Effect of Supplier's Assessment on Waste Prevention

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ABSTRACT

Since the industrial revolution, the natural resources have been exploited vigorously throughout the world. Therefore, governments and customers force organizations to produce more economic, sustainable and green items. Beyond the financial, social and legal perspective, producers are challenged by environmental constraints while manging their supply chain.

A questionnaire was specifically designed in this research and submitted to company managers and to both business related and unrelated suppliers. Therefore, this study considers the effect of selection, incentive and development of suppliers.

Behavioral, structural and economic barriers, which may lead to some restrictions are also investigated in this research. Moreover, the difference of opinion between related suppliers and unrelated suppliers is studied by using hypothesis testing.

This research revealed that 95% of managers finds supplier development as the most effective motivation towards waste prevention, and 50% of them thinks economic barrier limits the supplier practices. This can be concluded that supplier development has the most positive effect on waste prevention and economic barrier has considered as the strongest barrier. Furthermore, there were difference of opinion between related and unrelated suppliers with regards to incentive and selection practices ($p<0.05$).

Keywords: Supply chain, Supply chain management Practice, Waste management**,** Envinroment

ÖZ

Sanayi devriminden itibaren, dünya genelindeki doğal kaynaklar aşırı bir şekilde tüketilmektedir. Bu nedenle, hükümetler ve müşteriler ticari kurumları daha ekonomik, sürdürülebilir ve yeşil ürünler üretmeleri konusunda zorlamaktadır. Finansal, sosyal ve yasal unsurların yanısıra, tedarik zinciri yönetimin sürecinde üreticiler çevre kısıtları için de çabalamaktadırlar.

Firma yöneticileri ve hem isle ilgili, hem de ilgisiz tedarikçilere dağıtılmak üzere bu çalışmaya özgün bir anket hazırlanmıştır. Böylece, bu çalışma tedarikçi seçimi, teşviği ve gelişimiyle ilgili etkileri içermektedir.

Bazı sınırlandırmalara yol açabilecek davranışsal, yapısal ve ekonomik engeller bu çalışma kapsamında incelenmiştir. Ayrıca, ilgili ve ilgiliz tedarikçiler arasındaki fikir farklılıkları hipotez testi kullanılarak araştırılmıştır.

Bu çalışma yöneticilerin %95'inin tedarikçi gelişiminin atıkların önlenmesi için en önemli sebep olduğunu ve %50'sinin ekonomik engellerin tedarikçi faaliyetlerini engellediğini düşündüğünü ortaya çıkarmıştır. Bu sonuç; tedarikçi gelişiminin atıkların önlenmesi konusuda en olumlu etki olduğunu ve ekonomik engellerin de en güçlü engel olduğunu göstermiştir. Bundan başka, teşvik ve seçim uygulamalarında ilgili ve ilgisiz tedarikçiler arasında fikir farklılığı tespit edilmiştir ($p<0.05$)

Anahtar Kelimeler: Tedarik zinciri, Tedarik Zinciri Yönetimi Uygulaması, Atık Yönetimi**,** Çevre

Dedicated to

All of producers in my dear country

Iran

and then, all developing countries in the world

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IKID	Iran Khodro Industrial Dies
SCM	Supply Chain Management
SCMP	Supply Chain Management Practice
ANOVA	Analysis Of Varianse

Chapter 1

INTRODUCTION

1.1 Significance of the Research

The global situation is worsening in terms of various environmental, economic and socio-political etc., arenas. The ever-increasing environmental pollution due to the industrial wastes the raw materials becoming more and more expensive, greedy consumption and the resulting emptying of natural resources, and further, the worldwide high rate population rise, all are collectively developing critical situation across the globe. As a result, the competition for natural resources is fierce (Štreimikienė, 2012) greatly impacting the business worldwide, creating an enormous impact on global businesses. The European community (EC) in its strategy developed for the year 2020 in view is emphasizing the waste-to- resource conversion and has set the goal of re-structuring the current legal system as well as promoting the waste mitigating initiatives.

Furthermore, the knowledge and awareness among the consumers is escalating. Such an approach requires continuity and for it to be ensured, the financial goals are to include social participation and enhancing environmental performance (Seitanidi & Crane, 2013). Enterprises should abandon entirely the non-value added wastes and focus to promote their processes and resources to value-added scale, implement efficiency of use, decreasing re-procurement and thereby reducing the disposal operation and expenses. Accordingly, the smaller the consumable input volume, the

smaller size/volume of the output waste, if achieving more value objective is followed throughout all processes.

