

AN OVERVIEW OF BEST ORDER FULFILMENT STRATEGIES IN SUPPLY CHAIN



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AN OVERVIEW OF BEST ORDER FULFILMENT STRATEGIES IN SUPPLY CHAIN

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PLAGIARISM

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A handwritten signature in blue ink, appearing to be 'Kiyan Behinfar', written over the printed name. The signature is stylized and cursive.

ABSTRACT

The present research aims at investigating the best order fulfilment option for online businesses in Istanbul Turkey and metropolis areas. In particular based on research gaps in extent literature, the present research attempts to narrow the research gaps by hypothesising that seven criteria including customer satisfaction, material handling, delivery lead time, cost of end product, product availability, inventory costs and cost of capital will significantly influence order fulfilment options. The research employs a quantitative research approach whereby 34 respondents were sampled from a population of online business managers in private sector in Turkey, using a simple random sampling technique. Employing Expert choice software, the Analytic Hierarchy Process were conducted. The research found that; customer satisfaction, material handling, delivery lead time, cost of end product, product availability, inventory costs and cost of capital significantly influence order fulfilment options for online businesses in Turkey. It was also found that the best order fulfilment option for online business in Turkey is drop-shipping method. Several implications from this research were discussed. In particular online business managers, corporate leaders as well as government leaders and officials may use the findings of this research to justify the efforts in designing performance improvement interventions so that business lost in online platforms will be monitored and further enhanced among e-tailors in Turkey. Several other implications were further discussed.

Keywords: drop-shipping, in-house, hybrid, e-tailor, customer satisfaction, material handling, delivery lead time, cost of end product, product availability, inventory costs, cost of capital

ÖZET

Bu çalışma, İstanbul Türkiye ve metropol alanlarında çevrimiçi işletmeler için en iyi sipariş yerine getirme seçeneğinin araştırılmasını amaçlamaktadır. Özellikle mevcut literatürdeki araştırma boşluklarına dayanarak; müşteri memnuniyeti, malzeme taşıma, teslim süresi, nihai ürün maliyeti, ürün bulunabilirliği, envanter maliyetleri ve sermaye maliyeti olarak yedi kriterin ışığında en iyi alternatifi seçmeye çalışmaktadır. Sonuçlar sipariş yerine getirme süreçlerini önemli ölçüde etkileyecektir. Araştırmada, basit rastgele örnekleme tekniği kullanılarak, Türkiye'deki özel sektör çevrimiçi işletme yöneticileri popülasyonundan 34 katılımcının örneklendiği nicel araştırma tekniği kullanılmıştır. Veri analizinde uzman seçim yazılımı kullanılarak(Expert choice 11.0), Analitik Hiyerarşi Süreci uygulanmıştır. Araştırma bulguları, müşteri memnuniyeti, malzeme taşıma, teslimat süresi, nihai ürün maliyeti gibi ürün bulunabilirliği, stok maliyetleri ve sermaye maliyeti, Konularında Türkiye'deki çevrimiçi işletmeler için sipariş yerine getirme seçeneklerini önemli ölçüde edeğiştirebilecek sonuçlar içermektedir. Ayrıca, Türkiye'de online ticaret için en iyi sipariş yerine getirme seçeneğinin “açılan nakliye yöntemi”olduğu tespit edilmiştir. Ardından, araştırmanın sonuçları tartışılmıştır. Özellikle çevrimiçi işletme yöneticileri, şirket liderleri, hükümet liderleri ve yetkilileri, bu araştırmadan elde edilen bulguları, performans iyileştirme süreçlerini tasarlamak için kullanabilir.

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Chapter 1 Introduction

1.1 Research Overview

In this chapter, The topic will introduce , and give the readers more insights into the influence of order fulfilment option namely Drop-shipping , in-house and hybrid (a combination of drop-shipping and in-house) on supply chain operation. From the available literature on supply chain operation and logistic strategies this study features on the effects of Drop-shipping, in-house and hybrid (a combination of drop-shipping and in-house) on supply chain operations ;this research is based on whether this order fulfilment practices can influence supply chain strategies of companies or not. The application of different order fulfilment practices is somewhat not truly applied to its full potential, and the effectiveness of order fulfilment practices is unknown. Therefore, this chapter, will define what Drop-shipping , in-house and hybrid are, and the features that are applied to influence supply chain. For this research, there will be usage of secondary data which will be gathered by various articles, and journals from previous researchers as well as similar cases studied and primary data information which will be gathered by questionnaires. Also there will be use for decision-making software Expert-choice that is based on multi-criteria decision making to analysis what will be the best choice for supply chain operation in terms of order fulfilment options.

1.2 Research Background

With rise of internet availability, e-commerce or online retail markets become reputable way of earning income for so many people around the world. The internet provides efficient platforms with fewer geographical boundaries. Internet and progress in information technology have caused to the development of e-commerce and the quick growth of online retail markets. The Internet is a powerful medium for selling products, the advancement of conventional operational processes, and even the introduction of new business practices (Dennis, Z. Y., Cheong, T., & Sun, D. -2017).

The progress of e-commerce provide new chances for retailers and suppliers to imposed new distribution networks to retailers channels (Tsay and Agrawal 2004). Many e-commerce retailers use Drop-shipping to fulfil their costumer demands. A retailer simply send customers' orders to the producer who fills the orders directly to the customers and is paid a pre-agreed fees by the retailer (Frook, J. E. 1998,Scheel, N. T. 1990,Wood, L. 1999) . Drop-shipping has extraordinary benefit over keeping stock. These benefits include savings in the keeping cost, which includes cost of storage, taxes, material handling, capital, insurance, and, above all, reduce obsolescence cost (Frook, J. E. 1998,Wilson, R. F. 2000). Another order fulfilment option which is more common to use for companies around the world is in-house fulfilment which means the company will have warehouse to keep their socks and when ever they receive an order they took the product from their warehouse and give it to their customer.

In-house fulfillment option has its own advantages such as the product is available for the company all time so the order fulfillment time is much less than other options such as drop-shipping which the retailer must wait for the supplier to fulfill the customer order , but there are disadvantages to in-house fulfillment option as well for example the cost of product will be higher for the end customer due to the cost of keeping stock in hand. Hybrid order fulfillment is another option which is a combination of drop-shipping and in-house which its used to reduce disadvantages of both method.

1.3 Problem Statement

Drop-shipping has become popular order fulfillment policy for many e-tailers, in fact, 56% of suppliers obtained the drop-shipping model, 30.6% of e-tailors recognize Drop-shipping as their primary way of order fulfillment, 44.5% of e-tailers rely primarily on stocking inventory internally (Scheel, N.T.- 2000). while Drop-shipping is a primary policy for fulfilling orders in many e-commerce businesses, some major e-commerce websites such as Amazon.com and Zappos.com, have changed their early order fulfillment policy and adopt traditional inventory management by investing in warehouses and distribution infrastructures(in-house order

fulfillment). The main reason for shifting against their primary principles in these companies is that order fulfillment relies heavily on collaboration with manufacturers and e-tailers do not have full control of order processing. this can cause a lot of problems for the huge companies which operate under the drop-shipping model.

In fact Drop-shipping is a kind of “just-in-time” operation, and high efficiency of order fulfilment and shipping in time is critical for smooth Drop-shipping operation. these factors associated with shipping and delivery operations in e-commerce which influences end customer satisfaction. That is why many e-tailors are prefer in-house order fulfilment to eliminate problems of Drop-shipping method.

The growth of shopping in internet escalated consequential problems in terms of organization and order flow management, primarily when related to physical goods (Vidar-Gudmundsson S, Walczuck R -1999 , Disney, S.M. 2004). Despite of many benefits of Drop-shipping there are some Disadvantages as well for this method of order fulfilment including fragmented order delivery when a single customer order involves products from different manufacturers and longer delivery times(Khouja , m.-2001).

Khouja and Stylianou (2009) developed the inventory models within an EOQ framework that allowed online retailers to use the hybrid strategy for fulfilling customer orders. However, they did not consider product placement decisions.

To over come this problem Chen et al. (2018) solve this issue of product placement and inventory control decisions simultaneously. They developed an EOQ model with visual-attention-dependent demand rate to determine the optimal product placement and inventory control decisions.

Unfortunately, the model could be restricted in its application due to assumption that all products were all stored in a self-owned warehouse.

1.4. Research questions

1. Is it possible for companies to use Drop-shipping to cover up their shortage of products in their store?
2. Is it possible for companies to use Drop-shipping for reduce price of the product for those costumers which do not care about delivery time?
3. Is it possible for companies to use Drop-shipping to increase the variety of the products in their store?
4. Is it possible for small companies to use Drop-shipping to get chance to sale their product online with joining force of well-known internet enterprise?
5. Is it possible for small companies to use Drop-shipping as order fulfilment to give more options to their costumers and over come small inventory space problem?
6. Is it possible for internet enterprise to use Drop-shipping to join force with small companies to increase variety of the products in their stocks?

1.5 Research objectives

1. To investigate the possibility of using Drop-shipping to cover up shortage of products in store.
2. To investigate the possibility of using Drop-shipping for reduce price of the product for those costumers which do not care about delivery time
3. To investigate the possibility of using Drop-shipping to increase the variety of the products in store.
4. To investigate the possibility of using Drop-shipping for small companies to get chance to sale their product online with joining force of well-known internet enterprise.
5. To investigate the possibility of using Drop-shipping for small companies as order fulfilment to give more options to their costumers and over come small inventory space problem.

6. To investigate the possibility of using Drop-shipping for internet enterprise to join force with small companies to increase variety of the products in their stocks.

1.6 Significance of the study

This research will aid e-tailors to have further understandings on the functioning of Drop-shipping and how it can be used as a tool to improve and grow a business. E-tailors will also comprehend Drop-shipping needs in relation to supply chain operation and what drives an e-tailors to choose Drop-shipping as their primarily fulfilment option. The study will show the ways to use Drop-shipping practices as a tool to improve supply chain and, therefore, influence the business in positive way.

In manufacturer point of view, Drop-shipping give access to flexibility as well as available opportunities to work with more diverse retailers sites with fewer geographical boundaries. By using Drop-shipping manufacturer can access to work with flexibility as well as the variety of markets opportunities they needed to improve their sells, since there are fewer geographical blocks. Consequently, the newer market environment will become more versatile for them and will lead their production increase reputably.

The continuous rise in the cost of retailer operations has led to the limited use of traditional retail markets, and therefore, the Drop-shipping is given to be used as a tool to ensure growth as well as giving retailer a brand-new experience. Drop-shipping practices do not only involve order fulfilment operation but also involves reduction of capital costs, taxes storage costs insurance and material handling costs. Besides, it provides the relevant opportunities and abilities to work with the flexibility that are needed for e-tailors.

This research is also to gain information on the supply chain strategies; to see whether Drop-shipping can impact on retailer decision-making progress about staying or leaving their current

markets or not ; whether Drop-shipping can increase customer satisfaction; and to discover what the different attitudes toward Drop-shipping among internet shoppers.

This research focuses on retailers decisions and the way Drop-shipping influence it. The motivations for choosing this topic are that it is still not a fully developed topic, and there are still many possible ways to discuss it. Drop-shipping is very uncommon among traditional retailers, thus, we make our study relevant to this significant problem and how retailers react to it. In addition, frequent economical obstacles among retail markets are becoming more and more common than the past few years, it offers new opportunities for researchers to do research on intentions of closed down businesses and the methods which can reduce it.

The research target is broad as it is related to every e-tailor in online retail markets. Istanbul city in Turkey will be the research grounds for this study. Besides, the targeted audiences were e-tailors which work in private sector.

Chapter 2

Literature review

2.1 Preface

In this section of the research, will study previous researches that have been carried out by various experts in the subject, and what they have been able to prove through relevant and substantial researches.

2.2 Customer satisfaction

There are many definitions for customer satisfaction but the one which is widely accepted by experts is a post-choice evaluative judgment of a specific transaction (Bastos and Gallego, 2008). Customer satisfaction is the result of a customer's perception of the value received in a transaction or relationship – where value equals perceived service quality relative to price and customer acquisition costs (Hallowell, 1996; Heskett et al., 1990; Blanchard and Galloway, 1994).

While most expert cannot agree on one definition of customer satisfaction, all the definitions have some similarities (Giese and Cote, 2002).there are three general components which all experts believe plays important role in defining customer satisfaction, first The response pertains to a particular focus (expectations, consumption experience, product,etc.); second Consumer satisfaction is a response (cognitive or emotional); and third The response occurs at a particular time (after choice ,after consumption, based on accumulated experience, etc).

customer satisfaction has a great impact on customer loyalty according to Yi, Y. (1990) customer satisfaction influences purchase intentions as well as a post-purchase attitude". Customer loyalty can be defined in two distinct ways, first loyalty as an attitude, different emotions develop an individual's overall attachment to a product, service, or organization. These feelings define an individual's degree of loyalty. The second meaning of loyalty is behavioral. Customer loyalty definition explains why customers continue to purchase services from the same supplier, increasing the scale, scope of a relationship, or the act of recommendation. The relationship between

satisfaction and loyalty has been observed in several studies such as; Gultinan, et al. (1997); Bowen, and Chen (2001); Mittal et al. (1999).

Due to the literature of Mittal et al. (1999) the relationship between satisfaction and loyalty changes over time. However, the relationship between satisfaction and loyalty is expected to be dependent on the quality of the product and services. The findings of Bowen and Chen (2001) study verified the non-linear and asymmetric relationship between customer satisfaction and customer loyalty. When satisfaction increased purchase loyalty increased as well and when satisfaction decreased, purchase loyalty decreased equally. Gultinan, et al. (1997) found that satisfied customers are more likely to be repeated costumers and even become a loyal customer . This study is focused at determining the relationship between customer service with customer satisfaction and loyalty in the context of the e- tailors and online market in Turkey.

2.3 Product availability

The overtone of a stock-out is significant to all types of retailer companies (Schary and Christopher, 1979). □Offering a variety of products is important for companies to attract different consumer segments. A research study in the Harvard Business Review (Corsten and Gruen, 2004) uncover that, depending on the product category, 21–43% of consumers faced with a stock-out will actually go to another store to buy the item.

Due to the magnitude of this problem, several Literature have investigated the relationship between the stock-out and the value of the potentially lost sales by examining consumer response to stock-outs (e.g., Walter and Grabner, 1975; Motes and Castleberry, 1985; Anupindi et al., 1998; Fitz-Simons, 2000; Zinn and Liu, 2001).

Higher product availability can help companies to secure their potential costumers and avoid stock-outs. Nevertheless, high product variety expands production and distribution costs. Furthermore, from a strategic viewpoint, a number of marketing studies have shaped the tactical interactions in a

distribution channel based on consumer response to stock-outs (e.g., Hess and Gerstner, 1987, 1998; Balachander and Farquhar, 1994; Wilkie et al., 1998).

One of the distribution channels which companies can use to the stock-out problem is to use order fulfillment strategies such as drop-shipping or hybrid technique in the supply chain. In a time when stock-out accrued the company can use drop shipping to purchase a product which costumer wants and provide it to their costumer.

2.4 Inventory cost

An important decision facing a manufacturing and retail companies , whether it is a new entrant or an established manufacturer or retailer, is the choice of inventory management and control system. Dealing with inventory cost is always hassle for manufactures and retailers and it always have important effect on cost of end product and capital costs. That is why many manufactures and retailers use inventory management techniques such as just-in-time (JIT) and economic order quantity (EOQ) model. JIT is more than just an inventory management system since it is designed to virtually eliminate the need to hold items inventory and, therefore, requires an overhaul of/the entire production and supply system.

The benefits associated with JIT include savings in inventory holding costs, savings in manufacturing costs, reduction in ordering costs, improved quality, elimination of waste, streamlining of the production process, and the elimination of production process bottlenecks(Rao A., Scheraga .D, 1988). Drop-shipping is a kind of “just-in-time” operation, and high efficiency of order fulfilment and shipping in time is critical for smooth Drop-shipping operation.

Despite the impressive success of JIT programs and a plethora of literature prescribing it as the solution to many manufacturing ills, many companies still use the EOQ model to determine their purchase orders (Pan A.C Ching-jong .L , 1989).

Johnson and Stice believed that the traditional inventory management practices that centre around the EOQ model focus on minimising the inventory costs rather than on minimising the inventory (Johnson G. H, Stice J.D, 1993).

EOQ model usually used by manufacturer and retailers who needs to keep product in hand to present it to their customer on regular bases. Almost all manufacturer and retailers which faced such situation prefer to use EOQ model and keep inventory in hand so they can prevent stock-out situation. But there is tired option for manufacturer and retailers who have consideration about stock- out situation and also prefer to provide variety of products to attract different consumer segments.

According to Grant managers should consider the use of EOQ and price breaks in determining the order quantity even when they are operating in a JIT environment (Grant.M.R, 1993). Aggrawal and Dave (1995) also present a model that recommends the optimal purchase decision in a JIT environment within the framework of an EOQ model with price discounts. Thus to research study available in inventory cost control manufacturer and retailers can use hybrid method to get benefits of both methods, in other word they can order products which have frequent demand by using EOQ system and for products which have lower demand they can use Drop-shipping method as JIT model to get maximum product availability and lower inventory cost at their business.

2.5 Delivery lead time

The growing use of the Internet provides a developing prospect for E-marketers. If E-marketers know the factors affecting online buyers' behavior, and the relationships between these factors and the type of online buyers, then they can further develop their marketing strategies to convert potential customers into active ones, while retaining existent online customers.

One of the factors which has a significant impact on buyers satisfaction and loyalty is on-time delivery. Time-based delivery performance especially contributes to overall firm competitiveness (Simchi-Levi et al., 2000; Vickery et al., 1995). According to Shergill, G.S., and Chen Z. (2005)

on-time delivery has a huge impact on customer trust for e-marketers. In their research on customers attitude towards online shopping in News land, they showed online buyers rated the website reliability/fulfillment factor as the most important factor to consider when they want to purchase a product online. They find out that customer rated the reliability of E-retailers' delivery time a slightly lower than overall reliability factors which were discussed in their research. This showed that customers were more satisfied with other reliability/fulfillment factors such as prompt reply, responding to customer needs and problem-solving, good selection, competitive prices, And online buyers were still concerned about on-time delivery (Shergill G.S; Chen. Z, 2005). Higher levels of overall customer service derive from more efficient and effective business processes (Hall, 1992; Hayes and Pisano, 1994; Tracey, 1998).

Corbett (1992) pinpointed a furniture manufacturer that discovered that their customers actually valued delivery reliability more than fast delivery. For their customer, short lead times were secondary to having the product delivered on time. Although lead times may be extremely important to the manufacturer, on-time delivery was more important to the customer.

2.6 Cost of end product

Another Important criterion which e-marketers should consider is cost of end product. Many companies use Outsourcing to reduce cost of end product. Outsourcing means developing value, not within their own company. With this outside perspective, a company's border becomes more and more practical. The idea of a borderless organization is the integration of external partners for creating and adding value to end customers which means to reduce product cost by using outside sources for cheaper operation cost (Picot et al., 1996). Companies need to get outside resources without getting these resources from the environment, it would not be able to survive in competition. It is a supply management's job to analyze sourcing markets for obtaining competitive advantages. Therefore, purchasing must develop suitable instruments to perform a supplier-oriented strategy (Arnold, 1997).

