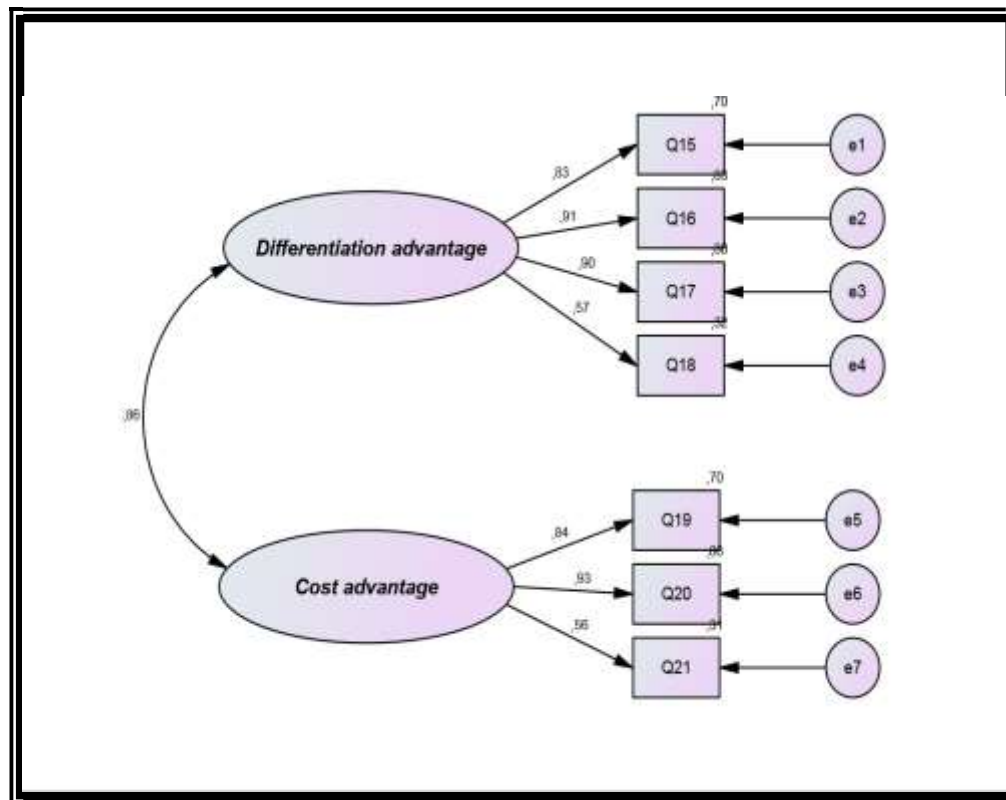
**Table 3:** Results of confirmatory factor analysis

Identical Indicators	Indicators value		Researchers explain
	supply chain agility	Competitive advantage	
<b>The Relative Chi-Square</b>	2.310	2.584	All the results of confirmatory factor analysis were morale that is ensuring the reliability of questionnaire
<b>Good of Fit Index ( GFI )</b>	0.906	0.911	
<b>Root Mean Square Error Of Approximation ( RMSEA )</b>	0.070	0.068	
<b>Normed Fit Index ( NFI )</b>	0.703	0.744	
<b>Comparative Fit Index (CFI)</b>	0.717	0.813	
<b>Incremental Fit Index ( IFI )</b>	0.728	0.826	
<b>Tucker-Lewis Index ( TLI )</b>	0.766	0.698	

Source: data by using Amos v25 system



**Figure 14:** Chart of confirmatory factor analysis of variable (supply chain agility)



**Figure 15:** Chart of confirmatory factor analysis of the variable (competitive advantage)

**4-2 : The analytical describe of the level of responders answers about the statements of (supply chain agility) and (competitive advantage)**

The researchers used a (weighted mean) and (standard deviation) and (the relative importance) to each variables in this study to analyze them (described analyzing) to the level of sample answers, the results explained in table (4) the inference from table (4) that the value of weighted mean of supply chain agility variable was (3.9018). That means the level of importance of responders answers about the dependent variable headed towards an agreement at a high level and standard deviation reaches to a value (0.4896), which points related supply chain agility statements, but the relative importance reaches to (78.04%), So the value of weighted mean of competitive advantage reached (3.8140), that means the level of importance of responders answers about the Independent variable statements turn toward the agreement at a high level respond by weighted mean reaches to (0.5744) which points the harmony in sample answers about supply chainagility statements, but the erlative importance reach to (76.28%), as table (4) shows.