1.2 Motivation to Conduct Research

This research is yielded base on practice and persuade suppliers to more sustainable performance by selection and evaluation of them. Furthermore, achieving sustainable suppliers can be adequated by supplier incentive like awarding certain status. The present practice-oriented thesis constitutes such changes as its commencement point and considers the Iran Khodro Industrial Die (IKID) performance as the defined 'practitioner'.

To achieve changes in waste regulations, IKID is looking for efficient methods to manage its waste. Accordingly by implement an appropriate questionnaire related to waste prevention and design a model (Berdien, 2014) which inclines a sustainable result, this research intents an appropriate result.

1.3 Aims and Objectives

IKID, which would be affected by the forthcoming developments in legal domains concerning waste policies, seeks implementing dynamic methods for managing its wastes aiming at prior complying with the future changes in bylaws and regulations.

Hence, the main aim of this study is generalizing the knowledge of the practitioner (Hak, 2008) and developing a dynamic model capable of offering an appropriate solution for management of the wastes in all the company premises including the main office of IKID. In addition, answering the questions are explained in the conceptual model is the other aim of this research.

1.4 Waste

Various types of waste management strategies exist as show Figure 1 illustrating the most to the least preferred methods ("EU Waste Legislation," 2013) IKID is currently using the energy recovery, reuse and waste recycling.

Figure 1: Waste treatment hierarchy (source: ("EU Waste Legislation," 2013)

The waste producing sources were identified as follows:

In general, production and utilization of resources entails producing wastes such as residues which are remains from the materials used (i.e. end-of-use items); Moreover, faults and failures occurred during the production or quality issues can generate waste. Again, one of the other sources of waste is the 'cutting wastes', the wastes that are created during resizing of the purchased tread-size non-modular items before using them in actual production; Although some of such items like steel plates may be sold back to the market. It can be understood from above that waste may be generated due to lack of coordination among logistics and transportation departments. For example, the miscommunication between the related staff on transport modalities can lead to repacking. Additionally the Customer Services department acts according to a policy that says packing of the customers' deliveries should be performed in a certain packing bearing the company name IKID, seeking

promoting of the company branding. This way such policy leads to repacking and hence increasing the wastes.

On the whole, the prevalence of the mentality appreciating the value of resources is of utmost importance. With the abundance of items it would be much easier to get a new one rather than recycling.

Also waste is produced as the result of by-products of procured items with unsuitable and damaged packs. Additionally, the defaults of products as well as wrong or incomplete items emanating from communication or productions faults or shortage of awareness on the part of the supplier may create waste.

The waste issue is pertinent to the whole organization and the supply chain participants because the waste is often created along with the supply chain.

The stakeholders include both inside and outside partners: e.g. the procurement department.

Waste prevention is defined by two common types of strategies: reactive and proactive.

● Reactive strategies mange waste optimally through recycling and reuse and concentrate on the perception of efficiency and utilization of resource (Walton et al., 1998).

● Proactive strategies focus on preventing the existence of resources and avoiding the loss of resource. Both cycle phase (products) and supply chain (processes) are considered by the source- reduction prevention approach (Gupta, 1995).

Given the practitioner's goal for adopting a proactive model capable of offering a suitable solution for waste management, 'prevention' was selected as the optimum strategy.

1.5 Questions

●How can waste management be promoted at the supply chain at IKID?

●How supply processes can impact on waste prevention?

●Which division of company has the most waste?

●How waste prevention can be induced at the supply chain with attention to find the most efficient reduction?

Chapter 2

LITERATURE REVIEW

Due to the increasing waste of industrial sectors and at the same time rising cost of raw materials, growing population and the most important reducing natural resources, firms should find the effective methods in order to optimize the usage of sources and reduce waste.

Particularly, from the supply chain management point of view, previous researches and studies show the fact that suppliers play an important role in this issue. So, more attentions must be taken by firms in to consideration about supplier selection strategies and supplier's development.

Although suppliers are significant part of each industry organization, one of the challenges firms are faced by green practicing is the inadequacy of green products from suppliers (Kasim & Ismail, 2012).

The main aim of this chapter is explaining common concepts and definitions of principle issues related to effective environmental practices.