The Internet has become an essential business platform for trading, distributing and selling products between organizations, among organizations and consumers, and even between consumers. This has brought e-commerce to an entirely new level (Barnes S.J. et al, 2002; Berners-Lee .T, 1999). Drop-shipping is a perfect way to reduce the cost of end product by using an outsourcing strategy. Right now many online marketers outsource their inventory and distribution by using Drop-shipping as their order fulfillment system. E-tailors receive an order from their customer they transfer order information to their supplier which provide drop-shipping order fulfillment method, the supplier sends the customer order to the customer directly and receive a fair share from profit of the purchased product. In this system, e-tailer does not need to have an inventory and distribution system and supplier provide these important elements for the e-tailer. The cost of end product will be much less than traditional way, in the traditional way the cost of inventory and distribution is double because supplier should send product to retailer inventory and retailer should resend product to customer so there are two inventory cost one for the supplier and the other one for the retailer and also there are two distribution cost so the cost of end product will increase because of this wasteful cycle.

2.7 Material handling cost

Material handling cost is another obstacle which many businesses faced. Inventory cost, distribution cost and etc increase material handling cost therefor the cost of end product will increase. There is a negative correlation between material handling cost and cost of end product and customer satisfaction. At first of the 1980s, purchasing became more strategic in the phase of general market orientation (Arnold, 1982; Lindner, 1983).

Very strong competition forced companies to look for new sources of competitive advantages. Marketing is no longer dominating all other functions. Instead, purchasing acquired more and more important for realizing quality improvements and cost reduction together with suppliers. Purchasing, procurement, inventory and materials handling, and logistics are optimized simultaneously in the supply chain management approach.

According to Khouja, M. (2001) the successful implementation of drop-shipping requires the establishment of several policies on return, packaging, and payment terms. The return policy should outline who is responsible for the associated cost and how will returned products be handled. Packaging, in some cases, will require the manufacturer to stock special packaging materials, which may increase the cost.

A tour of the packaging area at the contract manufacturer shows an array of different brand names packaging materials which the manufacturer uses for drop-ship products. Payment terms can provide a source of working capital for the retailer. Customers usually pay upon ordering products. However, many retailers settle their accounts with the manufacturers once per month, which creates a surplus of funds for the retailer. The design of compatible information systems is another critical factor in the success of drop-shipping. Achieving good customer service requires close linkage, ideally online, between the manufacturer and the retailer. Delays in forwarding customer orders from the retailer to the manufacturer will result in increased delivery lead time to customers(Khouja. M, 2001). Which reduce customer satisfaction. Material handling is an important part of the supply chain and e-tailers which can reduce responsibilities of material handling by using drop-shipping method benefit from the cost reduction in many areas of their business.

2.8 Cost of capital

Modigliani, F. and Miller, M.H. discussed what is the cost of capital in their research paper on the American economic review, They explained "cost of capital" to a firm in a world in which funds are used to acquire assets whose yields are uncertain; and in which capital can be obtained by many different media, ranging from pure debt instruments, representing money-fixed claims, to pure equity issues, giving holders only the right to a pro-rata share in the uncertain venture.? This question has vexed at least three classes of economists: (1) the corporate finance specialist concerned with the techniques of financing firms so as to ensure their survival and growth; (2) the

managerial economist concerned with capital budgeting; and (3) the economic theorist concerned with explaining investment behavior at both the micro and macro levels(Modigliani .F et al ,1958) .

That is why the Cost of capital is really important to business owners. In drop-shipping, some costs include ordering, storage, cost of capital, insurance, and transportation costs are either eliminated or substantially reduced. Supply chain management in the drop-shipping model or any other JIT model may be considered to be an extension of traditional logistics. Whereas logistics investigates the flow of information, materials, capital and manpower in the internal supply chain owned by a single firm, supply chain management deals with the coordination of logistic processes within the external supply chain. The main goal of both traditional logistics and supply chain management is “to deliver superior customer value at less cost to the supply chain as a whole”(Christopher M., 1999; Yano C.A., Lee H.L, 1995).

The supplier to a JIT buyer in the drop-shipping model is strongly encouraged to implement JIT in its production facility to further reduce cost, improve quality, and become more responsive to the buyer. It is argued that it is to the economic advantage of a supplier to frequently deliver small quantities to JIT retailer as this would reduce the supplier's inventory cost (Golhar D.Y. et al, 1992; Zhuang .L, 1994).

In this case, the supplier could pass some of these savings to the retailer by offering the items at a lower price. the obviously lower price of the end product will encourage buyers to purchase more frequently from the retailer and the profit which both retailer and supplier gain from the sold product will be much higher. which can benefit all three component of the supply chain: supplier, retailer, and costumes.

2.9 Outsourcing , E-commerce and its impact on operations management

E-commerce is possibly the most promising application of information technology witnessed in recent years. It is revolutionizing supply-chain management and has enormous potential for manufacturing, retail and service operations(Gunasekaran .A et al, 2000).

Perhaps the most useful description of E-commerce would link it to trading: E-commerce is trading by means of new communications technology. It includes all aspects of trading, including commercial market creation, ordering, supply chain management and the transfer of money (Garrett S.G.E, Skevington P.J, 1999).

Supply chain management is the most important aspect which E-commerce has enormous potential for it. Supply chain management is the approach to enable companies to exploit their resources for their individual purposes. outsourcing is an abbreviation for “outside resource using” (Buhner and Tuschke, 1997; Koppelman, 1996; Quinn and Hilmer, 1994; Zahn et al., 1998).

By using E-commerce companies can revolutionize their supply chain operating system and use outsourcing to reduce the costs which affect the cost of the end product for their costumes and increase customer satisfaction. It is not enough to know about these external resources. They must be used by and for a company in order to reinforce its position in the competition(Picot A., 1991). It is important for online marketer, e-tailers and all E-commerce businesses to compete with traditional businesses to increase their profit and survive the market.

there are some costs which can reduce the profitability of a company gradually costs such as transaction costs. Coase (1937) was the first to discuss transaction costs. These costs of making each contract appear because of information asymmetry bounded rationality and opportunism. Such costs arise from activities which include: evaluating suppliers, negotiation, control function, etc(Picot, 1991). All these costs can eliminate in E-commerce business throughout using technology and outsource some of important aspects of business to other companies and create

perfect supply chain system which is involve a few individual companies working together under supply chain system using technology to connect to each other online and eliminate any errors which could appear to traditional operating system due to lack of using supply chain management and technology appropriately.



Chapter 3

Methodology

3.1 Preface

This chapter presents the research methods used in the present study. Data collection methods include survey and observations with questionnaires as the main method of collecting data. This chapter will elaborate on the methodological details of the study.

3.2 Research framework

This particular research is designed to have seven selected criteria which have a specific impact over the three alternative choices of fulfillment options (in-house, Drop-shipping, and hybrid) for the supply chain. Therefore, this brings us to the point where our first criteria are the effect of customer satisfaction over the supply chain strategy. Customer satisfaction is one of the important concerns for business owners in general and especially for e-tailer in online retail markets. poor supply chain strategy can mitigate customer satisfaction.

Material handling carries great importance for business owners as mentioned before, one of the reasons which bring a lot of costs and waste of time to business owners is Material handling. Dealing with organizing material can take a lot of time, effort and costs for business owners.

The next criteria for this study will be the delivery time one of the factors which can reduce customer satisfaction and hurt online business is delivery time. Delivery time is always an issue for e-tailer in online retail markets because they usually have little or no control over this factor.

Cost of the end product is another issue which online marketer and in general business owners always struggle with it. The most logical approach to cost of the end product is to reduce costs such as material handling costs, inventory costs and all hidden costs which could increase the cost of the end product for customers. In reality, all customers prefer to purchase products at a lower cost to the ultimate goal for business owners is to reduce the cost of the end product as much as possible.

Other important criteria which will be covered in this research are inventory costs. Inventory cost is one of the most important costs which every business owners faced. Generally speaking, Inventory cost is the biggest cost which has a huge impact on the cost of the end product. There is a negative correlation between inventory cost and cost of the end product and customer satisfaction.

Product availability is one of the important factors which has a positive correlation with customer satisfaction.

the main goal of any business owner is to have the product in quality, variety, and description which their customer needs, and if they can not provide a product which the customer is looking for, they will definitely lose that costumer. So it is only logical to have as much as possible available products so the customer could purchase the product they need.

The last criteria in this study are the cost of capital, opening a new business is really costly and if there was a way to reduce the cost of capital the business will have more chances to grow over time. Many businesses fail because the appropriate capital cost is not injected to the business so the business can not grow easily. many starts up businesses cut important costs such as insurance cost to reduce their capital cost which is too risky for the business.

Criterion 1	Costumer satisfaction
Criterion 2	Material handling
Criterion 3	Inventory cost
Criterion 4	Delivery lead time
Criterion 5	Product availability
Criterion 6	Cost of end product
Criterion 7	Cost of capital

3.3 Research Design

3.3.1 Sample Size

To confirm the sample size of this study, a general rule by Hair et al., (2006) will be used. In order to fulfil the requirements of the method , 34 questionnaires have been distributed.

3.3.2 Target population

The targeted population of this research is e-tailor in online retail markets in the private sector of Istanbul and the metropolitan area. The respondents were mostly managers who are working in the field of retail.

3.3.3 Sampling Technique

Sampling is a fundamental operation for the auditing and statistical analysis of large database (Oklen & Rotem, 1986). Sampling is a very important technique which consists of selecting some part of the population in order to estimate the population at low cost. There are many other types of sampling methods, but in this study, “Simple Random Sampling” was chosen which is a basic type of sampling, and it is used for building blocks for more complex sampling methods.

3.3.4 Data Collection Method and Sample Size

There are various techniques to collect data, the survey method has been used for data collection purpose in this research. The technique applied for data collection is structured questionnaires. The questionnaires are distributed among the following organizations, such as Trendyol, Gittigidiyor, Teknosa, Boyner, Koctas, Alisveris Paketim, Ceyiz and Fiyatonda , 34 samples from all online businesses have been completed. The survey is conducted in Istanbul and the metropolitan area.

3. 4 Research Approach

For conducting this research AHP method was used to select best order fulfilment including the criteria and alternatives namely drop shipping in-house and hybrid method.

3.4.1 Analytic hierarchy process

The analytic hierarchy process is a multi-criteria decision-making method permitting decision makers to model a complex problem in a hierarchical structure which incorporate the goal,

objectives (criteria), sub-objectives, and alternatives (Saaty T.L 1990). The advantages of AHP include its capability to make both qualitative and quantitative decision attributes commensurable, and its flexibility with regard to the setting of objectives (Kangas, 1992.). Based on pairwise comparison discrimination, AHP integrates both criteria significance and alternative predilection measures into a single overall score for ranking decision alternatives (Ngai E.W.T, 2003). Numerical techniques are used to obtain quantitative values from verbal comparisons.

Analytic hierarchy process (AHP) dispense a comprehensive view of the complex relationships inherent in the problem and assist the decision maker to estimate whether the evaluation criteria are of the same order of magnitude, so the decision maker can differentiate such homogeneous alternatives accurately.

Although the analytic hierarchy process is considered a reliable decision-making method some criticisms have been launched at AHP over the years. Watson and Freeling believe that in order to generate the weights of the criteria by means of a ratio scale, the method asks decision-makers senseless questions, for example: 'Which of these two criteria is more important for the goal? By how much? (Watson SR, 1982) Dyer and Wendel (1985) and Belton and Gear(1985) criticize the AHP on the foundation that it lacks a firm theoretical basis.

But these criticisms proved to be invalid due to works of Harker and Vargas (1987) and Perez (1995)they argued these major criticisms and proved with theoretical work and examples that they are not valid. They mentioned that the AHP is based upon a firm theoretical foundation and, as examples in the literature and the day-to-day operations of various governmental agencies, corporations and consulting firms clarify, the AHP is a viable, usable decision-making tool.

AHP consists of three principles of decomposition, comparative judgment, and priority synthesis. (Saaty T.L , 1990) Decomposition is associated to the construction of a hierarchical structure of the model for introducing the problem.

The first level comprise the overall objective; the second level contain evaluation criteria; and the third level constitute decision alternatives. Comparative judgment is a level which pairwise comparison of the factors at the same level will measured with their comparative contribution to achieve the overall objective.

A comparison matrix will be crated to compare pairs of criteria or alternatives. The pairwise comparison will facilitate decision-makers to judge independently the contribution of each criteria to the objective.

Ultimately, priority synthesis determine a composite influence for each alternative, based on preferences identified through the comparison matrix. Based on the value of composite effect, relative priority of each alternative will be obtain.

A sensitivity analysis will follow to show how criteria consequence changes can affect the changes of ranks of alternatives. The consistency of the results is measured using a consistency ratio (CR).² A CR of less than 10% is considered adequate to interpret the results (Carnero M.C. ,2005).

3.4.2 The process of AHP

1. Develop a model for the decision: Break down the decision into a hierarchy of goals, criteria, and alternatives.
2. Derive priorities (weights) for the criteria: The importance of criteria are compared pairwise with respect to the desired goal to derive their weights. Next the consistency of judgments must be checked; that is, a review of the judgments is done in order to ensure a reasonable level of consistency in terms of proportionality and transitivity.

3. Derive local priorities (preferences) for the alternatives: Derive priorities of the alternatives with respect to each criterion separately (following a similar process as in the previous step, compare the alternatives pairwise with respect to each criterion). The consistency must be checked and adjusted as required.
4. Derive Overall Priorities (Model Synthesis): All alternative priorities obtained are combined as a weighted sum—to take into account the weight of each criterion—to establish the overall priorities of the alternatives. The alternative with the highest overall priority constitutes the best choice.
5. Next Perform Sensitivity analysis: A study of how changes in the weights of the criteria could affect the result is done to understand the rationale behind the obtained results.
6. At last Making a Final Decision: Based on the synthesis results and sensitivity analysis, a decision can be made.

In this stage the advantages of AHP and the process of creating AHP model has been explained, it is mandatory to explain the consistency ratio as one of the important factor which can effect the final result of AHP method, according to Saaty (2012) consistency ratio (CR) of 0.10 or less is acceptable to continue the AHP analysis. If the consistency ratio is greater than 0.10, it is necessary to revise the judgments to locate the cause of the inconsistency and correct it.

3.4.3 Consistency

In the pairwise comparison method, criteria and alternatives are presented in pairs of one or more referees (e.g. experts or decision makers). It is mandatory to evaluate individual alternatives, deriving weights for the criteria, constructing the overall rating of the alternatives and identifying the best one. the alternatives by $\{ A_1, A_2, \dots, A_n \}$ (n is the number of compared alternatives), their current weights by $\{ W_1, W_2, \dots, W_n \}$, and the matrix of the ratios of all weights by

$$W = [w_i/w_j] = \begin{pmatrix} w_1/w_1 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \dots & w_2/w_n \\ \vdots & \vdots & \ddots & \vdots \\ w_n/w_1 & w_n/w_2 & \dots & w_n/w_n \end{pmatrix}$$

The matrix of pairwise comparisons $A = [a_{ij}]$ represents the intensities of the expert's preference between individual pairs of alternatives (A_i versus A_j , for all $i, j = 1, 2, \dots, n$). They are usually chosen from a given scale (1/9, 1/8, ..., 8, 9). Given n alternatives $\{A_1, A_2, \dots, A_n\}$, a decision maker compares pairs of alternatives for all the possible pairs, and a comparison matrix A is obtained, where the element a_{ij} shows the preference weight of A_i obtained by comparison with A_j .

$$A = [a_{ij}] = \begin{pmatrix} 1 & a_{12} & \dots & a_{1j} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2j} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1/a_{1j} & 1/a_{2j} & \dots & a_{jj} & \dots & a_{jn} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1/a_{jn} & \dots & 1 \end{pmatrix}$$

The a_{ij} elements estimate the ratios W_i/W_j where W is the vector of current weights of the alternative (which is the main goal).

If a matrix A is absolutely consistent, we notice that $A=W$ and in the ideal case of total consistency, the principal eigenvalue (λ_{max}) is equal to n , i.e. " $\lambda_{max} = n$ " the relations between the weights and the judgements will be given by $W_i/W_j = a_{ij}$ for $i, j = 1, 2, \dots, n$. The weights W_i , $i=1, 2, \dots, n$, were obtained using the eigenvector method, they are positive and normalized, and satisfy the reciprocity property.

Let $A = [a_{ij}]$ for all $i, j = 1, 2, \dots, n$ denote a square pairwise comparison matrix, where a_{ij} gives the relative importance of the elements i and j . Each entry in the matrix A is positive ($a_{ij} > 0$) and reciprocal ($a_{ij} = 1/a_{ji} \forall i, j = 1, 2, \dots, n$). Our goal is to compute a vector of weights $\{W_1, W_2, \dots, W_n\}$ associated with A . According to the Perron-Frobenius Theorem, if A is an $n \times n$, non-negative, primitive matrix, then one of its eigenvalues λ_{max} is positive and greater than or equal to (in absolute value) all other eigenvalues, and there is a positive eigenvector W corresponding to that eigenvalue, and that eigenvalue is a simple root (matrix Frobenius root) of the characteristic equation

$$Aw = \lambda_{max}W$$

In the eigenvector method, w is the weight vector that is our goal.

The traditional eigenvector method for estimating weights in the analytic hierarchy process yields a way of measuring the consistency of the referee's preferences arranged in the comparison matrix. If a square pairwise comparison matrix is not absolutely consistent, two different situations may be considered. The first situation is a contradictory matrix; in this case, i.e. for $n=3$ if $a_{ij} > 0$, $a_{jk} > 0$ and $a_{ik} < 0$, or the opposite (and essentially similar) situation $a_{ij} < 0$, $a_{jk} < 0$ and $a_{ik} > 0$. A different situation appears when the matrix is neither totally consistent nor contradictory. In this case, Saaty defined the consistency index (CI) as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

It is well known that small changes in a_{ij} imply small changes in λ_{max} with the difference between this and n being a good measure of consistency. Saaty has shown that if the referee is completely consistent then,

- $a_{ij} - a_{jk} = a_{ik} (\forall i, j, k)$,
- $\lambda_{max} = n$ and
- $CI = 0$

In this exceptional case, the two different matrices of judgements (A) and weights (W) are equal. However, it would be unrealistic to require these relations to hold in the general case. For instance, it is known that the number of totally consistent different matrices (using the Saaty scale) for $n=3$ is 13 or only 4 depending on whether the indifference in the relation of preference is accepted or not, for $n=4$ these values are 13 and 1, respectively, for $n=5$ is 14 and none, and so on. Otherwise, if the referee is not absolutely consistent then $\lambda_{max} > n$, and we need to measure this level of inconsistency. For this purpose, Saaty defined the consistency ratio (CR) as

$$CR = \frac{CI}{RI}$$

where RI is the average value of CI for random matrices using the Saaty scale obtained by Forman and Saaty only accepts a matrix as a consistent one if $CR < 0.1$. If (and only if) the decision-makers generate "perfect" judgements (absolutely consistent judgements) for arbitrary i, j and $k, a_{ij}, a_{jk} = a_{ik}$ ($i, j, k=1, \dots, n$), the comparison matrix determinant is null (Lamata et al), the matrix Frobenius root (λ_{max}) is always equal to n , and the remaining eigenvalues are all 0 for any a_{ij} . Thus, the eigenvector corresponding to the Frobenius root is always non-negative, and each element of the eigenvector standardized by normalization can be interpreted as the degree of importance of each alternative. In this situation, the comparison matrix obviously satisfies the transitivity property for all pairwise comparisons.

3.4.4 Development of questionnaire

Designing an appropriate questionnaire is important to a factor which can determine whether the result of the study is acceptable or not. Not all the criteria will have the same importance. Therefore, in the AHP process is to derive the relative priorities (weights) for the criteria. It is called relative because the obtained criteria priorities are measured with respect to each other as we will see in the following discussion. For creating an appropriate questionnaire it is necessary to measure the weights of criteria in view of respondents of the questionnaire. Clearly, the importance or weight of each criterion will be different because of the different view of respondents and because

of this, it is required to derive by pairwise comparisons the relative priority of each criterion with respect to each of the others using a numerical scale for comparison developed by Saaty (2012) as shown in Table 3.1.