**Table 4:** Level of sample answers about the variable of the study

Code	variables	Weighted mean	Standard deviation	The relative importance %	Level of responder responding
<b>X</b>	supply chain agility	3.9018	0.4896	78.04%	high
<b>Y1</b>	Differentiation advantage	3.9773	0.5451	79.55%	high
<b>Y2</b>	Cost advantage	3.6506	0.6037	73.01%	high
<b>Y</b>	Competitive advantage	3.8140	0.5744	76.28%	high

**4-3: effect test of supply chain agility in the competitive advantage.**

The researchers diagnostic in this stage of analyzing an explanation of results related to effect of dependent variable (supply chain agility) in the independent variable (competitive advantage) by the hypothesis below:

**1. The first basic hypothesis:**

[there is a moral effect with statistical indication to (supply chain agility) variable in the independent variable (competitive advantage)], this hypothesis divided into two secondary hypothesis as follows:

**2. The first secondary hypothesis:**

[there is moral effect with statistical indication for supply chain agility variable in differentiation advantage variable].

**3. The second secondary hypothesis:**

[there is a moral effect with a statistical significant to supply chain agility variable in cost advantage].

**4. The second basic hypothesis:**

A comparison between linear and non-linear regression models to choose the best model reflects the largest effect for supply chain agility variable in the competitive advantage, this hypothesis divided into secondary hypothesis as follows:

**5. The first secondary hypothesis:**

[a comparison between linear and non-linear regression models to select the best model which reflect the largest effect of supply chain agility variable in differentiation advantage variable].

#### 6. *The second secondary hypothesis:*

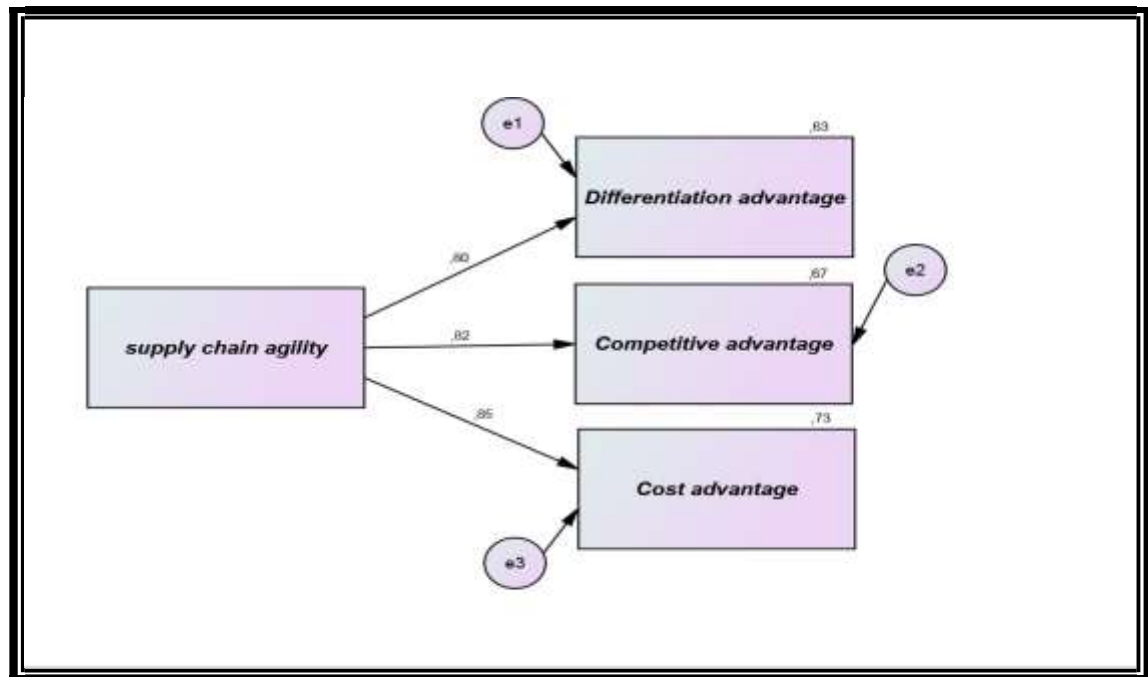
[a comparison between linear and non-linear regression models to select the best model which reflect the largest effect of supply chain agility variable in cost advantage variable].