2.1 Supply Chain

A supply chain is consisting of stream of products, economic and knowledge. Nowadays one of the most important aspect for successful business is competition

between suppliers, not individual activities, and key of success of supply chain is conclusively decided by end customer (Christopher, 2005).

Supply chain is generally defined as a series of stakeholders consist of suppliers, customers, logistic providers that contribute in a synergic way to deliver value packages of products to the end customer (Simchi-Levi et al., 2007).

The aim of firms in supply chain is complying such practices tend to reduce waste disposal, reverse energy, deduction pollution, recycle and take steps to responsible use of natural sources (Scharge, 2004).

One of solution which is considered in one of Japanese manufacturer for reducing waste is that assemblers trend with suppliers that generate less waste to incline toward better environmental performance (Hayami et al., 2015).

Multi-stage production, transportation, disposal of goods, the energy generation and transmission that supports all of those activities, should be approved as a new constructions and enterprises of supply chain in order to avoid dangerous climate (Plambeck, 2012).

2.2 Supply Chain Management (SCM)

Following By growing dependence on suppliers, the need to capable supply manager are increasing (Kannan & Tan, 2002).

Aim of managers in specifically manufacturing industries is achieving improved manage of supply chain in terms of methodologies and techniques (Gunasekaran et al., 2004).

In 1980’s late, approximately 60% of outsourcing of the total product cost is afforded by the US industry (Ballou, 1999).

Such survey shows the importance of distribution, purchasing and supply chain management in companies’s strategies (Gunasekaran et al., 2004).

Perception of SCM presents progression of purchasing, procurement, and other supply chain activities (Thomas & Griffin, 1996).

Significance of SCM is emphasized by business managers, advisers and academicians (Hamister, 2012).

Impact of a good supply chain management on reducing waste by implying just in time methodology, in order to prevent waste due to long time storage or to providing unnecessary materials can be clearly observed by manufacturing companies (Al-Hajj & Hamani, 2011).

Since, there are associates between both internal and external processes in firms, SCM is resembled to the business ecosystem (Bechtel & Jayaram, 1997).

In fact, Matthews et al. (2008) found that across all industries, companies' direct emissions average only 14% of their supply chain emissions prior to use and disposal; accounting for the emissions in use and disposal of goods would make that percentage even lower.

Supply managers, by providing information and incentives for customers and suppliers must approach to reduce waste and emissions that are not under their direct control (Plambeck, 2012).

In recent years, protection of the environment has received dominate attention from large companies in the world like Walmart, which is recognized as a significant supply chain management and high revenue (Plambeck, 2012).

Share real time information about inventory levels and end customer demand data throughout the supply chain and reduce transportation lead time are recommended by supply chain managers to avoid energy's waste in manufacturing companies (Lee et al., 1997).

One of the most appropriate solutions can be recommended by supply chain managers in order to reduce waste in manufacturing corporations is imposing penalty on greenhouse gas emissions (X. Chen et al., 2013).

Furthermore, intensive competition among firms is yield by supplier selection, which plays important role in SCM, can be another solution in order to decrease waste. Supplier selection method can be applied for all suppliers from row materials to end of life service providers (Azadi et al., 2015).

All in all Positive or negative effect of environmental and social performance leaning on critical decisions are taken by supply chain managers (Azadi et al., 2015).

2.3 Sustainable Supply Chain Management (SSCM)

Sustainability is used immense either in our everyday life or in the business world (Juliana, 2015).

Sustainability is defined by many factors: social actions of organizations, a better understanding of climate changes and an increasing transparency of environmental and a new way to consume energy (Crum et al., 2011).

Sustainability is one of the most important factors in supply chain management (Wen et al., 2013).

Due to depleting natural resources and rising population, sustainability has reserved vital responsibility from firms and manufacturers (Govindan et al., 2013).

Sustainability is a momentous action to achieve a successful supply chain management (Ageron et al., 2012).

Competitive advantage of corporates is one of the most significant aims is achieved by finding efficient and effective suppliers (Azadi et al., 2015).

Since, these days sustainable supply chain management has received consideration from manufacturing industries, various techniques are suggested by managers that can help to improve sustainable supplier's performance which play a significant role in providing an effective SSCM. Data envelopment analysis (DEA) is one of the practical techniques is used for this issue. (Azadi et al., 2015).