Strongly more important	5
Moderately more important	3
Equally important	1

Table 3.1 pairwise comparison scale for ranking the weights of criteria

After creating a scale for pairwise comparison between criteria next step is to create appropriate measurable questions which can be put in a pairwise comparison matrix to measure the weight of all criteria with respect to each other. It is important to know how many questions must be asked from the respondents to measure the weights of criteria; in this research, there are seven different criteria which should be measured with respect to each other so in this research the mathematical ranking system will be used. The mathematical formula which is used to count the numbers of questions is $n(n-1)/2$, in this case, $n=7$ so when we put 7 in the formula ($7(7-1)/2=21$) the numbers of questions will be 21. Each pair of candidates will be compared and determined which candidate (criterion) respondents prefer between the two. A point will be awarded to each candidate (criterion) according to its importance in the view of respondents and the candidate (criterion) with higher importance win the comparison. If a comparison yields a tie, then each candidate (criteria) are awarded one point. For a better understanding of how the pairwise comparison will be used in this research an example of a question will be demonstrated in the following:

Which factor Do you think is more important to consider in your organization Customer satisfaction or Material handling?

1. Customer satisfaction is strongly more important than material handling. (5 points will be given to this item in favor of customer satisfaction)

2. Customer satisfaction is moderately more important than material handling. (3 points will be given to this item in favor of customer satisfaction)
3. Customer satisfaction is equally important to material handling. (1 point will be given to both items)
4. Material handling is strongly more important than customer satisfaction. (5 points will be given to this item in favor of material handling)
5. Material handling is moderately more important than customer satisfaction. (3 points will be given to this item in favor of material handling)

Note: the whole questionnaire will be demonstrated in the appendix.

The format of the questionnaire is adapted from previous research was done by saaty(2012) although the criterion is not the same the format of questions are borrowed from his research.

3.4.5 Expert Choice software

In 1970 Dr. Thomas Saaty created The Analytic Hierarchy Process (AHP) and since then AHP continues to be widely used and the most highly regarded decision-making theory.

Initially, all quantification with AHP was achieved by pairwise relative comparisons of the elements in each bunch of the hierarchy, taken two elements at a time. Eventually, all process of AHP was performed in a spreadsheet and if priorities do not possess the ratio level property, which often occurs with other decision methodologies, the results were likely to be mathematically meaningless.

That is why Dr. Saaty decides to join Dr. Ernest Forman in 1983 to co-found Expert Choice software. Solving decision-making problems by using AHP method was complex task using spreadsheet so Expert choice software was design to solve decision-making problems by using

AHP method to help individuals set priorities and make the best decision when both quantitative and qualitative features of a decision need to be examined.

One of the most important advantages of the AHP method is that it allows the inclusion of tangible variables such as cost as well as intangible ones such as comfort as criteria in the decision. By reducing complex decisions to a series of one-on-one comparisons, then synthesizing the results, The Analytic Hierarchy Process not just assists decision makers to arrive at the best decision, yet equally contribute a clear rationale that it is the best.

Structuring a decision and separate it into compact parts, starting from the main objective or goal to sub-objective (criteria) and the alternative courses of action is what the Expert choice software assist decision makers to do. Decision makers then make simple pairwise comparison judgments right through the hierarchy to transpire at all-inclusive priorities for the alternatives.

what Expert choice actually did was using AHP method to compare relative compassions to derive the priorities of the objectives in the objectives hierarchy. Expert Choice software was afterward modified to incorporate absolute as well as relative measurement for deriving priorities of the alternatives with respect to the objectives. The modified version of the software allows for subjective besides objective measurement. This new capability makes it somewhat unique in that most mathematical models do not allow for human judgment to the extent possible with AHP. Furthermore, all measures derived with Expert Choice are ratio level measures, an important property that avoids computations that lead to mathematically meaningless results.

A synthesis (combining) of the measures according to the objectives hierarchy follows the structuring and measurement steps. This is done automatically by Expert Choice.

The synthesis results include priorities for the competing objectives as well as overall priorities for the alternatives. Because of the structuring and measurement methods used by Expert Choice, the

results are mathematically sound, unlike many traditional approaches such as using spreadsheets to rate alternatives.

But having mathematically sound results is not enough. The results must be intuitively appealing as well. The synthesis workflow step provides tools (such as sensitivity analysis and consensus measures) to allow decision-makers to investigate the results from numerous perspectives. Using these tools, a decision maker can ask and answer questions such as "What might be wrong with this conclusion?" Why is Alternative Y not more preferable than Alternative X? If they were to increase the priority of the financial objective, why does Alternative Z become more preferable? Why might others in the organization feel that Alternative V should have a higher priority than alternative X?

The answers to one or more of these questions might signal the need for iteration. If for example, a decision maker feels that Alternative Y might be more preferable than Alternative X because of its style, and style is not one of the objectives in the model, iteration is necessary. If a style is already in the model, does increasing the importance of style shift the priorities such that Alternative Y becomes more preferable than alternative X? If not, then perhaps the judgments were entered incorrectly, and iteration to re-investigate the judgments is called for. If a style is already in the model and the judgments are reasonable, how much would the importance of style have to be changed before the decision was reversed? If it is just a little bit, then they might reconvene those whose role it was to prioritize style and ask that they discuss their judgments and feel that they are reasonable. Because of these unique properties of Expert choice in this research Expert Choice software will be used to solve the decision-making problem which e-tailors faced in choosing the best order fulfillment options to gain the most profit from their business. Expert Choice software works based on the analytic hierarchy process method to determine the most logical decision according to data presented from the questionnaire answered by managers of online businesses.

Chapter 4

Data Analysis and Findings

In this chapter, the main objective is to take a look at the data obtained from 34 respondents. The data collected will be analyzed and explained to give readers a clearer view of the results as well as the different factors that affect it. By the end of this chapter, all the data will be analyzed and explained through tables and pie charts. This makes it easier to demonstrate and deliver the results.

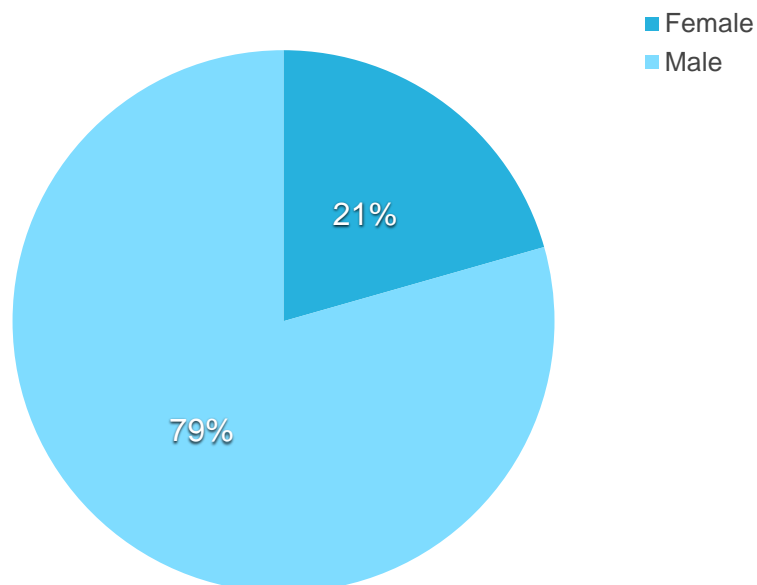
4.1 Demographic Analysis

4.1.1 Gender

Table 4.1.1 frequency analysis (Gender)

GENDER	PEOPLE
Female	7
Male	27

The table 4.1.1 above shows that, out of the 34 respondents, the majority of respondents are 27 males and 7 females.



Pie Chart 4.1.1 (Gender)

The diagram above shows that, the percentages of male respondents in relation to female respondents who answered our questionnaires. A total of 21 % female respondents in comparison to a majority of male respondents that attained 79%.

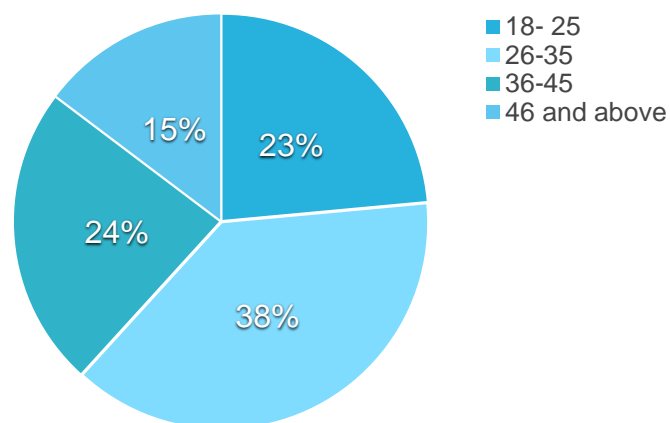
4.1.2 Age

Table 4.1.2: Frequency analysis (Age)

The table 4.2.1 above shows that, the different age groups that to take part in filling out

AGE	PEOPLE
18- 25	8
26-35	13
36-45	8
46 and above	5

questionnaires. From 34 respondents to the survey, the majority of respondents are in the age group of 26-35 . Second, groups of respondents are shared between people who are 18-25 years old and 36-45 year old . The minority of respondents are above 45 years old.The result indicates that most of respondents are younger adults.



Pie Chart 4.1.2 (Age)

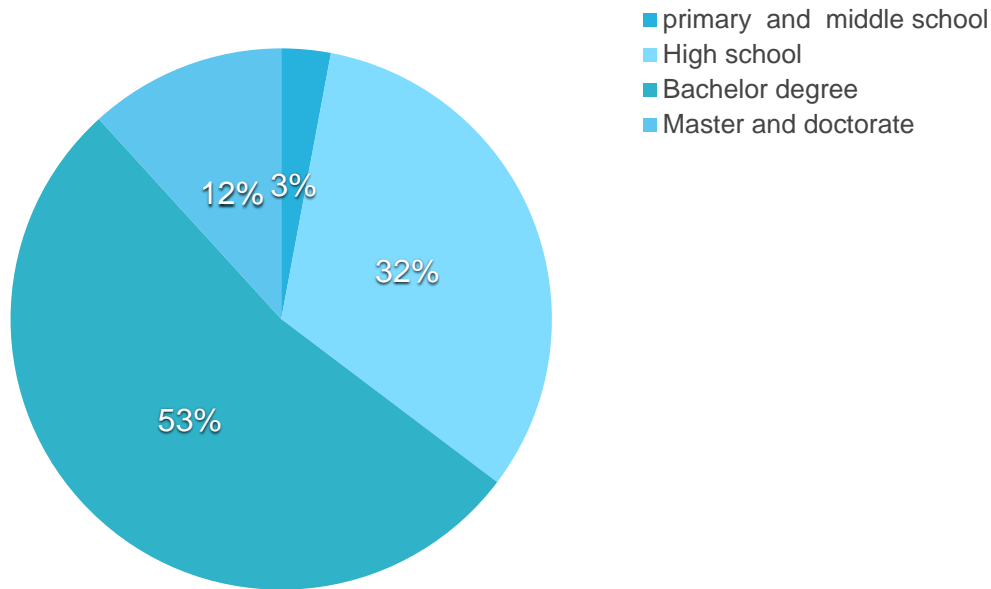
The diagram above shows the total amount in the percentage of different ages of people who have taken part in this survey. As it is obvious, there are 38% of respondents who take part in our survey are in the age group of 26-35, and they are the majority of respondents. In addition, 15% of respondents are over 45 years old, and thus, they are the minority.

4.1.3 Education level

Table 4.1.3 *Frequency analysis (Education level)*

EDUCATION	PEOPLE
primary and middle school	1
High school	11
Bachelor degree	18
Master and doctorate	4

The table 4.1.3 above represents the response of 34 respondents regarding their education level. From the table, it is shown that, out of 34 respondents, the majority of them have bachelor degree with a total of 18 responses. The minority of respondents who have primary and middle school degree are only 1 responses.



Pie Chart 4.1.3 (Education level)

The diagram above interprets that education level in percentage for 34 respondents of this survey. the majority of respondents who have studied until bachelor degree with a total of 53%, 32% of responses are high school graduate, 3% of respondents have graduated only until primary and meddle schools and 12% of them have studied until the master and doctorate level.

Computer-based information systems cover every sphere of management. They are pointers of a new 'Information Age', where information is a key organizational resource, and where management activities become more information-intensive. Enterprise applications are used widely in every sector and become more widespread every day.

This paper focuses on decision-making problems using AHP methodology with the use of Expert Choice Software to solve these problems for managers of E-commerce businesses. In the following section, seven selected criteria are discussed while introducing three alternatives used in our model, drop-shipping, in-house, and hybrid. After structuring the problem, it will be solved with the Expert Choice software and sensitivity analysis will be included. It is important to note that the usage of this methodology is not restricted to software selection; it can be used for various multi-attribute decision problems.

4.2 Hierarchy tree

The first step in an AHP analysis is to build a hierarchy tree for the decision. The analytic hierarchy process (AHP) structures the problem as a hierarchy. Figure 4.1 shows the hierarchy proposed for this research. Note that the first level of the hierarchy is the goal in this research. The second level in the hierarchy is constituted by the criteria we will use to decide best order fulfillment option; In this research, there are seven criteria. The third level consists of the available alternatives. In this case Drop-shipping, in-house, and hybrid. The advantages of this hierarchical decomposition are clear. By structuring the problem in this way it is possible to better understand the decision to be achieved, the criteria to be used and the alternatives to be evaluated.

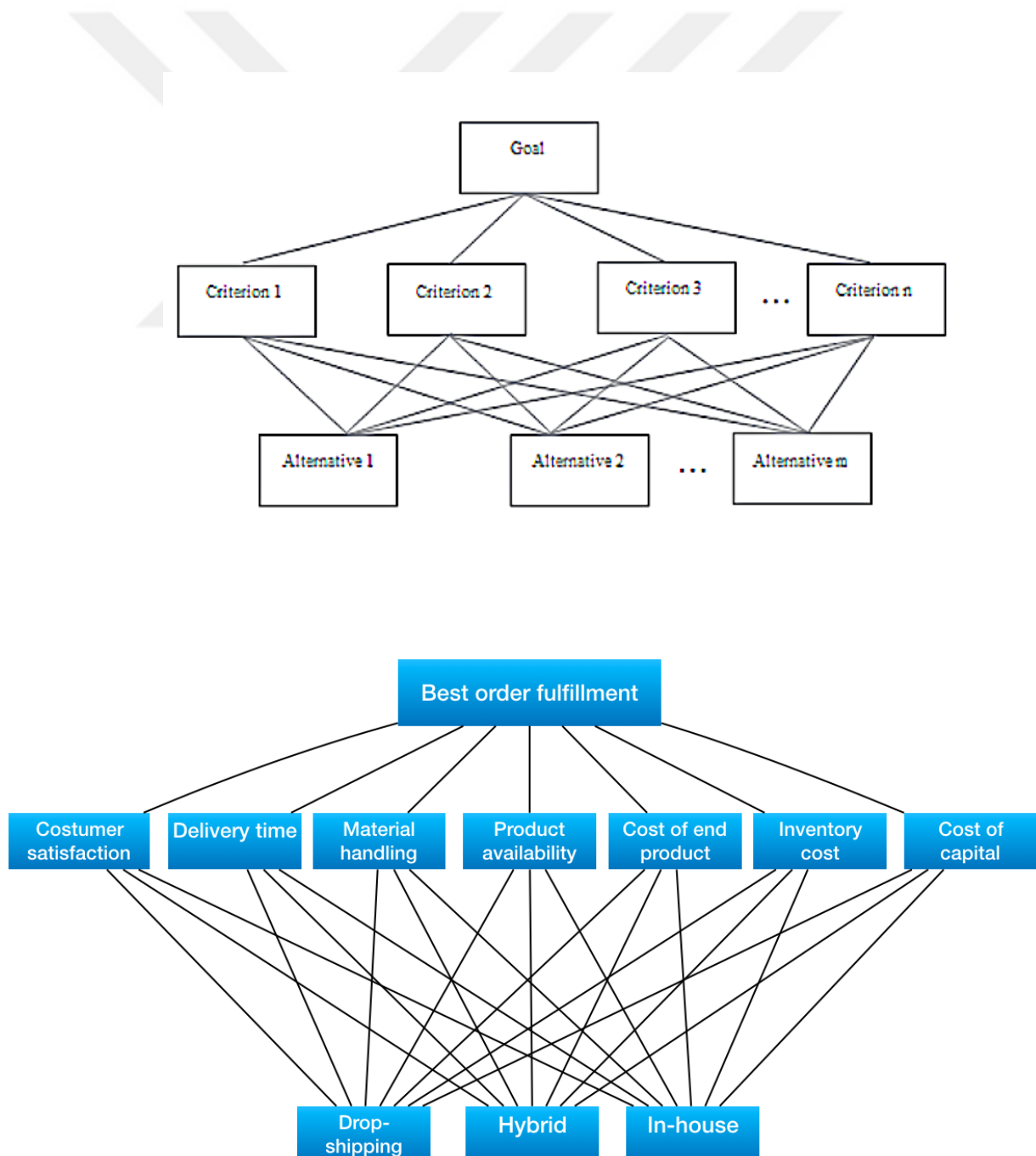


FIGURE 4.1 Hierarchy Tree Structure of order fulfillment problems

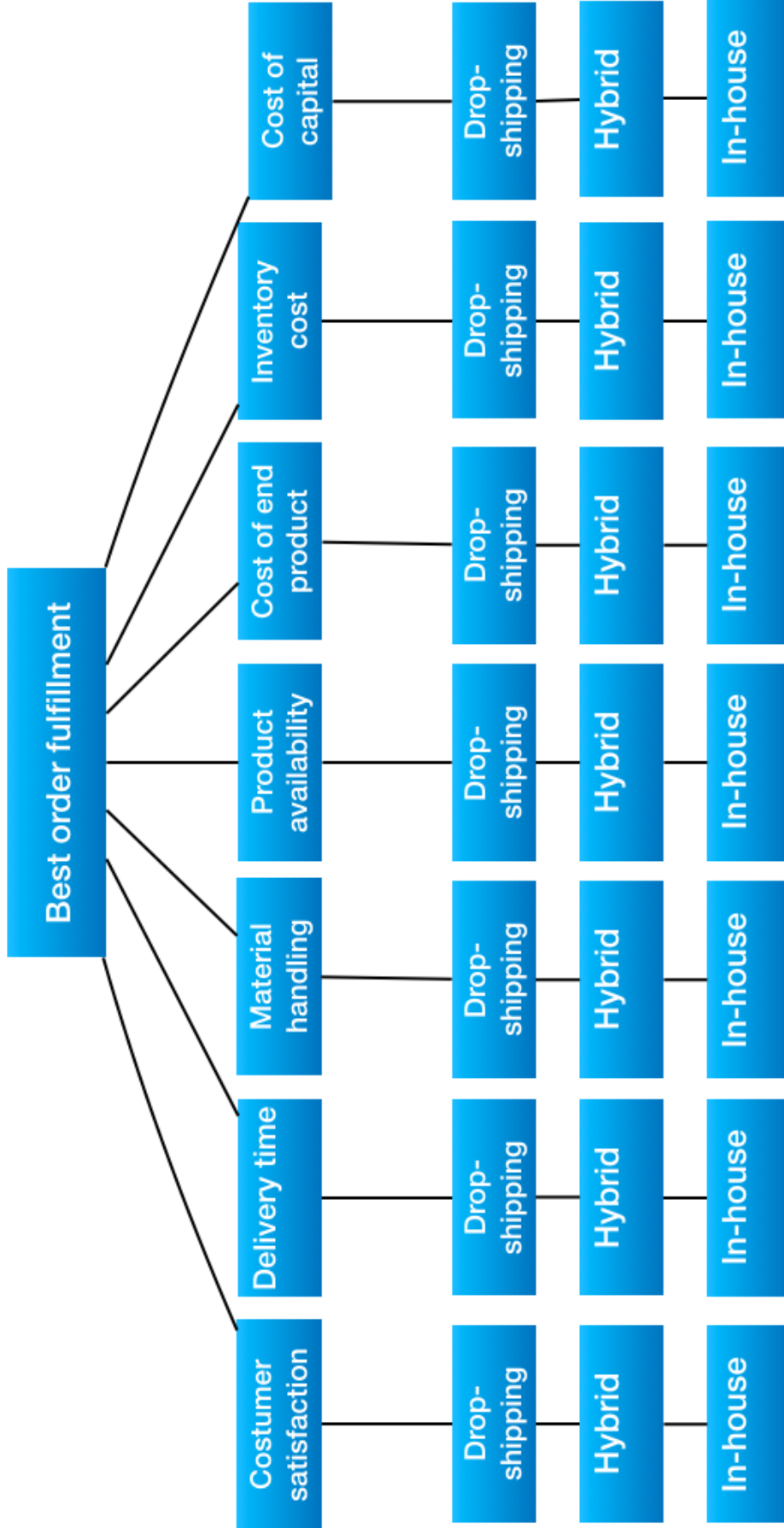


FIGURE 4.1 Hierarchy Tree Structure of order fulfillment problems

4.3 Deriving Priorities (Weights) for the Criteria

Not all the criteria will have the same importance. Therefore, the second step in the AHP process is to derive the relative priorities (weights) for the criteria. It is called relative because the obtained criteria priorities are measured with respect to each other as we will see in the following discussion. It is clear that when making a decision, not all criteria are equally important in a given time. For example, a manager may give more importance to the customer satisfaction factor rather than to delivery time or inventory cost, while another manager may give more importance to the delivery time factor rather than to customer satisfaction. Clearly, the importance or weight of each criterion will be different and because of this, first, it is required to derive by pairwise comparisons the relative priority of each criterion with respect to each of the others using a numerical scale for comparison developed as shown in Table 4.2.1

Table 4.2.1 *pairwise comparison scale*

Extremely important	7
Strongly more important	5
Moderately more important	3
Equally important	1

To perform the pairwise comparison , a comparison matrix of the criteria involved in the decision are needed to be created ,as shown in Table 4.2.1

Table 4.2.2 *Pairwise comparison matrix of criteria*

Best order fulfilment option	Costumer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital
Costumer satisfaction							
Material handling							
Delivery time							
Cost of end product							
Inventory cost							
product availability							
Cost of capital							

Cells in comparison matrices will have a value from the numeric scale shown in table 4.2.1 to reflect the relative preference (also called intensity judgment or simply judgment) in each of the compared pairs. Once all these judgments are entered in the pairwise comparison matrix (Table 4.2.2) the results shown in Table 4.2.3 will be obtained.