Table (5) documented the acceptance of first secondary hypothesis and acceptance of second secondary hypothesis which are splitting from a first basic hypothesis with trust percent (95%), so the values of F calculated for each were (34.626 , 54.177), and each of them was moral, which establishes the effect marked to the dependent variable supply chain agility in the Differentiation advantage variable, as well, there is a noticed effect of dependent variable (supply chain agility) in (cost advantage) variable.

From table (5) we inference the acceptance of first basic hypothesis by a trust percentage (95%), by the value if F was (41.276) so it is moral

**Table 5:** The results of first basic test hypothesis

Hypothesis	Variables		Determinatio n coefficient $R^2$ %	Statistical lab		Researcher s explain
	Dependent	Independent		Calculated F value	Probabilit y value	
<b>First secondar y</b>	suppl y chain agilit y	Differentiat i on advantage	%63.4	34.62 6	0.00	Hypothesis acceptance by (95%) trust percent
<b>Second secondar y</b>	suppl y chain agilit y	Cost advantag e	%73	54.17 7	0.00	Hypothesis acceptance by (95%) trust percent
<b>Basic first</b>	suppl y chain agilit y	Competitive advantage	%67.4	41.27 6	0.00	Hypothesis acceptance by (95%) trust percent



**Figure 16:** Points the influence relationship for (supply chain agility) variable in the independent variable (competitive advantage)

Figure (16) Points the influence relationship for (supply chain agility) variable in the independent variable (competitive advantage): depending on Amos program data. Also, depending on table (5) and figure (16) we infer that the effect percentage of independent variable (supply chain agility) in (Differentiation advantage) variable reach to (63.4%) and the effect percentage of (supply chain agility). Independent variable in (cost advantage) variable reached (73%) and the effect percentage of the independent variable (supply chain agility) in (competitive advantage) Dependent variable reached (67.4%).

After ensuring that the effect existing among the studied variables, the researchers will compare among the models (linear and non-linear regression) shown in table (6), the best model reflect a largest effect of (supply chain agility) variable in (competitive advantage) dependent variable.



**Table 6:** Model description

Equation	Model	the description
Linear	$Y_i = b_0 + b_1 X_i$	<b>Linear</b>
Logarithmic	$Y_i = b_0 + \{b_1 \ln(X_i)\}$	<b>Non- Linear</b>
Inverse	$Y_i = b_0 + b_1 / X_i$	<b>Non- Linear</b>
Quadratic	$Y_i = b_0 + b_1 X_i + b_2 X_i^2$	<b>Non- Linear</b>
Cubic	$Y_i = b_0 + b_1 X_i + b_2 X_i^2 + b_3 X_i^3$	<b>Non- Linear</b>
Compound	$Y_i = b_0 b_1^{X_i}$	<b>Non- Linear</b>
	$\ln(Y_i) = \ln(b_0) + \{X_i \ln(b_1)\}$	<b>Linear</b>
Power	$Y_i = b_0 + X_i^{b_1}$	<b>Non- Linear</b>
	$\ln(Y_i) = \ln(b_0) + \{b_1 \ln(X_i)\}$	<b>Linear</b>
Exponential	$Y_i = b_0 e^{(b_1 X_i)}$	<b>Non- Linear</b>
	$\ln(Y_i) = \ln(b_0) + b_1 X_i$	<b>Linear</b>