With the rising awareness of consumer, incorporating sustainability into the corporate strategy is a way to match stakeholder's expectations, from investors to communities, while taking into account social and environment impacts (Steven, 2010).

Ample benefits are achieved by SSCM include: pollution and waste management reducing long term risks associated to resource depletion, (Linton et al., 2007; Srivastava, 2007), minimizing waste while, minimizing reliance on scarce environmental resources (Closs et al., 2011), packaging and production waste resource efficiency through reduction of material consumption (Wittstruck & Teuteberg, 2012).

2.4 Sustainable Supplier Selection and Evaluation

Supplier selection refers to the process of gathering and processing information in order to assess and approve the performance of suppliers or potential supplier (Klassen & Vachon, 2003).

According to Bonini et al. (2010) "sustainability the management of environmental, social, and governance issues as very or extremely important in a wide range of areas, including new-product development, reputation building, and overall corporate strategy.

According to C.-T. Chen et al. (2006) supplier selection is"Critical issues faced by operations and purchasing managers to help organization a strategically competitive position".

In supplier selection procedure, various factors such as quality, price, flexibility and supplier authority are considered by firms. some of these factors are visible and some of them are invisible (Bai & Sarkis, 2010).

Within supplier selection performance, suppliers are assigned grades in order to achieve an effective method for selecting appropriate suppliers. For evaluating suppliers, the analytic hierarchy process (AHP) method are used by Yahya and Kingsman (Yahya & Kingsman, 1999).

Organizational factors and strategic performance metrics is on of method for evaluate and selecting the best suppliers which is suggested by Sarkis and Talluri. Analytic network process (ANP) is applied by them (Sarkis & Talluri, 2002).

A five-step AHP-based model which is afforded by Muralidharan, is another method that help managers to select correct suppliers (Muralidharan et al., 2002).

AHP is used for selecting the best suppliers (Liu & Hai, 2005).

Fuzzy AHP are proposed by Kahraman in order to best supplier's selection (Kahraman et al., 2003).

Reserving linguistic values to evaluate rate and weight by fuzzy decision making method is one of practical ways for selecting and evaluating suppliers (C.-T. Chen et al., 2006).

2.5 Supplier Incentives

According to Simpson and Power (2005) Krause et al. (2000), supply incentives are meant to “motivate suppliers to improve by signaling that improve performance is rewarded with increased business and preferred status for future business”.

Though evaluation can be a useful element in the buyer-supplier relationship to assess if suppliers have indeed implemented sustainable practices, it should take into account the supplier’s process next to the product output. Even though it could be beneficial for both the focal firm and the supplier, evaluation alone will not lead to the adoption of environmental practices. Incentives as an additional or alternative process have evolved from a carrot-and-stick approach to competitive constructions and shared responsibilities. The feasibility of these incentives to inducing actual adoption of SSCM practices has not been studied to great extent. This might be due to the fact that it is harder to measure than traditional contracts and incentives.

Innovative competitive advantages to members causes to improve performance of the supply chain (Wu et al., 2012).

2.6 Supplier Development and Integration

Supplier development is one of the significant factors to achieve development in manufacturer companies (Krause et al., 2000).

Commonly, achieving improvement can be more straightforward when two or more companies work together than working individually (Simatupang & Sridharan, 2002).

Herein, a relationship ‘built on trust, communication and collaboration may be more effective’ in ensuring sustainable sourcing compared to transactional relationships (Hoejmose & Adrien-Kirby, 2012).

2.7 Waste

Waste is defined by the Waste Framework Directive (75/442/EEC), as “any substance or object which the holder disposes of or is required to dispose of”.

Over the last few decades, due to social and legal pressures, waste issue has received more attentions by manufacturers (Sarkis et al., 2011).

New definition of waste inclines more relevant and sustainable program toward conversion of waste to resource (Pongrácz & Pohjola, 2004).

Recycling companies define waste as a restriction to environmental conservation (Pongrácz & Pohjola, 2004).

In many manufacturing industries vast amount of production in compare of variability in demand lead to generate inefficient energy the redound to increase mean percentage in the energy intensive chemicals (15%), pulp and paper (11%), primary metal (30%) and fabricated metal (17%) (Bray & Mendelson, 2012).

Using waste for producing new product is a new strategy which is applied by successful companies (Plambeck, 2012).