Table 4.2.3 *Pairwise comparison matrix with intensity judgments*

Best order fulfillment option	Customer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital
Customer satisfaction	1	85/38	81/44	76/29	86/23	64/62	86/23
Material handling	–	1	97/19	61/36	79/34	93/34	59/43
Delivery time	–	–	1	75/26	69/59	75/52	69/40
Cost of end product	–	–	–	1	60/49	77/30	56/43
Inventory cost	–	–	–	–	1	66/38	67/43
product availability	–	–	–	–	–	1	63/50
Cost of capital	–	–	–	–	–	–	1

Note in the comparison matrix of Table 4.2.3 that when the importance of a criterion is compared with itself; for example, Customer satisfaction versus Customer satisfaction; the input value is 1 which corresponds to the intensity of equal importance in the scale of Table 4.2.1 this is intuitively sound because the ratio of the importance of a given criterion with respect to the importance of itself will always be equal.

4.4 Priorities with respect to best order fulfillment

In this step, the data collected from the questionnaire must be entered to expert choice software to identify the importance of criteria according to the respond of managers in the e-commerce business. It is very important to identify the importance of each criterion for making the correct decision, by ranking each criterion from lest important to most important the software will receive correct information to choose best order fulfillment option according to the opinion of managers in e-commerce field. For making decision about importance of each criteria in this research the

analytic hierarchy process method was chosen and a comparison matrix was crated to compare pairs of criteria. The pairwise comparison was to facilitate decision-makers to judge independently the contribution of each criterion to the objective. A sensitivity analysis was followed to show how criteria consequence changes can affect the changes in the ranks of alternatives. An inconsistency of less than 10% is considered adequate to interpret the results (Carnero M.C,2005) .

Model Name: best order fulfilment

Priorities with respect to:
Goal: Best order fulfillment



Figure 4.2 priorities with respect to choose best order fulfilment option

According to figure 4.2 customer satisfaction is the most important criterion for managers in the e-commerce field and cost of capital is least important criterion for them. It means in Normalized situation the cost of capital is almost 5 times less important than customer satisfaction. Product availability and inventory cost are almost 3 times less important than customer satisfaction. the future 4.2 also illustrate that delivery time and cost of the end product are almost 50 percent less important than customer satisfaction. Material handling is the second most important criterion in view of managers in the e-commerce field. And 0.09 Inconsistency is less than 10% which is considered adequate to interpret the result. Disclaimer: the information here is subjective to managers in e-commerce field in Istanbul city and metropolis areas because the questionnaire distributed to managers in e-commerce field in Istanbul city and metropolis areas and the result might be different in any other research in the different target population.

Model Name: best order fulfillment

Graphical Assessment

Customer satisfaction



Compare the relative preference with respect to: Goal: Best order fulfillment



Material handling



	Customer s	Material ha	Delivery tim	Cost of end	Inventory c	Product av	Cost of cap
Customer satisfaction		2,23	1,84	2,63	3,74	1,04	3,74
Material handling			5,09	1,7	2,32	2,72	1,71
Delivery time				2,91	1,16	1,44	1,72
Cost of end product					1,23	2,61	1,31
Inventory cost						1,72	1,57
Product availability							1,26
Cost of capital	Incon: 0,09						

4.5 Consistency Ratio

Once judgments have been entered, it is necessary to check that they are consistent. Since the calculation of the consistency ratio is easily performed by computer programs, we limit ourselves here to producing an estimate of this value as follows:

Firstly it is required to calculate the sum of each column vertically for calculating inconsistency ratio. Table 4.5.1 shows comparison the relevant preference with respect to the best order fulfillment option and sum of each vertical column.

Table 4.5.1 compare the relative performance with respect to main goal and sum of vortical columns.

Best order fulfilment option	Costumer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital
Costumer satisfaction	1,00	0.44	0.54	0.38	0.26	0.96	0.26
Material handling	2.23	1,00	0.19	0.58	0.43	0.36	0.58
Delivery time	1.84	5.09	1,00	0.34	0.86	0.69	0.58
Cost of end product	2.63	1.7	2.91	1,00	0.81	0.38	0.76
Inventory cost	3.74	2.32	1.16	1.23	1,00	0.58	0.63
product availability	1.04	2.72	1.44	2.61	1.72	1,00	0.79
Cost of capital	3.74	1.71	1.72	1.31	1.57	1.26	1,00
Sum	16.22	14.98	8.96	7.45	6.65	5.23	4.6

The second step for calculating the consistency ratio is to create normalized matrix. The approximate method requires the normalization of the comparison matrix; i.e., add the values in each column. Next, divide each cell by the total of the column (table 4.5.2) The normalized matrix is shown in Table 4.5.2. From this normalized matrix, it is required to obtain the overall or final priorities by simply calculating the average value of each row (for the customer satisfaction row: $0.06+0.02+0.06+0.05+0.03+0.18+0.05/7 = 0.06$)

Table 4.5.2 Normalized matrix and Calculation of priorities: row averages

Best order fulfilment option	Customer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital	Priority
Customer satisfaction	0.06	0.02	0.06	0.05	0.03	0.18	0.05	0.06
Material handling	0.13	0.06	0.02	0.07	0.06	0.06	0.12	0.07
Delivery time	0.11	0.33	0.11	0.04	0.12	0.13	0.12	0.13
Cost of end product	0.16	0.11	0.32	0.13	0.12	0.07	0.16	0.15
Inventory cost	0.23	0.15	0.12	0.16	0.15	0.11	0.12	0.14
product availability	0.06	0.18	0.16	0.35	0.25	0.19	0.17	0.19
Cost of capital	0.23	0.11	0.19	0.17	0.23	0.24	0.21	0.19

Next step is to use the priorities as factors (Criteria weights) for each column as shown in Table 4.5.3. The first horizontal column of the matrix shows the judgment comparisons and derived priorities in table 4.5.2 which is reprinted for convenience in Table 4.5.4.

Table 4.5.3 Priorities as factors

Best order fulfilment option	Costumer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital
Criteria Weights	0.06	0.07	0.13	0.15	0.14	0.19	0.19
Costumer satisfaction	1,00	0.44	0.54	0.38	0.26	0.96	0.26
Material handling	2.23	1,00	0.19	0.58	0.43	0.36	0.58
Delivery time	1.84	5.09	1,00	0.34	0.86	0.69	0.58
Cost of end product	2.63	1.7	2.91	1,00	0.81	0.38	0.76
Inventory cost	3.74	2.32	1.16	1.23	1,00	0.58	0.63
product availability	1.04	2.72	1.44	2.61	1.72	1,00	0.79
Cost of capital	3.74	1.71	1.72	1.31	1.57	1.26	1,00

Table 4.5.4 shows the multiplication of each value in the first column of the comparison matrix in Table 4.3.3 by the first criterion priority (i.e., $1.00 \times 0.06 = 0.06$, $2.23 \times 0.06 = 0.13$, $1.84 \times 0.06 = 0.11$, ...ect.) as shown in the first column of Table 4.5.4 ; multiply each value in the second column of the second criterion priority; continue this process for all the columns of the comparison matrix. Table 4.5.4 shows the resulting matrix after this process has been completed.

Table 4.5.4 Calculation of weighted columns

Best order fulfilment option	Costumer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital
Costumer satisfaction	0.06	0.03	0.07	0.05	0.03	0.18	0.04
Material handling	0.13	0.07	0.02	0.08	0.06	0.06	0.11
Delivery time	0.11	0.35	0.13	0.05	0.12	0.13	0.11
Cost of end product	0.15	0.11	0.37	0.15	0.11	0.07	0.14
Inventory cost	0.22	0.16	0.15	0.18	0.14	0.11	0.11
product availability	0.06	0.19	0.18	0.39	0.24	0.19	0.15
Cost of capital	0.22	0.11	0.22	0.19	0.21	0.23	0.19

The fifth step is to add the values in each row to obtain a set of values called weighted sum as shown in Table 4.5.5.

Table 4.5.5 Calculation of weighted sum

Best order fulfilment option	Customer satisfaction	Material handling	Delivery time	Cost of end product	Inventory cost	Product availability	Cost of capital	weighed sum
Customer satisfaction	0.06	0.03	0.07	0.05	0.03	0.18	0.04	0.46
Material handling	0.13	0.07	0.02	0.08	0.06	0.06	0.11	0.53
Delivery time	0.11	0.35	0.13	0.05	0.12	0.13	0.11	1.00
Cost of end product	0.15	0.11	0.37	0.15	0.11	0.07	0.14	1.1
Inventory cost	0.22	0.16	0.15	0.18	0.14	0.11	0.11	1.07
product availability	0.06	0.19	0.18	0.39	0.24	0.19	0.15	1.4
Cost of capital	0.22	0.11	0.22	0.19	0.21	0.23	0.19	1.37

In next step it is required to divide the elements of the weighted sum vector (obtained in the previous step) by the corresponding priority of each criterion as shown in Table 4.5.6 Calculate the average of the values from the previous step; this value is called λ_{max}

Table 4.5.5 Calculation of λ_{max}

Weighted sum	Priority	
0.46/	0.06	7.66
0.53/	0.07	7.57
1.00/	0.13	7.69
1.1/	0.15	7.33
1.07/	0.14	7.64
1.4/	0.19	7.36
1.37/	0.19	7.21
	Total	54.32
	Divide Total by 7 to obtain λ_{max} =	7.76

$$\lambda_{max} = (7.66 + 7.57 + 7.69 + 7.33 + 7.64 + 7.36 + 7.21) / 7 = 7.76$$

Now we need to calculate the consistency index (CI) as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

where n is the number of compared elements (in this research n = 7). Therefore :

$$CI = \frac{\lambda_{max} - n}{n - 1} = (7.76 - 7) / (7 - 1) = 0.12$$

Now we can calculate the consistency ratio, defined as:

$$CR = \frac{CI}{RI} = 0.12 / 1.32 = 0.09$$

RI is the average CI of 500 randomly filled in matrices. Saaty (2012) provides the calculated RI value for matrices of different sizes as shown in Table 4.5.7

Table 4.5.7 Consistency indices for a randomly generated matrix

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

CI is the consistency index calculated in the previous step with a value of 0.12 RI is the consistency index of a randomly generated comparison matrix and is available to the public in tables 4.5.7 In other words, RI is the consistency index that would be obtained if the assigned judgment values were totally random. It is possible to show that the value of RI depends on the number of items (n) that are being compared (see expected values shown in Table 4.5.7). It can be seen that for n = 7, RI = 1.32 . Using these values for CI and RI, it can be calculated that

$$CR = \frac{CI}{RI} = 0.12/1.32 = 0.09$$

Since this value of 0.09 for the proportion of inconsistency CR is less than 0.10, it is correct to assume that this judgments matrix is reasonably consistent so we may continue the process of decision-making using AHP.

4.6 Pair wise comparison of alternatives with respect to inventory cost

After prioritizing criteria with respect to choices of managers in the e-commerce field the next step takes place. In this step, the relationship between criteria and alternatives must be identified for making the best decision. According to Khouja & Stylianou,(2009) The advantages of drop shipping include lower costs for holding inventory so there is a strong positive relationship (For strong positive relationship the value of 7 will be given to alternative) between using drop shipping and lower inventory cost. Obviously, there is a weak positive relationship (For a weak positive relationship the value of 3 will be given to alternative) between this cost and in-house order fulfillment option. And there is a moderate positive relationship (For moderate positive relationship the value of 5 will be given to alternative) between inventory cost and hybrid method because the hybrid method is a combination of drop-shipping method and in-house method.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	7/3	7/5
In-house	–	1	3/5
Hybrid	–	–	1

Drop-shipping: 7, In-house: 3 ,Hybrid:5

Figure 4.6.3 Pair wise comparison of alternatives with respect to the sub-objective “Inventory cost”

Figure 4.6.3 illustrates the pairwise comparison of alternatives with respect to inventory cost. The value of 2,3 black in expert choice (7/3) is given to drop-shipping as the first alternative because of strong positive impacts of drop-shipping to inventory cost. The hybrid method gets 1,41black in expert choice (7/5) value because of its moderated positive relationship with inventory cost and 1,6 red in expert choice (3/5= 0.6) is value given to the in-house method because of a weak positive relationship between inventory cost and in-house method. And inconsistency is 0.0 which illustrate that this result is consistent.



Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Inventory cost



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		2,3	1,41
In house			(1,6)
Hybrid			
Incorr:	0 ,00		

4.7 Pair wise comparison of alternatives with respect to customer satisfaction

A major drawback of drop shipping according to Khouja, M., (2001). is that a single customer order may include products from different manufacturers and therefore will be fragmented. This fragmentation causes an increase in shipping costs and is annoying too many customers. Additionally, drop shipping may have a longer delivery time, which is a critical measure of customer service. Longer delivery time and higher shipping cost reduce customer satisfaction rapidly.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	3/7	3/5
In-house	–	1	7/5
Hybrid	–	–	1

Drop-shipping: 3, In-house: 7 , Hybrid: 5

Figure 4.7.4 Pair wise comparison of alternatives with respect to the sub-objective “customer satisfaction”

Figure 4.7.4 illustrate the pairwise comparison of alternatives with respect to customer satisfaction. The value of 1.41 black in expert choice (7/5) is given to in-house as the first alternative because of strong positive impacts of in-house to customer satisfaction (For strong positive relationship the value of 7 will be given to alternative). Hybrid method gets 1.61 red in expert choice (3/5= 0.6) value because of its moderated positive relationship (For moderate positive relationship the value of 5 will be given to alternative) with customer satisfaction and 2.3 red in expert choice (3/7=0.4) is value given to the drop-shipping method because of weak positive relationship (For weak positive relationship the value of 3 will be given to alternative) between customer satisfaction and drop-shipping method. And inconsistency is 0.0 which illustrate that this result is consistent.

Model Name: best order fulfillment

Graphical Assessment

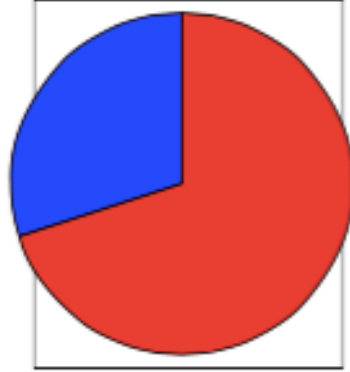
Drop-shipping



Compare the relative preference with respect to: Customer satisfaction



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		(2,3)	(1,61)
In house			1,41
Hybrid			
Incont	0,00		

4.8 Pair wise comparison of alternatives with respect to delivery time

Drop-shipping has some Disadvantages, one of the main disadvantages of drop-shipping is fragmented order delivery when a single customer order involves products from different manufacturers and longer delivery times (Khouja M., 2001).

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	3/7	3/5
In-house	–	1	7/5
Hybrid	–	–	1

Drop-shipping: 3 , In-house: 7 , Hybrid: 5

Figure 4.8.5 Pair wise comparison of alternatives with respect to the sub-objective “delivery time”

Figure 4.8.5 illustrates the pairwise comparison of alternatives with respect to delivery time. The value of 1.4 back in expert choice (7/5) is given to in-house as the first alternative because of strong positive impacts of in-house to delivery time (For strong positive relationship the value of 7 will be given to alternative). Hybrid method gets 1.6 red in expert choice (3/5= 0.6) value because of its moderated positive relationship (For moderate positive relationship the value of 5 will be given to alternative).with delivery time and 2.3 red in expert choice (3/7= 0.4) is value given to the drop-shipping method because of weak positive relationship (For weak positive relationship the value of 3 will be given to alternative) between delivery time and drop-shipping method. And inconsistency is 0.0 which illustrate that this result is consistent.

Model Name: best order fulfillment

Graphical Assessment

Drop p-shipping



Compare the relative preference with respect to: Delivery time

Inhouse



	Drop p-shipp	Inhouse	Hybrid
Drop p-shipping		(2,3)	(1,6)
Inhouse			1,4
Hybrid			
Incom:	0 ,00		

4.9 Pair wise comparison of alternatives with respect to material handling

One of the biggest advantages of drop-shipping according to Khouja & Stylianou,(2009) is lower handling materials cost. Companies can reduce their material handling cost significantly by using the drop-shipping method as their order fulfillment method clearly companies which use in-house method have to spend a lot of money for material handling. In hybrid method, because the combination of drop-shipping and in-house methods are used the material handling cost is less than the in-house method but it is still more than a drop-shipping method.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	7/3	7/5
In-house	–	1	3/5
Hybrid	–	–	1

Drop-shipping: 7, In-house: 3 ,Hybrid: 5

Figure4.9.6 Pair wise comparison of alternatives with respect to the sub-objective “material handling cost”

Figure4.9.6 illustrate the pairwise comparison of alternatives with respect to material handling cost.