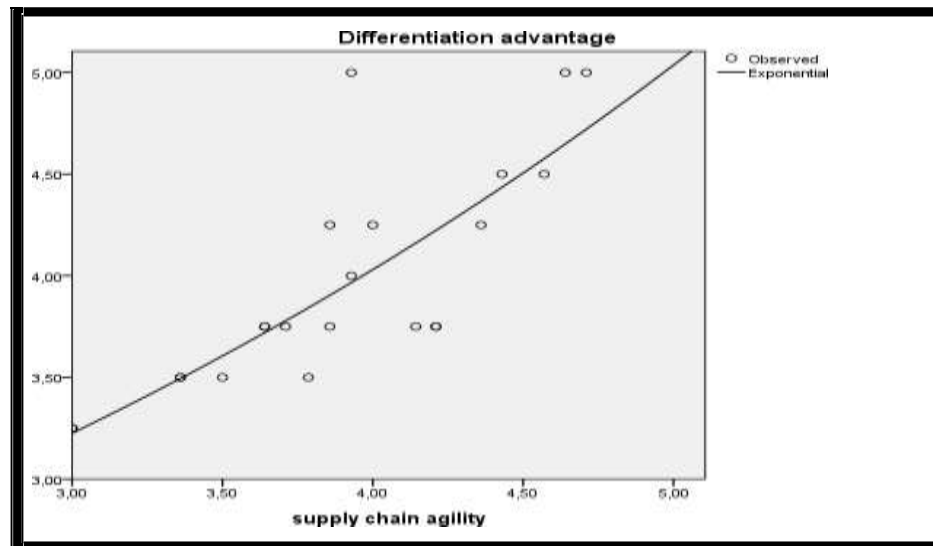
The researchers inferred from table (7) and figure (17) that the comparison between linear and non-linear regression to select the best model reflect the largest effect of (supply chain agility) variable in (Differentiation advantage) variable, which showed that the Exponential function model is most appropriate which attained a highest effect of (supply chain agility) variable in (differentiation advantage) variable reached to (66.5%), so the non-linear regression equation become the highest effect of (supply chain agility) variable as independent variable in (Differentiation advantage) as a dependent variable, as follow:

$$Y_i = (1,653) \text{Expo}^{(0.223 X_i)}$$

**Table 7:** Results of tests for a secondary first hypothesis which divided from a basic secondary hypothesis

Model Summary and Parameter Estimates							
Dependent Variable: Differentiation advantage							
Equation	Model Summary			Parameter Estimates			
	R Square	F	Sig.	Constant	b1	b2	b3
Linear	63.4%	34,626	0.000	0,493	0,893		
Logarithmic	61.9%	32,51	0.00	-0,576	3,363		

		5	0				
Inverse	59.9%	29,88 3	0.00 0	7,201	- 12,385		
Quadratic	64.6%	17,35 0	0.00 0	3,874	-0,883	0,230	
Cubic	64.8%	17,45 5	0.00 0	2,891	0.000	- 0,027	<b>0,024</b>
Power	65.6%	37,95 3	0.00 0	1,260	0,843		
Exponential	66.5%	39,67 6	0.00 0	1,653	0,223		
The independent variable is supply chain agility.							