It is obviously that reduce the consumption of resource, energy and money depends According to Lox (1994), “Either an output with (‘a negative market’) no economic

value from an industrial system or any substance or object that has ‘been used for its intended purpose’ (or ‘served its intended function’) by the consumer and will not be reused” Heijungs and Hofstetter (1996) on decrease of waste (Bartl, 2014).

2.8 Waste Management

Concept of waste management is a new strategy which is developed in the 1970s, 1980s and early 1990s (Berger et al., 1999).

According MacDonald (1996) “dealt with applying and refining various optimization and heuristic techniques to provide a more realistic representation of solid waste management practices”. Achieving sustainable environmental is considered under waste prevention (Cabanelas et al., 2013).

A key part of waste management policy is waste prevention (Gentil et al., 2011).

2.9 Waste Prevention

Any kind of action that avoid the generation of waste (Gupta, 1995).

Typical examples of waste prevention:

●At Home, reducing the utilization of expendable utensils, napkins, and, and other dispensable items. Purchasing durable things that will survive more than ephemeral things. Purchasing cereal, rice, or other grain-related nourishments in mass, and store these things in reusable compartments until required. Throw out the containers used to packages and store littler parts.

●In Business Buying cases of materials which are not in individual package. For example paper is packaged in individual reams by some of companies. By not

making singular bundles of 500 sheets you can simply open a box of paper alongside the scanner or printer, and put what they require into the machine.

Waste prevention means taking measures before a material, substance material or product has become waste that this strategy can lead to decrease:

●The amount of waste, including through the re-utilization of items or the augmentation of the life compass of items;

●The antagonistic effects of the created waste on the earth and human wellbeing;

●The substance of hurtful substances in materials and items.(Wilts et al., 2013).

According to Sharp et al. (2010) ”Very little is understood about how to monitor and evaluate waste prevention particularly among local authority waste managers who are most likely to implement intervention campaigns”.

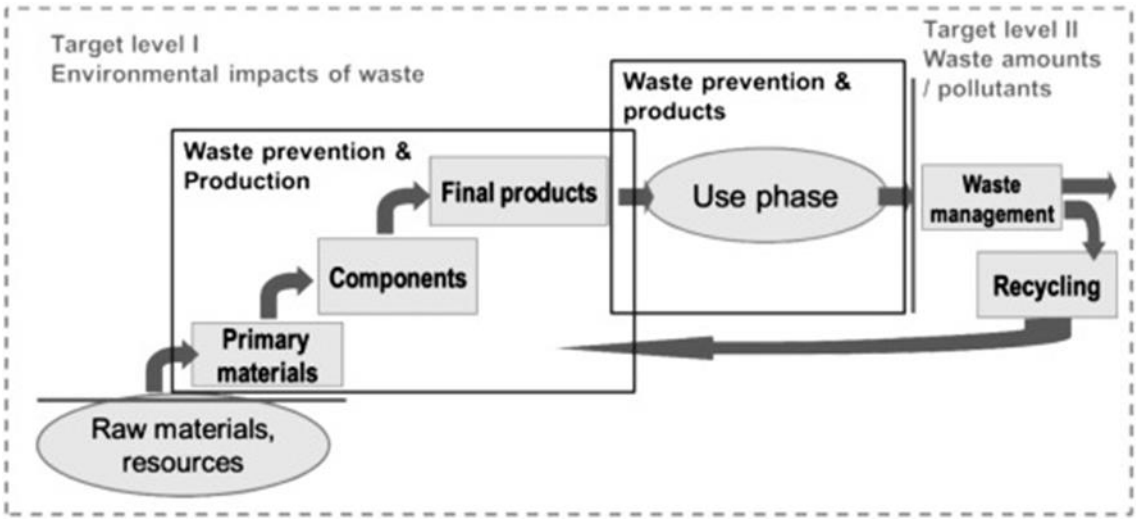

Figure 2: Assignment of target levels (Gentil et al., 2011)

Figure 2 shows assignment of target levels. The main objectives of the program relate to the reduction of environmental impacts caused by waste generation throughout the value chain. (Gentil et al., 2011).

The most important aspect of waste prevention states preventing or reducing the adverse impacts of the generation and management of waste in order to protect the environment and human health and by reducing overall impacts of resource use and improving the efficiency of such use (Wilts et al., 2013).