The value of 2.3 black in expert choice (7/3) is given to drop-shipping as the first alternative because of positive impacts of drop-shipping to material handling cost (For strong positive relationship the value of 7 will be given to alternative). Hybrid method gets 1.4 black in expert choice (7/5) value because of its moderated positive relationship (For moderate positive relationship the value of 5 will be given to alternative) with material handling cost and 1.6 red in expert choice (3/5= 0.6) is value given to the in-house method because of weak positive relationship (For a weak positive relationship the value of 3 will be given to alternative) between material handling cost and in-house method. And inconsistency is 0.0 which illustrate that this result is consistent.

Model Name: best order fulfilment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Material handling



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		2,3	1,4
Inhouse			(1,61)
Hybrid			
Incom:	0,00		

4.10 Pair wise comparison of alternatives with respect to product availability

The overtone of a stock-out is significant to all types of retailer companies (Schary and Christopher, 1979). Offering a variety of products is important for companies to attract different consumer segments. According to Chen, Y.K. and et al in case a shortage occurs during lead time, and the unit shortage is treated as a lost sale drop-shipping method can be used to overcome this problem (Chen, Y.K. and et al, 2018). Thus to Chen, Y.K. and et al research, there is a positive relationship between drop-shipping and product availability. Evidently, there is a weak positive relationship between product availability and in-house method and there is an even stronger relationship between hybrid method and product availability then drop-shipping because the hybrid method is a combination of in-house and drop-shipping so there is more product available for purchase when the two methods of drop-shipping and in-house methods are combined.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	5/3	5/7
In-house	–	1	3/7
Hybrid	–	–	1

Drop-shipping: 5, In-house: 3 ,Hybrid:7

Figure4.10.7 Pair wise comparison of alternatives with respect to the sub-objective “product availability”

Figure 4.10.7 illustrates the pairwise comparison of alternatives with respect to product availability. The value of 1.4 red in expert choice ($5/7=0.71$) is given to hybrid as the first alternative because of positive strong impacts of the hybrid method to product availability (For strong positive relationship the value of 7 will be given to alternative). Drop-shipping method gets 1.6 black in

expert choice ($5/3=1.6$) value because of its positive moderate relationship (For moderate positive relationship the value of 5 will be given to alternative) with product availability and 2.3 red in expert choice ($3/7=0.4$) is value given to the in-house method because of weak positive relationship (For weak positive relationship the value of 3 will be given to alternative) between product availability and in-house method. And inconsistency is 0.0 which illustrate that this result is consistent.



Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Product availability

Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		1,6	(1,4)
Inhouse			(2,3)
Hybrid	Incorr: 0 ,00		

4.11 Pair wise comparison of alternatives with respect to cost of end product

Drop-shipping is a perfect way to reduce the cost of the end product by using an outsourcing strategy. Right now many online marketers outsource their inventory and distribution by using Drop-shipping as their order fulfillment system. According to Frook,(1998) and Wilson (1988), Wilson (2000) drop shipping has significant advantages over holding inventory. These advantages include savings in the holding cost, which includes the cost of capital, taxes, insurance, storage, and material handling, and, more importantly, decreased the cost of the end product. Obviously there is a weak positive relationship (For weak positive relationship the value of 3 will be given to alternative) between cost of end product and in-house method and there is a strong positive relationship (For strong positive relationship the value of 7 will be given to alternative) between Drop-shipping method and cost of end product according to Frook J.E., (1998) and Wilson R.F., (1988) Wilson R.F.,(2000); and evidently there is a moderate relationship (For moderate positive relationship the value of 5 will be given to alternative) between cost of end product and hybrid method since hybrid method is a combination of drop-shipping and in-house method.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	7/3	7/5
In-house	–	1	3/5
Hybrid	–	–	1

Drop-shipping: 7, In-house:3, Hybrid:5

Figure 4.11.8 Pair wise comparison of alternatives with respect to the sub-objective “cost of end product”

Figure4.11.8 illustrate the pairwise comparison of alternatives with respect to the cost of the end product. The value of 2.3 back in expert choice (7/3) is given to drop-shipping method due to the positive strong relationship between drop shipping and cost of the end product. next hybrid method

gets 1.4 black in expert choice (7/5) because of its moderate positive relationship with the cost of the end product. and at last in-house method gets 1.6 red in expert choice ($3/5=0.6$) because of its weak positive relationship with the cost of the end product. And inconsistency is 0.0 which illustrate that this result is consistent.





Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Cost of end product



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		2,3	1,41
Inhouse			(1,6)
Hybrid	Incost 0,00		

4.12 Pair wise comparison of alternatives with respect to cost of capital

As it was mentioned above according to Frook,(1998) and Wilson (1988), Wilson (2000) one of the advantages of drop-shipping is the reduction of cost of capital. Cost of capital is an important issue for the online marketer. Cost of capital includes all costs which there is needed to open a business and by using drop-shipping online marketer can reduce many costs such as taxes, insurance, storage, and material handling. So by looking at Frook,(1998) and Wilson (1988,2000) research, it is obvious that there is a strong positive relationship (For strong positive relationship the value of 7 will be given to alternative) between the cost of capital and drop-shipping. From this conclusion it is appropriate to assume that there is weak positive relationship (For a weak positive relationship the value of 3 will be given to alternative) between cost of capital and in-house method because in-house method have opposite effect to drop-shipping method and there is moderate positive relationship (For moderate positive relationship the value of 5 will be given to alternative) between cost of capital and hybrid method since hybrid method is mixture of drop-shipping and in-house method.

	Drop- shipping	In- house	Hybrid
Drop-shipping	1	7/3	7/5
In-house	–	1	3/5
Hybrid	–	–	1

Drop-shipping:7, In-house: 3 ,Hybrid: 5

Figure4.12.9 Pair wise comparison of alternatives with respect to the sub-objective “cost of capital”

Figure 4.12.9 illustrates the pairwise comparison of alternatives with respect to the cost of capital. The value of 2.3 black in expert choice(7/3) is given to drop-shipping method due to the positive strong relationship between drop shipping and cost of capital. Next hybrid method gets 1.4 black in expert choice (7/5) because of its moderate positive relationship with the cost of capital.

and at last in-house method gets 1.6 red in expert choice($3/5= 0.6$) because of its weak positive relationship with the cost of capital. And inconsistency is 0.0 which illustrate that this result is consistent.



Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Cost of capital



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		2,3	1,41
Inhouse			(1,61)
Hybrid			Incorr: 0,00

4.13 Synthesis with respect to best order fulfilment option

The next step is to priority synthesis which determines a composite influence for each alternative, based on preferences identified through the comparison matrix. On the strength of the value of the composite effect, the relative priority of each alternative will be obtained.

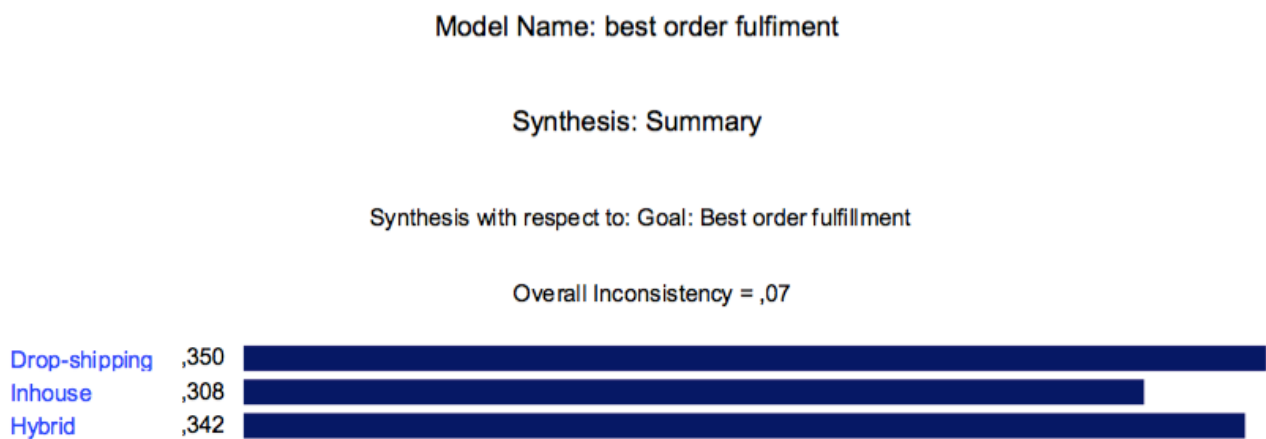


Figure 4.13 synthesis chart with respect to goal: choose best order fulfillment option.

According to figure 4.13 Drop-shipping method with a value of 0.350 which is Drop-shipping method is best to order fulfillment option for e-commerce business owners in Istanbul Turkey and metropolis areas. This result is logical because it gets a similar result as Chen, Y.K., et al (2018) research on an integrated model for online product placement and inventory control problem in a drop-shipping optional environment. Chen, Y.K., et al (2018) found that although there is some limitation in the drop-shipping method it is still the best choice of order fulfillment option for online businesses.

Next alternative is a hybrid method which gets the value of 0.342, the hybrid has a lot of advantages over the in-house method that is why hybrid is the second best choice for online

marketer after Drop-shipping method. The last method is the in-house method with a value of 0.308 between all three alternatives in this research in-house method gets the lowest value because of all disadvantages which have over hybrid and drop-shipping method.

The results of this research are based on the questionnaire which has been done by e-commerce business managers in Istanbul and metropolis areas. The result is conclusive according to the rates given to each criterion by e-commerce business managers in Istanbul and metropolis areas. But for better understanding of the importance of each criterion and finding out the effect of each criterion to end result different scenarios must be demonstrated to find the effect of each criterion to end result.

4.14 Sensitivity Analysis

The next step of this research is sensitivity test. The overall priorities will be heavily influenced by the weights given to the respective criteria. It is useful to perform a “what-if” analysis to see how the final results would have changed if the weights of the criteria would have been different.

Sensitivity analysis allows us to understand how robust is the original decision and what are the drivers. This is an important part of the process and, in general, no final decision should be made without performing sensitivity analysis. So in this step some “what if ” scenarios will follow to show the criteria consequence changes affect to changes of ranks of alternatives.

4.14.1 Sensitivity Analysis first scenario

The first scenario which was investigated in this research demonstrates the effect of customer satisfaction as the first criterion on the rank of alternatives in this research. The purpose of increasing the effects of customer satisfaction is to find out if customer satisfaction gets the greater effect in the view of e-commerce business manager in future, is it going to change the ranking of the alternatives for this research or not. According to figure 4.11, the ranks of alternative will change if customer satisfaction gets a greater effect in the view of e-commerce business manager in the future. The first alternative and best order fulfillment option will change to the in-house method if customer satisfaction gets a greater effect in the future. The second alternative will remain the same and the third alternative will be Drop-shipping when customer satisfaction is much more important than other criteria. The end result will change and the in-house method will be the best alternative for order fulfillment if customer satisfaction gets greater importance in the view of the manager in e-commerce businesses.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

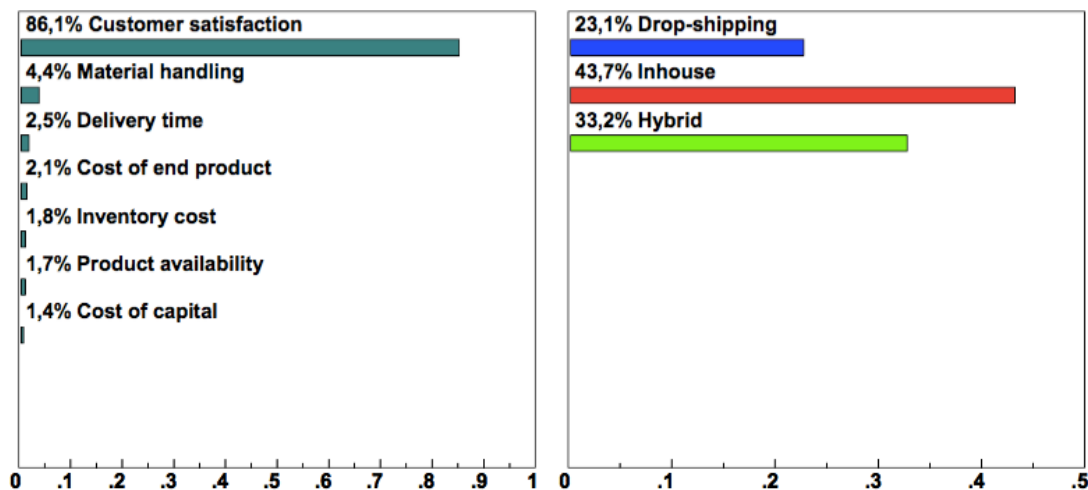


Figure 4.14.11 affect of costumer satisfaction on the ranks of alternatives.

4.14.2 Sensitivity Analysis second scenario

The second scenario which was investigated in this research demonstrates the effect of material handling as the second criterion on the rank of alternatives in this research. According to figure 4.12, the ranks of alternative will not change if material handling gets a greater effect in the view of e-commerce business manager in the future. The first alternative (Drop-shipping method) will remain the best order fulfillment option, and second alternative (Hybrid method) will also remain the second best choice for order fulfillment if material handling will be more important than any other criteria in this research and the third alternative (in-house method) will remain the same. In this scenario, the end result of the research will not change and drop-shipping will remain the best order fulfillment option if material handling will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

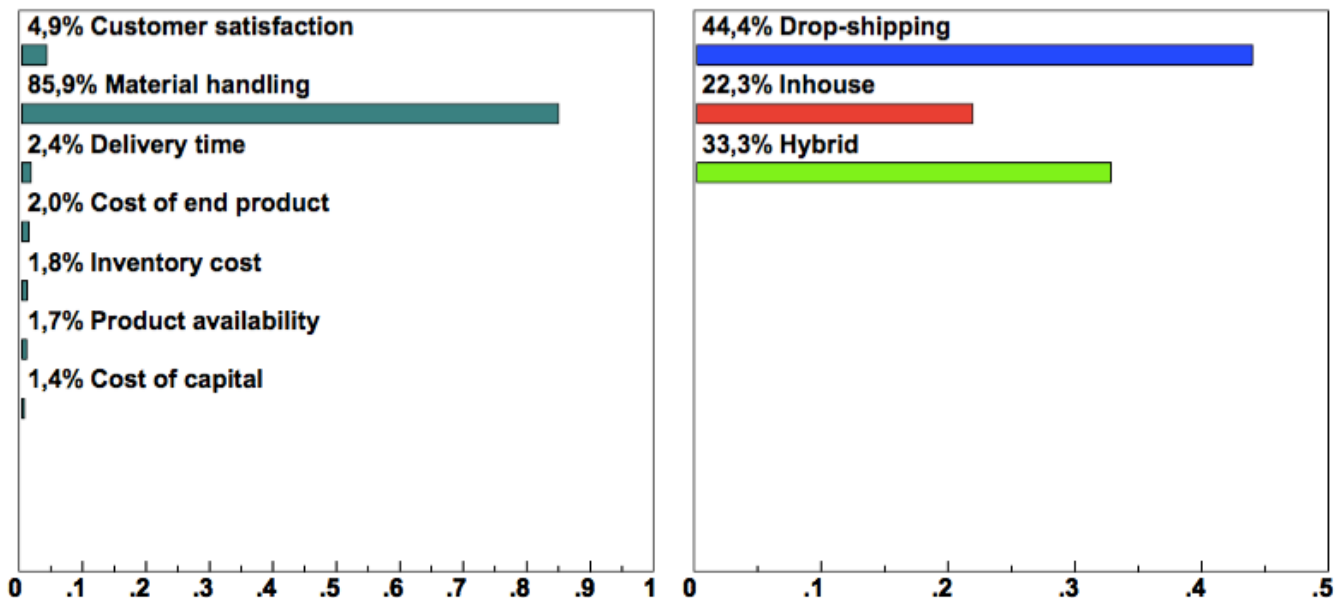


Figure 4.14.12 affect of material handling on the ranks of alternatives.

4.14.3 Sensitivity Analysis third scenario

The third scenario which was investigated in this research demonstrates the effect of delivery time as the third criterion on the rank of alternatives in this research. According to figure 4.13, the ranks of alternative will change if delivery time gets a greater effect in the view of e-commerce business manager in the future. The first alternative (Drop-shipping method) and third alternative (in-house method) will change the place if delivery time will be more important than any other criteria in this research and the second alternative (Hybrid method) will remain the second best choice of order fulfillment in this scenario. The end result of this research will change and the in-house method will be the preferred method of order fulfillment if delivery time will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

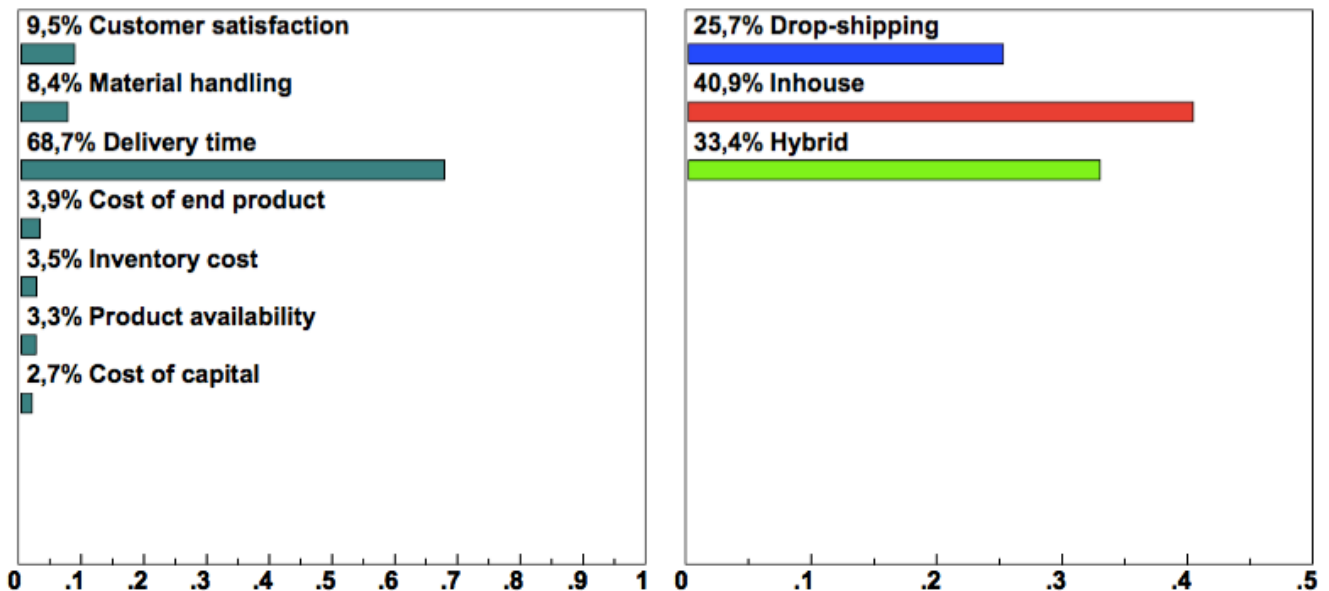


Figure 4.14.13 affect of delivery time on the ranks of alternatives.