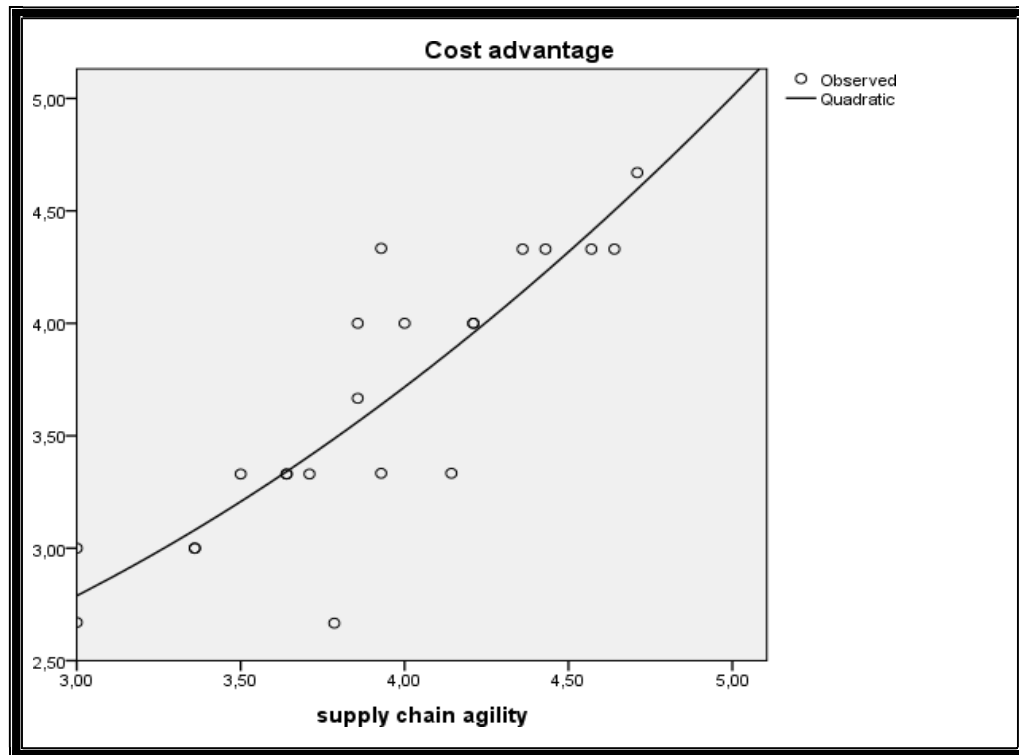


**Figure 17:** The Exponential function of influence relationship between (supply chain agility) & (Differentiation advantage)

We notice from table (8) and figure (18) that the comparison among the linear and non-linear regression models for select a best model reflect the largest effect for (supply chain agility) variable in (cost advantage) variable, showed the quadratic function from (second class) is the best which attained a highest effect for (supply chain agility) variable in (cost advantage) variable reached to (73.7%), the function of non-linear regression reached a highest effect to (supply chain agility) variable as an independent variable in (cost advantage) variable, as follows:  $Y_i = 2,188 - 0,346X_i + 0,182X_i^2$

**Table 8:** The results of tests of the secondary hypothesis divided from the basic secondary hypothesis

Model Summary and Parameter Estimates							
Dependent Variable: Cost advantage							
Equation	Model Summary			Parameter Estimates			
	R Square	F	Sig.	Constant	b1	b2	b3
Linear	73%	54,177	0.000	-0,492	1,062		
Logarithmic	71.6%	50,527	0.000	-1,774	4,007		
Inverse	69.5%	45,477	0.000	7,495	- 14,769		
Quadratic	73.7%	26,577	0.000	2,188	-0,346	0,182	
Cubic	73.7%	26,577	0.000	2,188	-0,346	0,182	<b>0.000</b>
Power	71%	48,868	0.000	0,796	1,115		
Exponential	71.8%	50,901	0.000	1,142	0,294		
The independent variable is supply chain agility.							