Waste prevention is either about waste, or practical, effective and new ways for handling with resources. Eco-innovations are needed to optimize the whole chain in order to increase resource efficiency (Wilts et al., 2013).The main goal of waste prevention is minimizing the adverse effect of waste generation (Dehoust et al., 2011).

Chapter 3

CASE DESCRIPTION

3.1 Iran Khodro Industrial Dies (IKID)

IKID is one of the most recognized companies in the field of industrial commodities. Iran Khodro industrial molds, called Kalibran and with a nominal capacity of 500 tons of mold and gauge panel in 1994 by then-president Ayatollah Hashemi Rafsanjani was opened.

Iran Khodro in two steps in the year 1997 and 1999 managed to buy 100 % shares of the company were Kalibran and change the company name to form Iran Khodro responsibility for the design and manufacture of molds first national car project X7 (Samand) to the enterprise awarded.

Development Plan I:

At this point, IKID increased the nominal capacity (500 tons) with 5 -axis CNC machines and the latest production hall with an area of 23,000 square meters in2003 to 4 nominal capacity of 1460 tons of mold and in this period by dispatching technical personnel to advanced centers Die Japan, France, Germany and Italy were able to transfer manufacturing technology forms G1 and G2 and G3 body size to take action.

Development Plan II:

In 2003, companies make strategic decisions and the technical and economic evaluations and studies conducted to install and set up the most advanced mechanized production lines under title II and infrastructure development 8,000 square meters, consists of three robotic line, two line Hand presses capable of producing vehicle body parts in the size G2, G1 and G3 and by developing and launching the collection in 86 years to assemble bodies produced to the customer to safely design, construction and production , auto body parts and assemblies , including design , CAD / CAM / CAE, simulation foam , machining , construction, materials, mold testing , quality control, production and collection of body parts to the company delegate. As well as companies with about 860 employees of Iran Khodro Industrial Commodities experienced and expert in an area 53,000 square meters, with the latest machines and the ability to build the world's most sophisticated auto body parts in order to improve knowledge of the center of the surrounding society launched in 87 years has been applied to the training of young people in order to promote the preservation of the values of the Iranian tricolor flag, to take action.

3.2 Car Manufacturing Industry

Rebuilding and change have portrayed the auto business in the previous decade. Overcapacity, expanding client necessities, serious environmental enactment and quick innovation advancement are among the most vital components behind this improvement. To stay aggressive, auto makers and suppliers along these lines constantly need to enhance their execution (Von Corswant & Fredriksson, 2002), concerning (e.g. conveyance accuracy, quality, and cost) and item improvement (e.g. time, cost, creativity). As a result, a few patterns (here characterized as general

changes after some time inside of the business) concerning sourcing methodologies and supplier relations can be recognized. Guaranteeing progression in this way requests closer participation with suppliers and accomplice with items and process advancement, and upgrading execution (Burgers, 2013).

Still, the significance of economical operations and empowering collaborations along the supply network is underscored (Xu et al., 2012). The quick paced advancement of innovations will empower Asian contenders to convey astounding vessels in a brief span. In this way, it is recommendable to endeavor opportunities in asset effective operations sooner rather than later.

3.3 Introduction of Company

Company Name: Iran Khodro Industrial Dies (IKID)

Main activity: Design and manufacture of metal dies body- plastic dies- production and assembly of car body parts.

The most significant advantages of the company include (licenses, awards,etc...):

- Standard 2008:ISO 9001 the scope of manufacture and desighn of molds;
- Standard 2008:ISO 9001 the scope of production and assembly set;
- Standard 2009: 16949 ISO/TS the scope of production and assembly set;
- Standard 2004: ISO 14001 in the field of environment;
- Standard 2007: OHSAS 18001 in the field of occupational health and safety;
- Standard integrated management system (IMS);

A SWOT analysis (appendix) at IKID is as follows:

- Strength: commitment and liability to continuous progress are already observed by IKID. Furthermore different initiatives have performed. It is worth mentioned that

having a good relationships among leaders, clients, shareholders and suppliers, is one of the key success of IKID;

●Weakness: energy management and optimal use of the resources are the lack of company. Moreover increasing staff and suppliers incentives need to more attention;

● Opportunities: the company by using resources more efficiently can develop competitive advantages, and concurrently gain aware and green customers;

● Threats: Away from the world of industry and lack of information on new technologies for example waste prevention, cause to increase purchase cost due to increased consumption and reduction of resources;

Chapter 4

METHODOLOGY

This research has been prepared based on the needs of the company in the field of environmental and waste reduction. In addition the aim of this research is to answer questions characterized in the theoretical model. Overall, ESMP is focused on one ecological problem; waste counteractive action.