4.14.4 Sensitivity Analysis fourth scenario

The fourth scenario which was investigated on this research demonstrates the effect of the cost of the end product as the fourth criterion on the rank of alternatives in this research. According to figure 4.14, the ranks of alternative will not change if the cost of the end product gets a greater effect in the view of e-commerce business manager in the future. The first alternative (drop-shipping method) will remain the best order fulfillment option and second alternative (Hybrid method) will remain in second place if the cost of the end product will be more important than any other criteria in this research. The third alternative (in-house method) will remain the same as well. In this scenario the end result of the research will remain the same drop-shipping will be the best order fulfillment if the cost of the end product will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

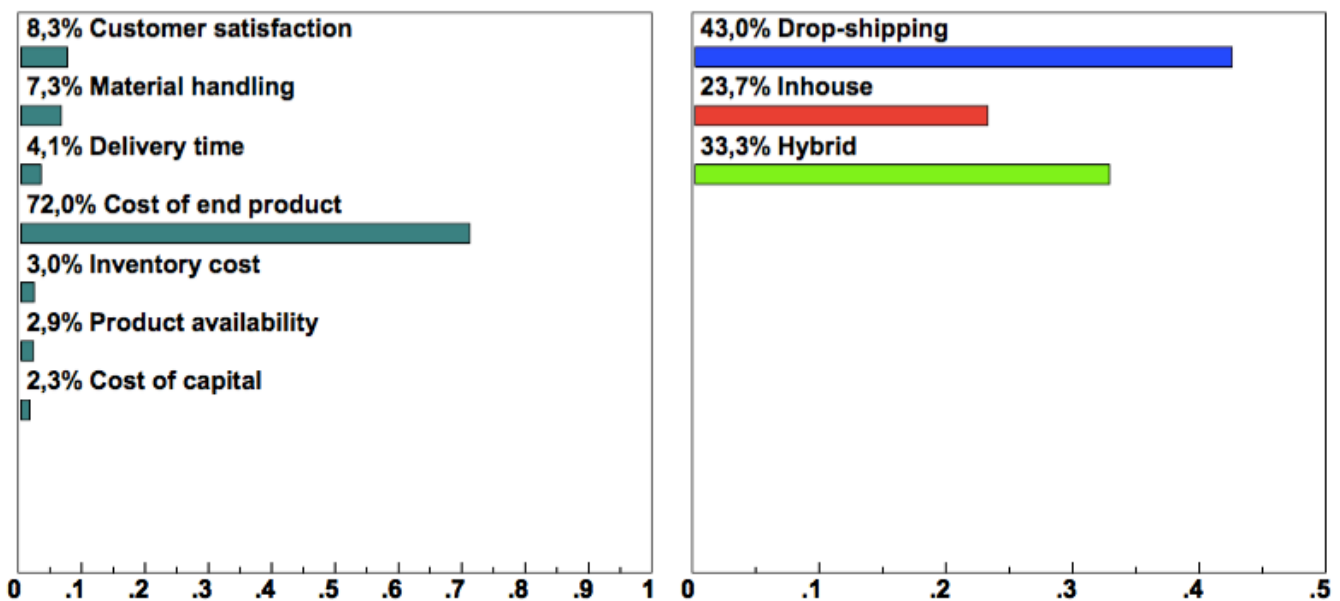


Figure 4.14.14 affect of cost of end product on the ranks of alternatives.

4.14.5 Sensitivity Analysis fifth scenario

The fifth scenario which was investigated in this research demonstrates the effect of inventory cost as the fifth criterion on the rank of alternatives in this research. According to figure 4.15, the ranks of alternative will remain the same if inventory cost gets a greater effect in the view of e-commerce business manager in the future. The first alternative (Drop-shipping method) will remain the best order fulfillment option and the second alternative (Hybrid method) remain the second best choice of order fulfillment if inventory cost will be more important than any other criteria in this research obviously the third alternative (in-house method) will remain the same. In this scenario, the end result of the research will not be changed and drop-shipping will be the best order fulfillment if inventory cost will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

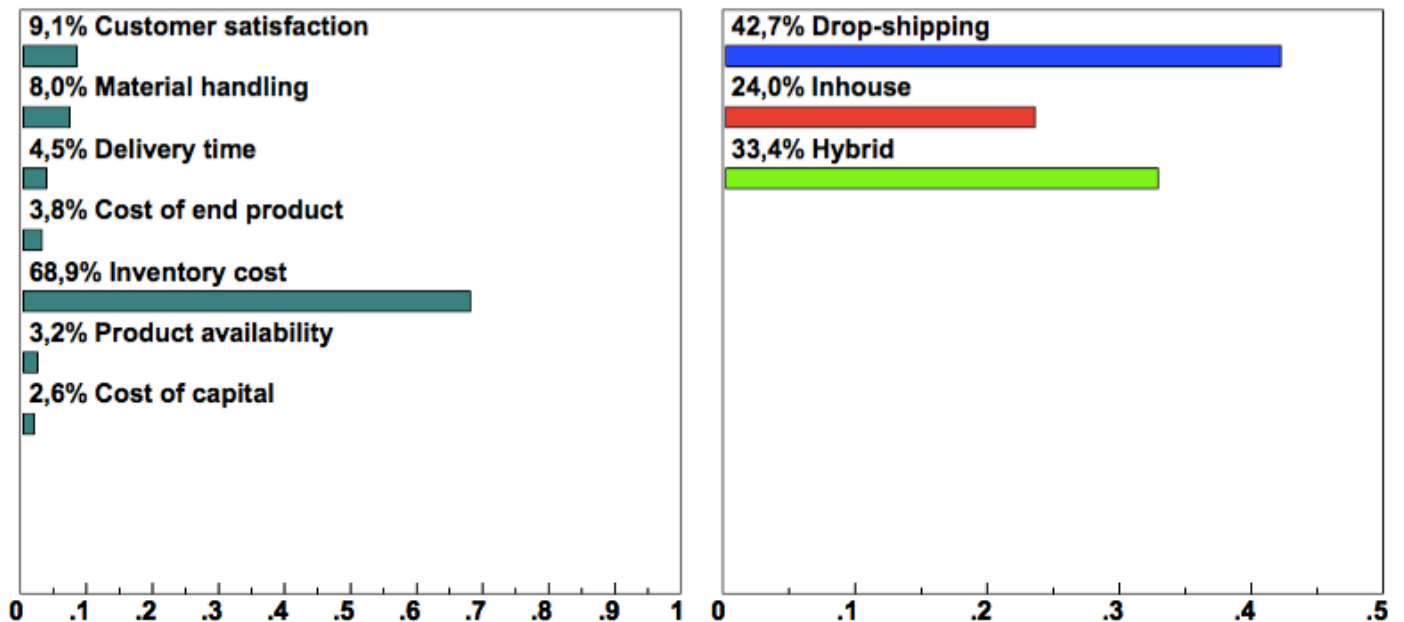


Figure 4.14.15 affect of inventory cost on the ranks of alternatives.

4.14.6 Sensitivity Analysis sixth scenario

The sixth scenario which was investigated in this research demonstrates the effect of product availability as the sixth criterion on the rank of alternatives in this research. According to figure 4.16, the ranks of alternative will change if product availability gets a greater effect in the view of e-commerce business manager in the future. The second alternative (hybrid method) will be best order fulfillment option if product availability gets a greater effect in the view of e-commerce business manager in future, and the first alternative (drop-shipping method) takes second place in this scenario. Obviously, the third alternative (in-house) will remain in the same place. The end result of the research will change and the hybrid method will be the best order fulfillment option if product availability will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

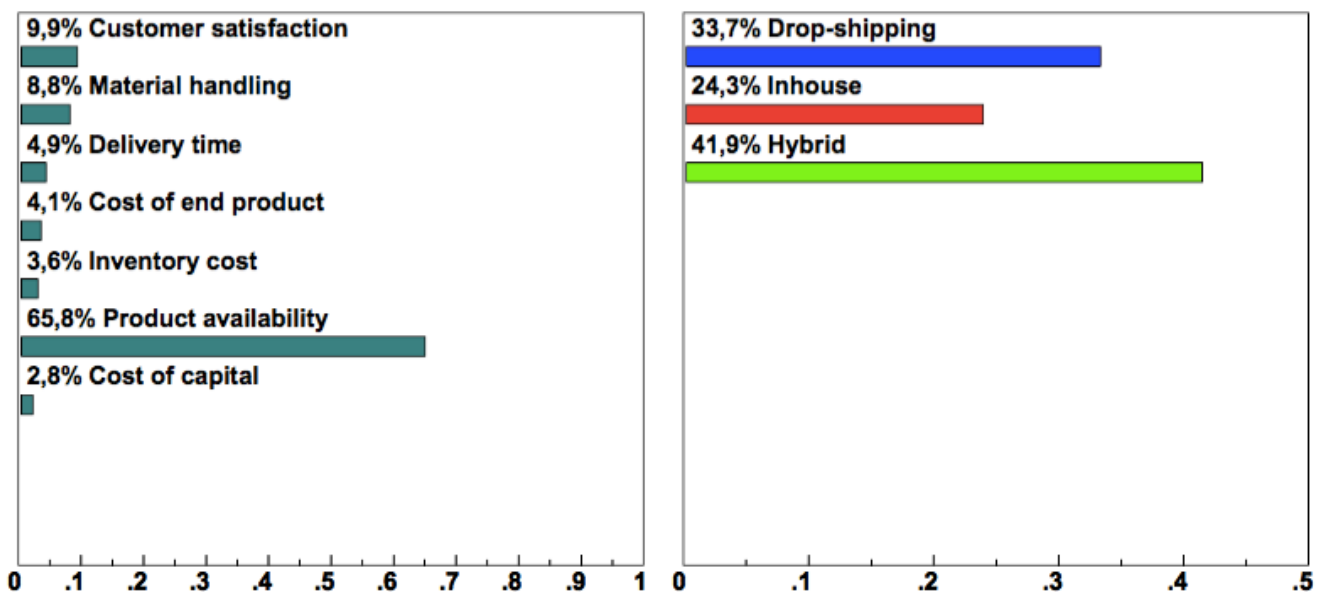


Figure 4.14.16 affect of product availability on the ranks of alternatives.

4.14.7 Sensitivity Analysis seventh scenario

The last scenario which was investigated in this research demonstrates the effect of the cost of capital as the seventh criterion on the rank of alternatives in this research. According to figure 4.17, the ranks of alternative will not change if the cost of capital gets a greater effect in the view of e-commerce business manager in the future. The first alternative (Drop-shipping method) will remain the best order fulfillment option. The second alternative (Hybrid method) will remain in place if the cost of capital will be more important than any other criteria in this research and obviously the third alternative (in-house method) will remain the same. In this scenario, the end result of the research will not change and drop-shipping will remain the best order fulfillment if the cost of capital will be the greatest concern of e-commerce business managers.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

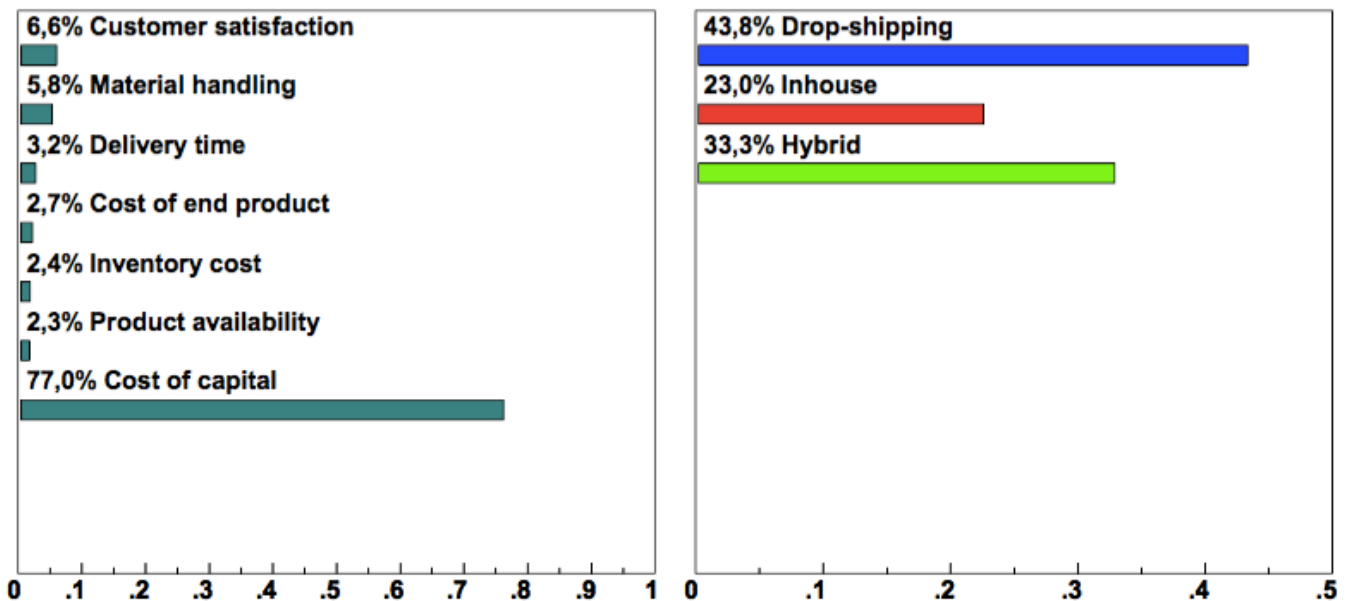


Figure 4.14.17 affect of cost of capital on the ranks of alternatives.

4.15 Summary table for “what if” scenarios

The table below shows the summary of all “what if” scenarios which was created in this research for investigating sensitivity analysis.

4.15 Summary table for “what if” scenarios

What if scenarios	Criteria	Best order fulfilment option if the weight of criteria changes in the future
First scenario	Customer satisfaction	In-house method
Second scenario	Material handling	Drop-shipping method
Third scenario	Delivery time	In-house method
Fourth scenario	Cost of end product	Drop-shipping method
Fifth scenario	inventory cost	Drop-shipping method
Sixth scenario	Product availability	Hybrid method
Seven scenario	cost of capital	Drop-shipping method

According to the summary table of sensitivity analysis, when a company tries to increase its consumer satisfaction gradually, the best order fulfillment option is an in-house method. Because customer satisfaction leads to customer loyalty. customer satisfaction is the main reason as to why a customer remains loyal to a business. According to Gartner in the next few years, companies will gain 80% of their revenue from 20% of their existing consumers(Sallam, R. and Fine. A, 2008).

If a company tries to increase material handling process, the best order fulfillment option is drop-shipping method according to sensitivity analysis in this research. A good material handling process can enhance customer service, reduce inventory cost and shorten delivery lead time. Investing in a material handling process can help companies to compete with increasing competition from new and existing companies in their business segment and in near future material handling might get greater importance in view of online business owners.

The third scenario investigates the increase of importance of delivery lead time for online business in Turkey. As mentioned by the result of sensitivity analysis in this research in-house method is best

to order fulfillment option if delivery lead time gets the greatest importance in view of e-tailers. Nowadays customers are not as patient as before and delivery lead time reduction can improve customer service, it might be a statement of the obvious but an increase of consumer services leads to customer satisfaction, which increases the revenue of the business rapidly.

The next scenario in the sensitivity analysis section of this research investigates the increase of importance of cost of the end product for online business in Turkey. In accordance with the result of fourth “what if” scenario in this research if the cost of the end product gets the greatest importance in the view of online business the best order fulfillment option is drop-shipping. Drop-shipping method reduce inventory cost, material handling cost, cost of capital, insurance cost and etc. which leads to a reduction of cost of the end product. Low cost of the end product can motivate customers to purchase a product via internet shopping rather than traditional in-store shopping and can increase revenue for online business.

The fifth “what if” scenario is about increasing the importance of inventory cost in the view of online business in Turkey. If Inventory cost became the most important criterion for online business the best order fulfillment option for them is to use drop-shipping method as the primary method of order fulfillment. companies which use drop-shipping as their order fulfillment method does not need to deal with inventory cost at all. Eliminating Inventory cost is one of the biggest advantages of using drop-shipping as an order fulfillment option. Because a product which a customer ordered from e-tailer will directly be shipped from supplier to the customer so e-tailor should not deal with stocking any product.

in the sensitivity analysis in this research, the sixth “ what if ” scenario which has been investigated is when product availability gets the greatest importance in the view of online business owners in Turkey. According to the result of sixth “what if” scenario the best order fulfillment option when

product availability gets the greatest importance in the view of online business owners is a hybrid method. The hybrid method provides the advantages of both drop-shipping and in-house methods and reduces the disadvantages of both methods. Greater product availability gives more choices to customers to choose from, which can reduce customer drawbacks when there is no product available in stock or when there is not enough product variety to choose from.

The last “what if” scenario investigates the increase in the importance of cost of capital in the view of online business owners in Turkey. Cost of capital is one of the most important factors for newly established companies. Usually, newcomers do not have the recourse of established companies which can heart their business in a competitive business environment. Lower cost of capital can help new companies to compete with more established companies and find their business segment in the worldwide business environment.

4.16 Performance sensitivity for best order fulfillment option

Next step in this research is to analyze figure 4.18, it is a line graph which illustrates the performance sensitivity for the three alternatives which was investigated in this research. In the line graph, the horizontal axis gives the weight of seven criteria and the overall result and the vertical axis shows importance percentages according to the answers of managers in e-commerce businesses which was collected by questionnaire. The performance sensitivity for Drop-shipping and in-house method rates fluctuated rapidly while the percentage of the hybrid method shows an almost steady pattern in this graph.

For customer satisfaction, drop-shipping was nearly 40% respectively. Drop shipping rate increase to 90% for material handling and its dropped rapidly again for delivery time to 40%. But it took off to 90% again for the cost of the end product and inventory cost. It dropped down again for product availability to 70% and increased again for the cost of capital to 90% in overall drop-shipping rate gets 35% at the end.

For customer satisfaction, in-house gets 90% but it dropped down rapidly for material handling to 40% and it again increases rapidly for delivery time to 90% but after that it decreases rapidly to 40% for cost of end product, inventory cost, product availability and cost of capital at the end for overall result it gets the rate 30.8%. For customer satisfaction, material handling, delivery time, inventory cost and cost of capital hybrid method gets the average rate of 65% but for product availability, it gets a rate of 90% at the end in overall hybrid rate gets 34.2%.

Performance Sensitivity for nodes below: Goal: Best order fulfillment

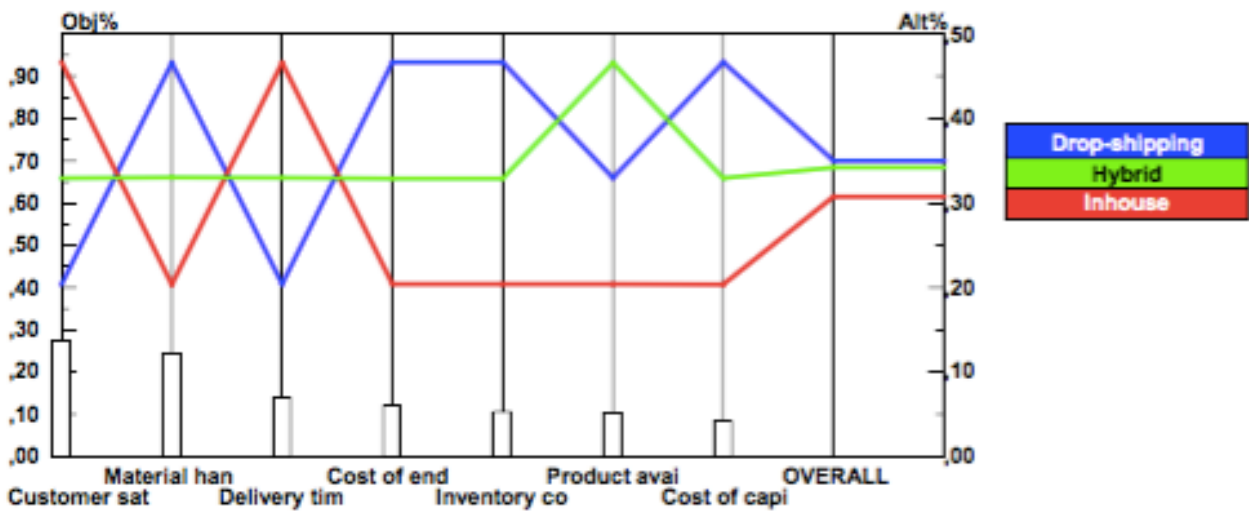


Figure 4.16.18 performance sensitivity (line graph)

4.17 weighted head to head between drop-shipping and In-house method

Next graph which was investigated in this research is figure 4.19 which is a bar graph that illustrates the weight of all seven criteria to best order fulfillment option(Drop-shipping) and the worst order fulfillment option (In-house). According to figure 4.19 (the bar graph) customer satisfaction and delivery time gets percentages of 6.95% and 3.47% in favor of an in-house method but material handling with percentage of nearly 6% cost of end product with rate of nearly 3.5% inventory cost with rate of 3.4%; product availability with rate of 1.2% and cost of capital with rate of 1.80% reverse the overall result in favor of drop-shipping by percentage of 4% at the end.