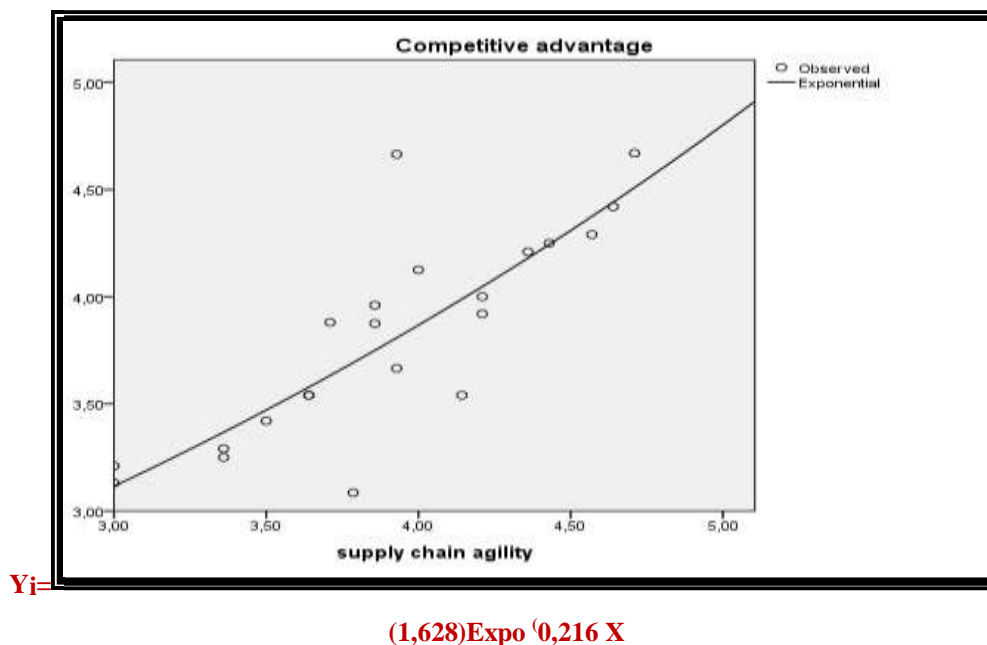


**Figure 18:**The quadratic function of effect relationship between supply chain agility and cost advantage

**Table 9:** Results of basic secondary hypothesis test

Model Summary and Parameter Estimates							
Dependent Variable:				Competitive advantage			
Equation	Model Summary			Parameter Estimates			
	R Square	F	Sig.	Constant	b1	b2	b3
Linear	67.4%	41,276	0.000	0,623	0,818		
Logarithmic	66.4%	39,604	0.000	-0,377	3,097		
Inverse	64.8%	36,834	0.000	6,796	-11,450		
Quadratic	67.6%	19,806	0.000	1,900	0,147	0,087	
Cubic	67.6%	19,806	0.000	2,083	0.000	0,126	<b>-0,003</b>
Power	67.7%	42.000	0.000	1,246	0,821		
Exponential	68.3%	43,087	0.000	1,628	0,216		
The independent variable is supply chain agility.							

We infer from table (9) and figure (19) that the comparison among the linear and non-linear regression models to select the best model which reflect the largest effect of (supply chain agility) variable in (competitive advantage) variable shows that the exponential function model is the best which attained a highest effect for (supply chain agility) variable in (competitive advantage) reached to (68.3%), so the equation of non-linear regression reached a highest effect of (supply chain agility) variable as an independent variable in (competitive advantage) variable as a dependent variable as follow:



**Figure 19:** The exponential function of effect relationship between supply chain agility & competitive advantage

## IV. CONCLUSIONS

- a- The exponential function model is the best to express about (supply chain agility) effect in (Differentiation advantage).
- b- The quadratic function model (second class) is the best to express about (supply chain agility) effect in (cost advantage) variable.
- c- Exponential function model is the best to express about (supply chain agility) effect in (competitive advantage) variable.
- d- There is a notice effect to (supply chain agility) variable in (differentiation advantage), also there is a notice effect of (supply chain agility) variable in (cost advantage).
- e- There is a notice effect of (supply chain agility) variable in (competitive advantage) variable.

## V. RECOMMENDATIONS

- a- Accreditation the model of exponential function to know the effect of (supply chain agility) in (Differentiation advantage) variable.
- b- Accreditation the model of quadratic function model to know the effect of (supply chain agility) in (cost advantage) variable.
- c- Accreditation the model of exponential function to know the effect of (supply chain agility) in (competitive advantage) variable.
- d- Using the benefits of (supply chain agility) to support (Differentiation advantage) & (supply chain agility).
- e- Using maximum benefit from (supply chain agility) to support (competitive advantage).

## REFERENCES

1. Bodd, David, (2017), "Management: An Introduction", PEARSON.
2. Goetsch, David and Stanley Davis, (2006), "Quality Management", prentice Hall.
3. Jones, Gareth R. , (2013), "Organizational theory, Design and change", PEARSON.
4. Krajewski, Lee J. , Larry P. Ritzman, Manoj, K. Malhotra, (2013), "Operations Management", PEARSON.
5. Olsen, Erica, (2007), "strategic planning kit for Dummies", 2<sup>nd</sup> Edition, wiley publishing, Inc.
6. Reid, R. Dan, Nada R. Sanders, (2010), "Operations Management", John Wiley & Sons, Inc.
7. Robbins, Stephen P Mary Coulter, David A. Decenzo, (2017), "Fundamentals of Management", PEARSON.
8. Slack, K., (1998), "Operations Management", second edition, pitman publishing.
9. Solomon, Michael, Grew. Marshall, Elnora, w. stuart, (2008), "Marketing", PEARSON, Prentice Hall.
10. Agarwal, Ashish, Ravi Shankar, M. K. Tiwari, (2007), "Modeling agility of supply chain", Industrial Marketing Management, Volume 36, Issue 4 May, 2007.
11. Ambe, Intaher Marcus, (2010), "Agile supply chain: strategy for competitive Advantage", Journal of global strategic Management, V.4, No. 1, June- 2010.