Significant of hypothesis on ESMP and related practices is done inside of the manufacturing automobile industry, considering both central firm and their related and unrelated suppliers. It should be mentioned that the meaning of related supplier is that these suppliers have currently business with IKID but unrelated suppliers are considered as potential suppliers which maybe have business in the future.

This research intends to perform existing ESMP structures in a specific industry and find that which ESMP are considered as a best practice in the company.by considering various number of perspectives concentrating on a particular natural concern.

This chapter presents the research design, the case selection and type of the questionnaire. Then, in this chapter, the empirical data collected are defined.

4.1 Research Design

This research is practice oriented and a hypothesis-testing methodology is employed based on the method proposed by (Dul & Hak, 2007).

Furthermore, in this research, focus on distinct topic of waste prevention based on the requirement of IKID is used instead of concentrate on waste at large enterprises.

The method is already tested in shipbuilding industry (Berdien, 2014). In this research, manufacturing of industrial dies is assessed from principal company and supplier's perspective. In fact, within this research, feasibility of environmental supply chain management practices is examined in specific situation by several outlooks.

4.2 Case Selection

In this research, in order to reduce the bias of interviewer, with different kind of managers were interviewed according to the type of their activities in company.

Samples were selected from manufacturing companies which are located in Iran.

Questionnaire was sent to managers of IKID including 2 purchase managers, 4 quality managers and 2 production managers. In addition, the questionnaire was answered by quality managers of 12 external supplier companies. External companies were divided in 6 IKID suppliers and 6 not related IKID can be considered as benchmarks. In order to avert confidentiality affairs interviewees are called as M1, M2, etc. It should be mentioned that M1 to M8 are IKIDs managers but M9 to M16 are each owned by one different company.

Furthermore, all cases were asked whether they are ISO14001 certificated or not. This certification determines the commitment of companies toward environmental policy.

Achieving the best environmental supply chain management practices is the significant aim of this research. Hence, various and different perspectives can be beneficial to determine this goal.

4.3 Type of Questionnaires

In this research, two types of questions; binary (0 or 1), and Likert type scale (range 1-none to 5-very high) were considered. Factual questions were patterned in Binary form, personal approach were patterned in Likert Type form. In addition, relation between variables in the conceptual model is defined by selected questions.

Questions are driven from different sources which all of them are listed in the table of questionnaire.

The questionnaire includes 2 sections: independent variables and barriers.

The first section contains:

Questions 1 to 4 include general information about company, environmental policy and ISO14001 certificate which can be a good attitude about companies and how the companies participate in the field of environment protection.

Questions 5 to 9 are designed to look for the importance of selection's role of supply chain with regard to waste reduction and efficient use of natural resources. In addition questions 10 to 13 evaluate to what extent evaluate can be involved in waste

reduction and whether the feedback request can play positive role to decreasing waste or not. Morever, to what extent the evaluation of the supply chain can keep a positive role in reducing waste and if yes, to how much this approach can be effective.

Consequently, questions 14 to 16 pays to study those motivational methods either financial or social, how much can help on suppliers strategies toward reduce waste and to keep natural resources.

Eventually, questions 3 and 4 imply that bilateral cooperation between the company and the supply chain, i.e. dealing knowledge and technology, to what extent will help to protect the environment.

The second section consists of 3 types of barriers; behavioral, structural and economic. These barriers may create problems which can restrict environmental practices.

The first type (behavioral barriers) are investigated by questions 1 to 4 which ask involvement in commitment, awareness and training for personnel in various field, to what extent can impact on waste reduction. Furthermore, regarding to barrier questions, managers who work in the IKID only answered the first type of barriers which are related to behavioral barriers.

The second type of barrier (structural barriers) are considered by questions 5 to 7 which assesses the structure of the company and the effect of environmental policy priority on waste prevention.

Finally, the importance of reducing cost and the effect of reducing losses in factories are assessed by questions 8 to 10, which are further related to barrier type III.

Since, managers are generally aware of all issues in companies hence, questionnaire is only distributed among managers of each company.

The questionnaire aims to effect which type of ESMP can motivate suppliers to endorse waste prevention policies.