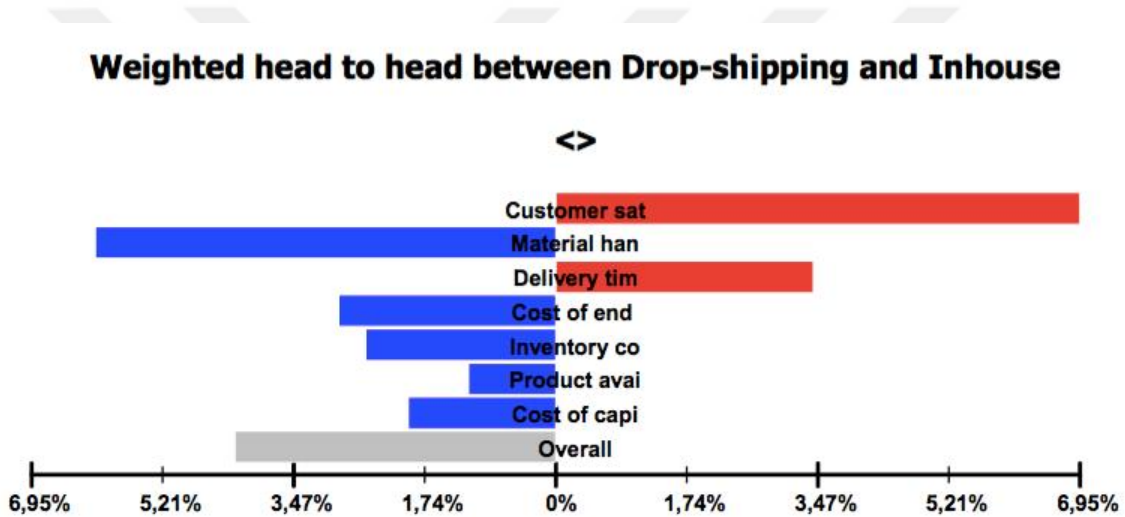


Figure 4.17.19 weighted head to head between Drop-shipping and In-house

4.18 Dynamic sensitivity for best order fulfillment option

Once the above steps have been completed, it is now possible to make a decision. This constitutes the last step in the AHP analysis. For this, it is necessary to compare the overall priorities obtained and whether the differences are large enough to make a clear choice. It is also necessary to analyze the results of the sensitivity analysis. From this analysis, which is illustrated in figure 4.20 it is possible to express the final result.

Figure 4.20 shows the criteria affect to ranks of alternatives in this research. According to figure 4.20 customer satisfaction have a 26.4 % effect on ranks of alternatives in this research. Material handling has 23.3% effect and delivery time has 13.1% effect on ranks of alternatives. Cost of end product fallow with 11.0% effect and inventory cost have 9.6% effect on ranks of alternative. Product availability and cost of capital have 9.2% and 7.4% effect on the ranks of alternatives in this research. And as it was demonstrated in below Drop-shipping method with 35.0 % was chosen alternative as the best order fulfillment method. Hybrid is the second best option by 34.2 % and in-house method is the last alternative by 30.8 % on the ranking.

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment

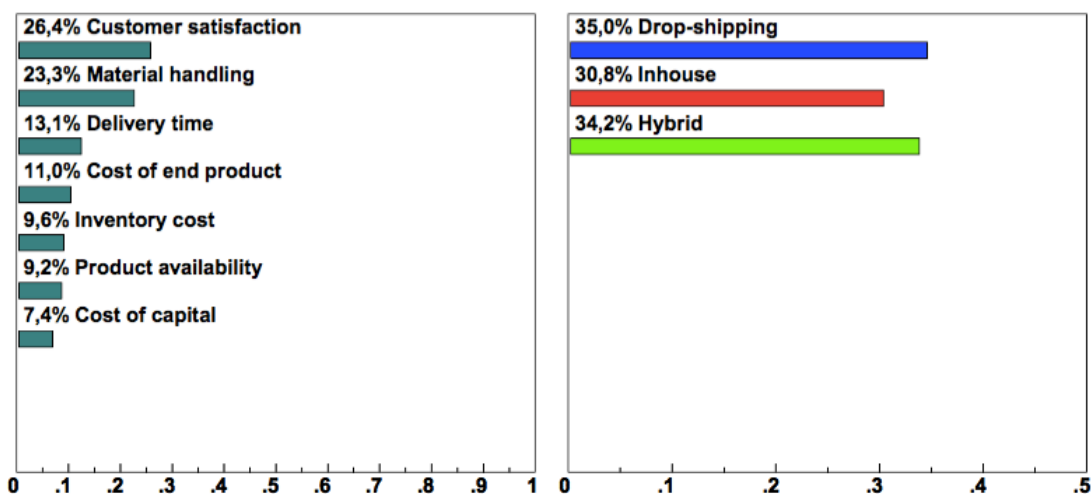
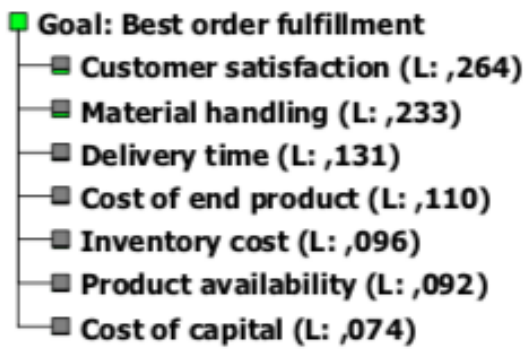


Figure 4.18.20 the affect of each criterion on the ranks of alternatives and ranks of alternatives of the research according to answers of questionnaire by e-commerce business mangers.

Appendix for chapter 4

Model Name: best order fulfillment

Treeview



Alternatives

Drop-shipping	,330
Inhouse	,204
Hybrid	,466

Model Name: best order fulfillment

Priorities with respect to:
Goal: Best order fulfillment



Model Name: best order fulfillment

Graphical Assessment

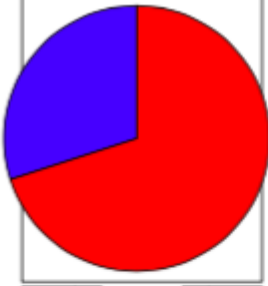
Drop-shipping



Compare the relative preference with respect to: Customer satisfaction



Inhouse



	Drop-s hipp	In house	Hybrid
Drop-shipping		(2,3)	(1,61)
In house			1,41
Hybrid	Incont: 0,00		



Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Material handling



Inhouse



	Drop-s hipp	In house	Hybrid
Drop-shipping		2,3	1,4
In house			(1,61)
Hybrid	Incont: 0,00		

Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Cost of end product



Inhouse



	Drop-shipp	Inhouse	Hybrid
Drop-shipping			1,41
Inhouse		2,3	(1,6)
Hybrid			
Incont:	0,00		



Model Name: best order fulfillment

Graphical Assessment

Drop-shipping



Compare the relative preference with respect to: Delivery time

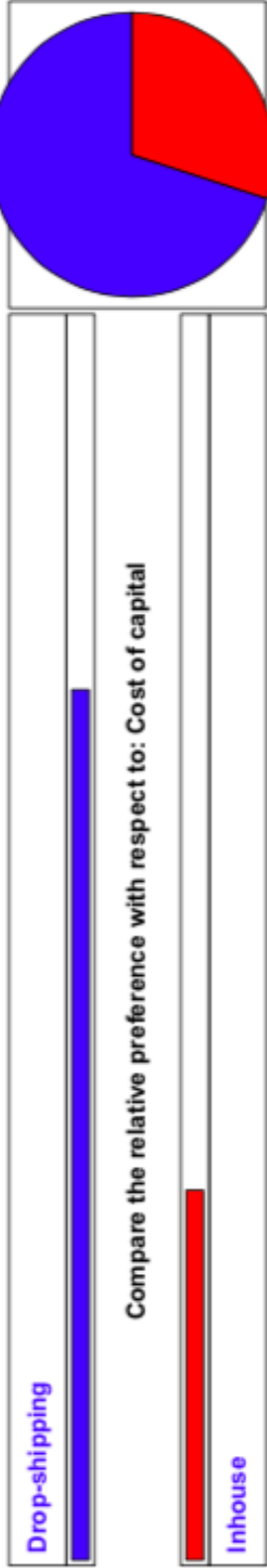


Inhouse

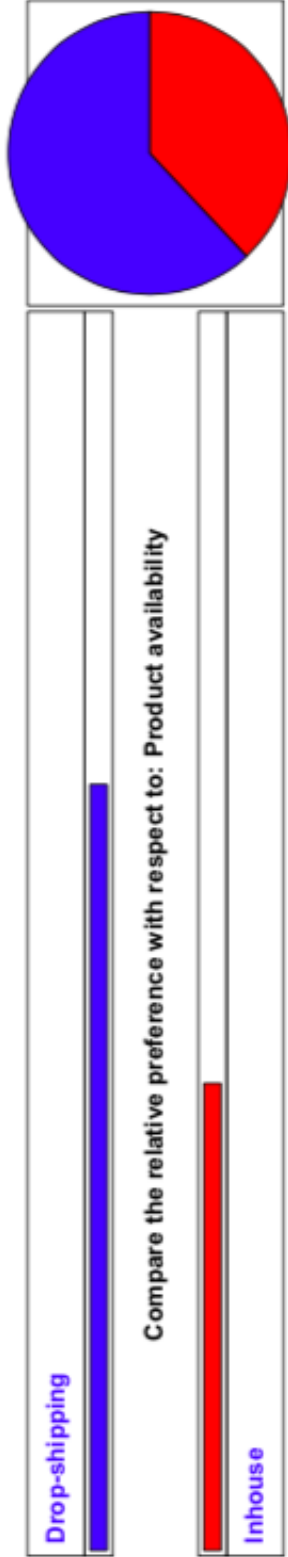


	Drop-shipp	Inhouse	Hybrid
Drop-shipping			(1,6)
Inhouse		2,3	1,4
Hybrid			
Incont:	0,00		

Graphical Assessment

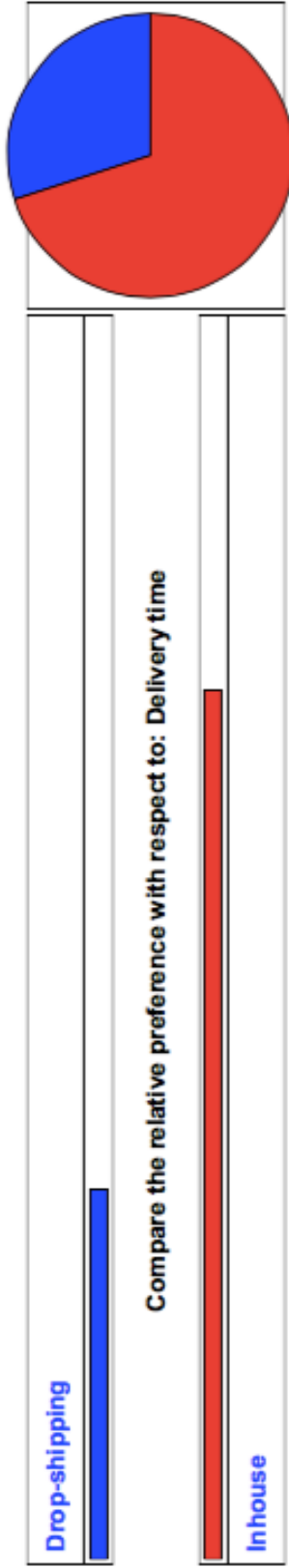


	Drop-shipp	Inhouse	Hybrid
Drop-shipping		2,3	1,41
Inhouse			(1,61)
Hybrid			
Incont:	0,00		



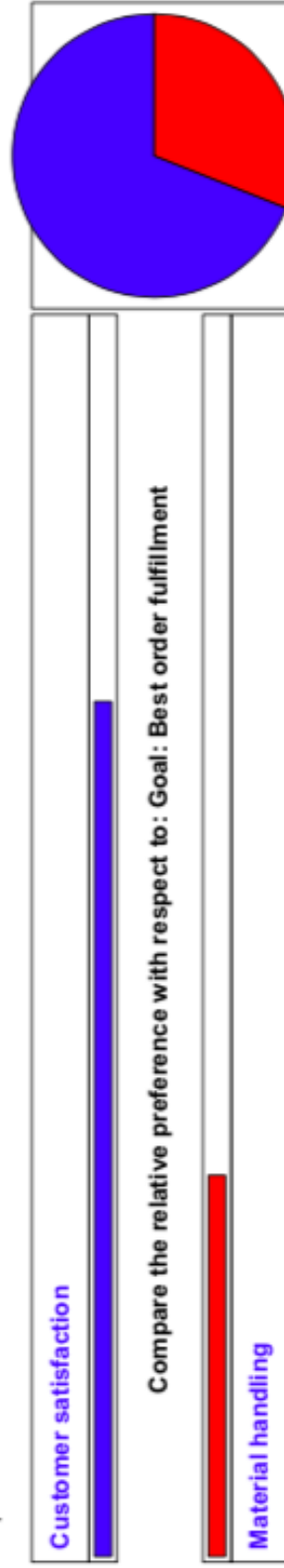
	Drop-s hipp	Inhouse	Hybrid
Drop-shipping		1,6	(1,4)
Inhouse			(2,3)
Hybrid			
Incont:	0,00		

Graphical Assessment



	Drop-shipp	Inhouse	Hybrid
Drop-shipping		(2,3)	(1,6)
In house			1,4
Hybrid			
Incorr: 0,00			

Graphical Assessment

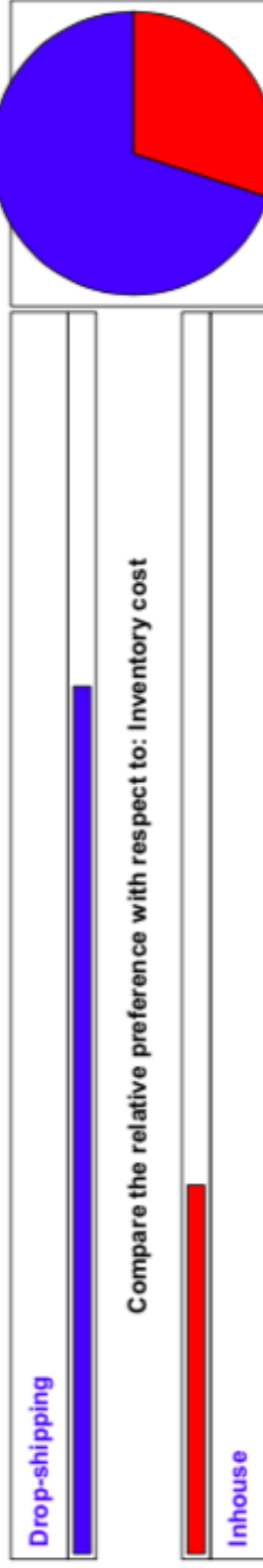


	Customer s	Material hai	Delivery tim	Cost of end	Inventory ci	Product av:	Cost of cap
Customer satisfaction		2,23	1,84	2,63	3,74	1,04	3,74
Material handling			5,09	1,7	2,32	2,72	1,71
Delivery time				2,91	1,16	1,44	1,72
Cost of end product					1,23	2,61	1,31
Inventory cost						1,72	1,57
Product availability							1,26
Cost of capital	Incorr: 0,09						



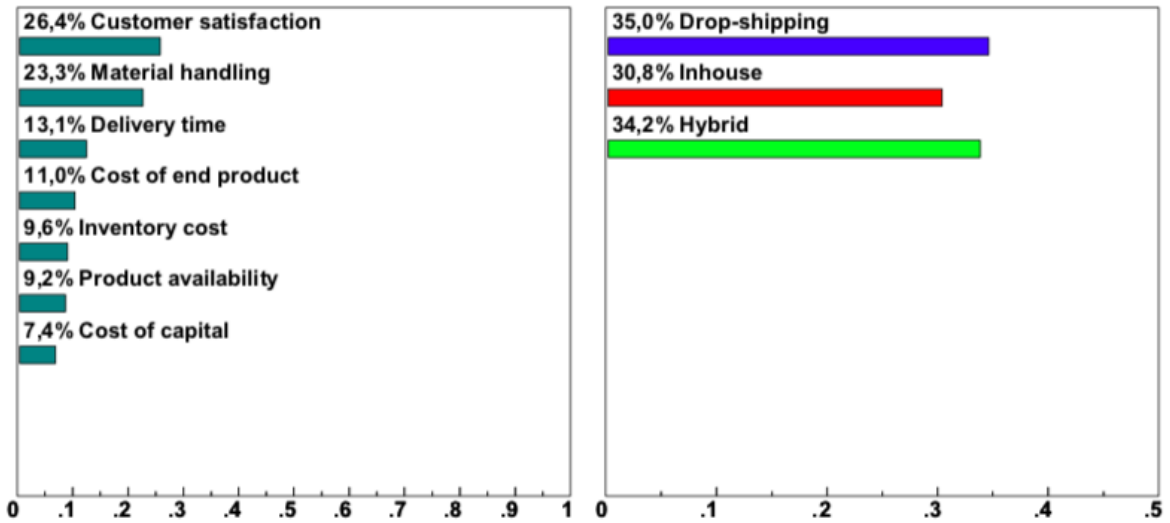
Model Name: best order fulfillment

Graphical Assessment



	Drop-s hipp	Inhouse	Hybrid
Drop-shipping		2,3	1,41
Inhouse			(1,6)
Hybrid			
Incont:	0,00		