12. Chen, chih- Jou, (2019), "Developing model for supply chain agility and innovativeness to enhance firms competitive advantage", *Management Decision*, Vol.57 No.7.
13. Gligor, David, Mary Holcomb, Javad Feizabadi, (2016), "An exploration of the strategy antecedents of firm supply chain agility: The Role of a firm's orientations", *Journal of production Economics* 129 (2016).
14. Kumkalem iLknur, (2016), "Organization's tool for Creating Competitive advantage: strategic Agility", *Balkan and Near Eastern Journal of social Sciences*, 2016: 02(03).
15. Wu, yi & Jannis Angelis, (2007), "Achieving agility of supply chain Management through Information Technology Applications", *IFIP international Federation for Information Processing*, Volume 246, person, (Boston: springer).
16. Zhou, Jing, Felix T. Mavondo, Stephen Graham Saunders, (2019), "The Relationship between marketing agility and financial performance under different levels of market turbulence", *Journal of Industrial Marketing Management*, 83 (2019).
17. "Competitive Advantage", (2020), [www.en.wikipedia.org](http://www.en.wikipedia.org).
18. "Competitive Advantage", (2020), [www.pmandj.com](http://www.pmandj.com)
18. "Information technology, operational, and management competencies for supply chain agility: findings from case studies", (2011), [www.semanticscholar.org](http://www.semanticscholar.org)
19. "IT Based supply chain Agility Evaluation using a new (TOPSIS) with Internal Data", (2008), Third international conference on convergence and Hybrid information technology, [www.semanticscholar.org](http://www.semanticscholar.org)
20. "The four Dimensions of supply chain Agility", (2020), [www.planettogether.com](http://www.planettogether.com)
21. "what is a competitive Advantage", (2020), [www.corporatefinanceinstitute.com](http://www.corporatefinanceinstitute.com)
22. "what is a competitive Advantage", (2020), [www.myaccountingCourse.com](http://www.myaccountingCourse.com)
23. Berczuk, steve, (2006), "Agile Code Line Management", [www.stick.com](http://www.stick.com)
25. Cassis, Sami, (2001), "Boosting Supply chain Agility for a competitive Edge", [www.inboundLogistics.com](http://www.inboundLogistics.com)
24. Grag, Manish Kumar, (2012), "supply chain Management", [www.infosysblogs.com](http://www.infosysblogs.com)
25. HiLLsdon, Mark, (2019), "supply chain agility is key for the future", [www.raconteur.net](http://www.raconteur.net)
26. Hughes, John, (2018), "Supply Chain Agility: How Important is it?", [www.siLvon.com](http://www.siLvon.com)
27. Iskanius, Paivi, Harri Haapasalo, Tom page, (2006), "Theoretical framework for develop agile supply chain", [www.reseachgate.net](http://www.reseachgate.net)
28. Jurevicius, Ovidijus, (2013) "Competitive Advantage", [www.strategicmanagementinsight.com](http://www.strategicmanagementinsight.com)
29. Meyer, Arno, Wesley Niemann, Karlheinz peckover, (2020), "supply chain Agility: A conceptual framework Towards Leagility", [www.up.ac.za](http://www.up.ac.za).
30. Perez, Ciro, (2017), "Change Agility, a competitive advantage for your organization", [www.GlocaLthinking.com](http://www.GlocaLthinking.com)
31. Rao K.S, (2017), "Resources & Capabilities; Cost & Differentiation, Value Creation," [www.bmindstody.com](http://www.bmindstody.com)
32. Rouse, Margaret, (2018), "Competitive Advantage", [www.searchcio.techtarget.com](http://www.searchcio.techtarget.com)
33. Saddington, John, (2017), "on Real Agility and competitive Advantage", [www.medium.com](http://www.medium.com)
34. Sage, Shannon, (2020), "Agility is a competitive Advantage", [www.onstrategy.com](http://www.onstrategy.com)

35. Uys, Abe & Ken Light, (2011), "Agility and flexibility provide competitive advantage",  
[www.bizcommunity.com](http://www.bizcommunity.com).
36. Wins, Marc, (2017), "Boosting Supply chain Agility for competitive Advantage"  
[www.procurement-academy.com](http://www.procurement-academy.com)