Dynamic Sensitivity for nodes below: Goal: Best order fulfillment



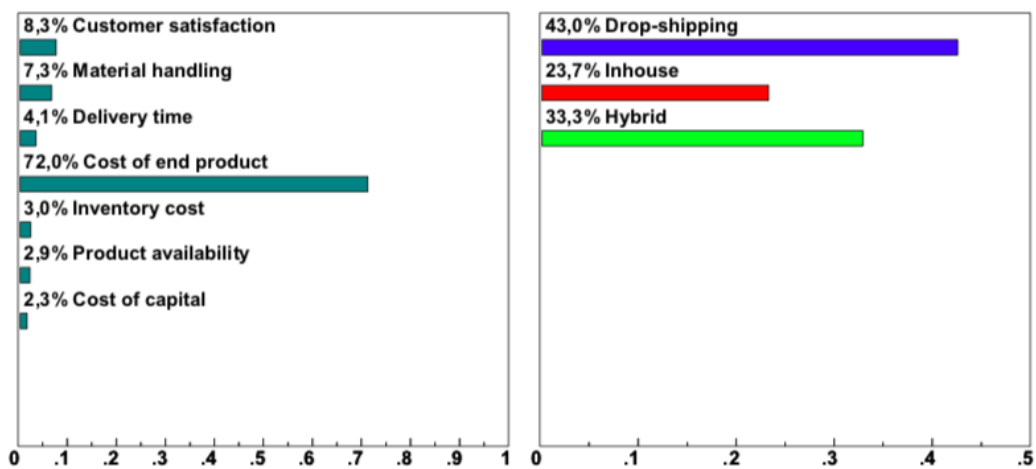
Synthesis: Summary

Synthesis with respect to: Goal: Best order fulfillment

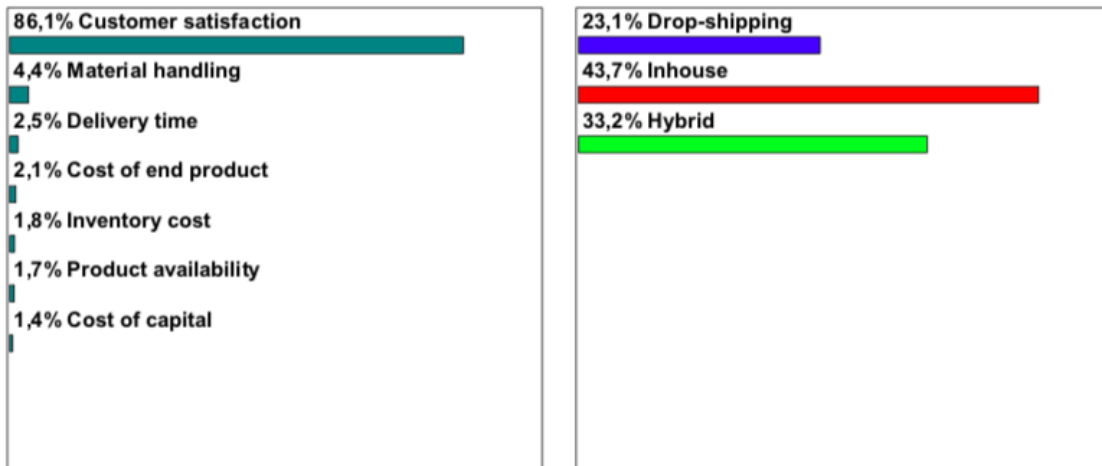
Overall Inconsistency = ,07



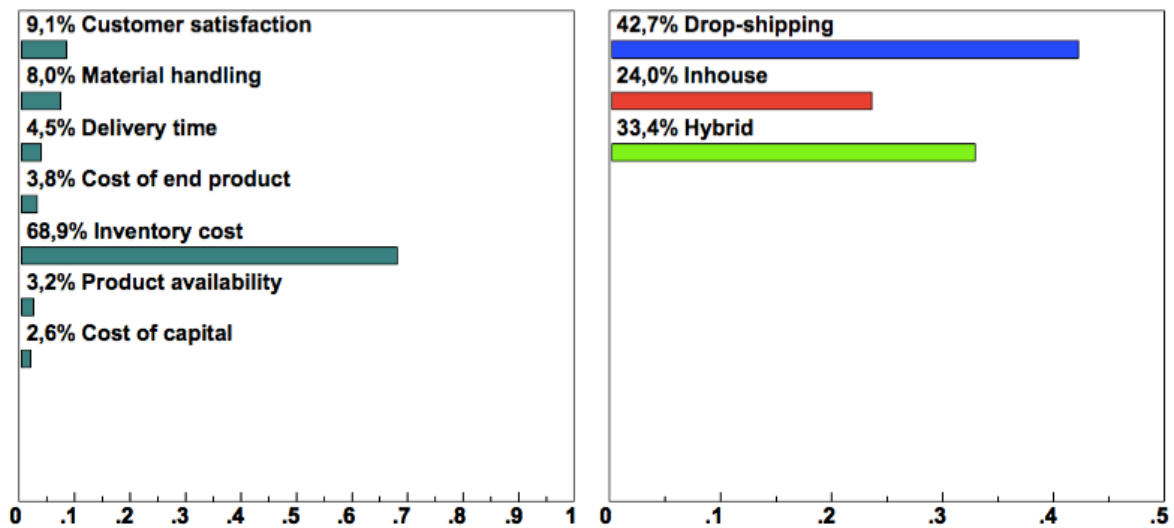
Dynamic Sensitivity for nodes below: Goal: Best order fulfillment



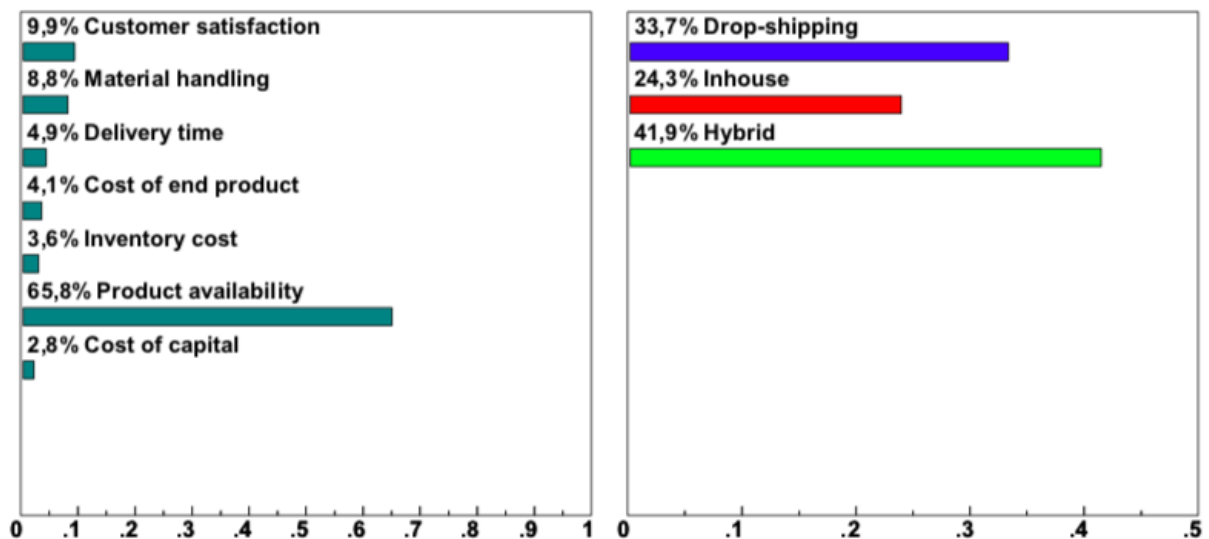
Dynamic Sensitivity for nodes below: Goal: Best order fulfillment



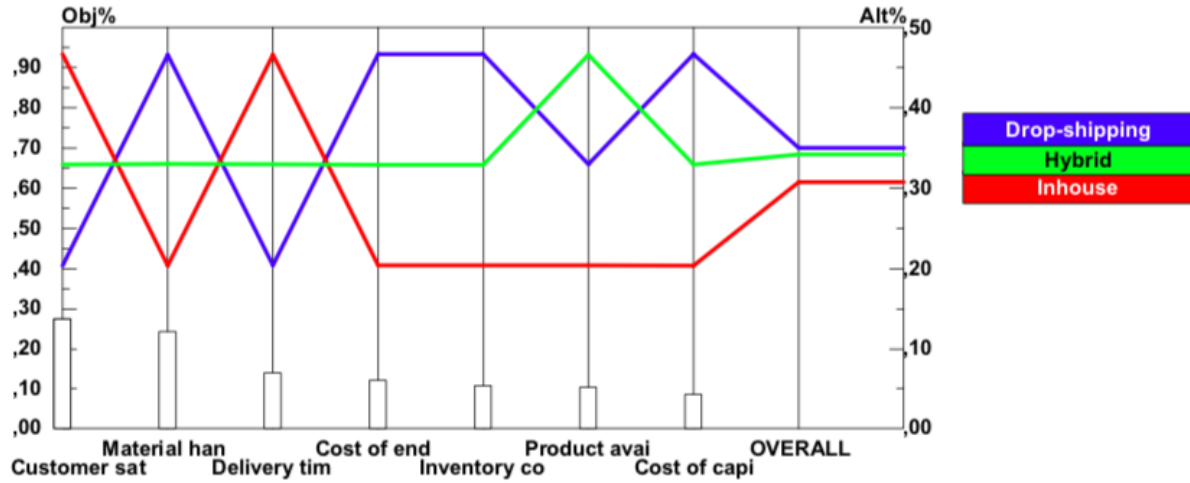
Dynamic Sensitivity for nodes below: Goal: Best order fulfillment



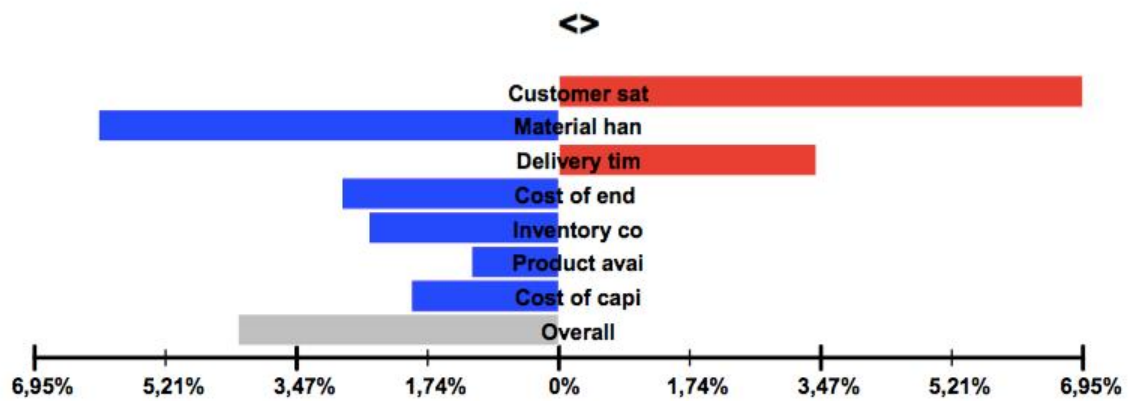
Dynamic Sensitivity for nodes below: Goal: Best order fulfillment



Performance Sensitivity for nodes below: Goal: Best order fulfillment



Weighted head to head between Drop-shipping and Inhouse



Chapter 5

Conclusion & Recommendations

5.1 Discussion and Conclusion

With the rise of internet availability, e-commerce or online retail markets become a reputable way of earning income for so many people around the world. The internet provides efficient platforms with fewer geographical boundaries. Internet and progress in information technology have caused the development of e-commerce and the quick growth of online retail markets. The Internet is a powerful medium for selling products, the advancement of conventional operational processes, and even the introduction of new business practices (Dennis Z.Y et al, 2017).

The dominant purpose of this research is to find the best order fulfillment option for online business in Turkey. and to examine the relationship between criteria which are important to these online businesses and three alternatives (Drop-shipping, hybrid and in-house method) available for them.

To reach the objective of this research, the sufficient volume of secondary data is gathered. The literature review is discussed in relation to the theoretical and pragmatic considerations, theories and models as well. Therefore, it provides ample support for the better realization of major factors that has a significant contribution in the order fulfillment, such as customer satisfaction, material handling, delivery time, cost of the end product, inventory cost, product availability, and cost of capital.

We have been able to confirm our hypothesis on the factors that affect the order fulfillment among online businesses in Turkey. These results are obtained from the statistical analysis to confirm our current study on investigating criteria effect on order fulfillment options.

The result gathered has confirmed our hypothesis on the best order fulfillment option for an online business is Drop-shipping in Turkey. Therefore, this current study will support the result of Chen, Y.K., et al (2018) research on an integrated model for online product placement and inventory control problem in a drop-shipping optional environment. Chen, Y.K., et al (2018) found that although there is some limitation in the drop-shipping method it is still the best choice of order fulfillment option for online businesses.

5.2 Research Contribution

This current study has examined what is the best order fulfillment option for online businesses in Istanbul city and metropolis areas. As results, the research found that the current criteria, customer satisfaction, material handling, delivery time, cost of the end product, product availability, inventory cost, and cost of capital contribute significantly to choosing best order fulfillment option. The segments in this research are based mostly on a theoretical frame. The overall findings depict that there is a strong relationship between all variables.

5.3 Theoretical contribution

This research is mostly involved in theoretical frameworks and models as the current study is a mere contribution to previous researches and theories. Moreover, this study highlights the facts and figures that are associated with each of criteria (customer satisfaction, material handling, delivery time, cost of the end product, product availability, inventory cost, and cost of capital) and how they affect the final decision process. The same case has applied to the hypothesis in this research which is a contribution by previous researchers that have confirmed the significance of criteria in this research.

5.4 Managerial contribution

The research topic is to investigate what is the best order fulfillment option for e-commerce businesses in Turkey. Thus, the outcomes of this study can provide useful information for online

businesses in Turkey. It also can help these organizations to reduce all unnecessary costs in their operation and to improve the performance of these businesses. Moreover, each hypothesis has been accepted, and it shows that there is an association between criteria and alternatives. Further management or organization wishes to improve their revenue and increase performance operations can find useful information, and apply it to their business strategies. The result of this research can help marketing specialist to evaluate the marketing strategies of their organizations. Besides, the costumers who purchase products from these online businesses can be benefited from the results of this research due to the evaluation in cost reduction for these businesses which lead to a reduction of cost of the end product.

5.5 Limitations to Research

According to an acknowledgment made by Summer and Fine (2008), which has stated that every study is bound to experience several limitations in the process of research. These limitations are figures that have impacted our study or understanding of the research. During the research, constraints may happen in various forms depending on the nature of the research. In this study, we have faced geographical constraints where we were not able to target the whole of Turkey as it covers a huge surface that limiting us from other people's opinions. Besides, the shortage of time is also a constraint which is encountered in every research, we have not faced many constraints on the time in our case. When coming to secondary data about the cost of capital we have faced some constraints as it is not a common variable among researchers. Thus, there is a lack of information related to our topic. Respondents also can cause a limitation by the way they have responded, but we have got mostly positive results in our case.

5.6 Recommendation for Future Research

The outcomes of this research provide a foundation for the additional researchers on choosing appropriate order fulfillment option in the future. The future authors are required to adopt an in-depth and comprehensive approach for examining all factors in details for the better elucidation of

the relationship among criteria and alternatives. The in-depth investigation can be conducted by applying qualitative methods of research to obtain more clear outcomes. With reference to the impact of different factors on order fulfillment options, future researches can be replicated in different contexts, for instance, different cultures, and states. The recommendations are given to future researchers to pay attention when carrying out researches which are related to the same topic.

The recommendations for the research are given below:

- The current study faces limitations in the geographical area coverage as it has focused on only Istanbul and metropolis areas thus, the future researches can test more cities to get a better result.
- In the future, different sampling methods can be considered to cover a greater number of respondents. In addition, more predictors can be added for the measurement of criteria This paper is based on quantitative research, future authors can also conduct qualitative methods, such as focus group interview for obtaining the greater insight about subjective norms and environmental concerns. In this chapter, we have discussed and concluded our research carried out on the criteria influence on alternatives. We have also discussed the limitations to the study, the theoretical and managerial contribution of the study as well as a recommendation for the future researchers to acknowledge when carrying out new research on employee retention.

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Appendix

Questionnaire

I. Demographic

A. Gender?

1. Female
2. Male

B. Age ?

1. 18- 25
2. 26-35
3. 36-45
4. 46 and above

C. Education level ?

1. Primary and secondary school
2. High school graduate, diploma or the equivalent
3. Vocational/ technical school
4. Bachelor's degree
5. Master's degree /Doctorate degree

II.

A. Which factor Do you think is more important to consider in your organisations Customer satisfaction or cost of Capital? ?

1. Cost of capital is Strongly more important
2. Cost of capital is moderately more important

3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

B. Which factor Do you think is more important to consider in your organisation Customer satisfaction or Material handling?

1. Material handling is Strongly more important
2. Material handling is moderately more important
3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

C. Which factor Do you think is more important to consider in your organisations Customer satisfaction or Delivery lead time?

1. Delivery lead time is Strongly important
2. Delivery lead time is moderately more important
3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

D. Which factor Do you think is more important to consider in your organisation Customer satisfaction or Cost of end product?

1. Cost of end product is Strongly more important
2. Cost of end product is moderately more important
3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

E. Which factor Do you think is more important to consider in your organisation Customer satisfaction or inventory cost ?

1. Inventory cost is strongly more important
2. Inventory cost is moderately more important
3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

F. Which factor Do you think is more important to consider in your organisation Customer satisfaction or product availability?

1. product availability is strongly more important
2. product availability is moderately more important
3. Both factors are equally important
4. Customer satisfaction is Strongly more important
5. Customer satisfaction is moderately more important

G. Which factor Do you think is more important to consider in your organisation Product availability or cost of Capital?

1. Cost of capital is strongly more important
2. Cost of capital is moderately more important
3. Both factors are equally important
4. Product availability is strongly more important
5. Product availability is moderately more important

H. Which factor Do you think is more important to consider in your organization Product availability or Material handling?

1. Material handling is strongly more important

2. Material handling is moderately more important
3. Both factors are equally important
4. Product availability is strongly more important
5. Product availability is moderately more important

I. Which factor Do you think is more important to consider in your organization Product availability or Delivery time ?

1. Delivery lead time is strongly more important
2. Delivery lead time is moderately more important
3. Both factors are equally important
4. Product availability is strongly more important
5. Product availability is moderately more important

J. Which factor Do you think is more important to consider in your organization Product availability or Cost of end product?

1. Cost of end product is strongly more important
2. Cost of end product is moderately more important
3. Both factors are equally important
4. Product availability is strongly more important
5. Product availability is moderately more important

K. Which factor Do you think is more important to consider in your organization Product availability or Inventory cost ?

1. Inventory cost is strongly more important
2. Inventory cost is moderately more important
3. Both factors are equally important
4. Product availability is strongly more important

5. Product availability is moderately more important

L. Which factor Do you think is more important to consider in your organization Inventory cost or Capital cost?

1. Cost of capital is strongly more important
2. Cost of capital is moderately more important
3. Both factors are equally important
4. Inventory cost is strongly more important
5. Inventory cost is moderately more important

M. Which factor Do you think is more important to consider in your organization Inventory cost or Material handling?

1. Material handling is strongly more important
2. Material handling is moderately more important
3. Both factors are equally important
4. Inventory cost is strongly more important
5. Inventory cost is moderately more important

N. Which factor Do you think is more important to consider in your organization Inventory cost or Delivery lead time?

1. Delivery lead time is strongly more important
2. Delivery lead time is moderately more important
3. Both factors are equally important
4. Inventory cost is strongly more important
5. Inventory cost is moderately more important

O. Which factor Do you think is more important to consider in your organization Inventory cost or Cost of the end product ?

1. Cost of end product is strongly more important

2. Cost of end product is moderately more important
3. Both factors are equally important
4. Inventory cost is strongly more important
5. Inventory cost is moderately more important

P. Which factor Do you think is more important to consider in your organization Cost of End product or Capital cost?

1. Cost of capital is strongly more important
2. Cost of capital is moderately more important
3. Both factors are equally important
4. Cost of end product is strongly more important
5. Cost of end product is moderately more important

Q. Which factor Do you think is more important to consider in your organization Cost of End product or material handling?

1. Material handling is strongly more important
2. Material handling is moderately more important
3. Both factors are equally important
4. Cost of end product is strongly more important
5. Cost of end product is moderately more important

R. Which factor Do you think is more important to consider in your organization Cost of End product or delivery lead time?

1. Delivery lead time is strongly more important
2. Delivery lead time is moderately more important
3. Both factors are equally important
4. Cost of end product is strongly more important

5. Cost of end product is moderately more important

S. Which factor Do you think is more important to consider in your organization Delivery lead time or Capital of cost?

1. Cost of capital is strongly more important
2. Cost of capital is moderately more important
3. Both factors are equally important
4. Delivery lead time is strongly more important
5. Delivery lead time is moderately more important

T. Which factor Do you think is more important to consider in your organization Delivery lead time or Material handling??

1. Material handling is strongly more important
2. Material handling is moderately more important
3. Both factors are equally important
4. Delivery lead time is strongly more important
5. Delivery lead time is moderately more important

U. Which factor Do you think is more important to consider in your organization material handling or cost of capital ?

1. Cost of capital is strongly more important
2. Cost of capital is moderately more important
3. Both factors are equally important
4. Material handling is strongly more important
5. Material handling is moderately more important