IKID Interview was provided by e-mail including a brief introduction on the research and questionnaire. In addition suppliers' interview was approached by both email and phone.

It should be noted that questions 8, 9, 12, 13, 16 and 18 were answered only by suppliers.

Definition of independent variables and barriers are listed in Table 1.

Table 1: Definitions of constructs

Construct	Definition
Supplier selection	The search for, assessment of and decision to contract potential suppliers based upon requirements that incorporate environmental concerns and thus manage supply chain risks and supply-base continuity.
Supplier evaluation	The processes of assessing a supplier's performance on environmental criteria in order to compare it across the supply base, reduce risks and inefficiencies, and investigate points of improvement.
Supply incentives	Rewards to proper environmental performance of suppliers in the form of increased (future) business or preferred status.
Supplier development	Strategic efforts focused on relationship-building with suppliers such as collaboration on intra- and inter-organization processes, supplier involvement and education with the aim of long-term supply chain improvement.
Structural barriers	The lack of resources, procedures, policies or strategies with respect to ESM that impose a barrier to implementation.
Economic barriers	The (perceived) additional costs or lower profits with respect to ESM that impose a barrier to implementation.
Best practice	An ESM practice in use that is deemed better than all other practices used elsewhere.
Waste prevention policies	Practices that are part of a sustainable and integrated strategy that underscores continuous improvement and aims to avoid waste and the generation thereof by employing a resource-efficient attitude to products and processes within the chain.

4.4 Conceptual model

The conceptual model was arranged based on the need of IKID and statement of (Meredith, 1993).

The conceptual model implies the dependent variable (approval of waste prevention policies at the supply chain) and the independent variables contain: four environmental supply management practices; selection, evaluation, supply incentives and supplier development. In addition, Behavioral, structural and economic are

considered as barriers beside ESMPs. Presumed relationship between ESMP, barriers and dependent variable is shown with the arrows in figure 3.

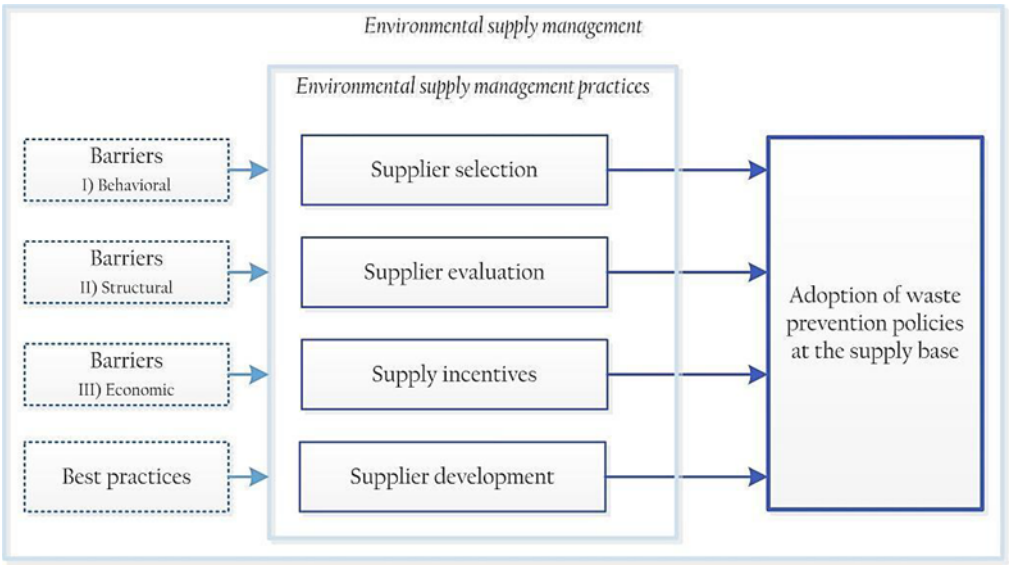

Figure 3: Conceptual model (Berdien, 2014)

A positive outlook is expected by supply selection practice. According to (Carter, 1998) ESMP is illustrated to have a positive influence in terms of corporation with suppliers in projects that are related to environment. Furthermore, waste reduction is gained by supplier evaluation(Simpson & Power, 2005) Since, supplier evaluation plays a controlling role; positive influence on waste management is expected(Lamming & Hampson, 1996; Simpson & Power, 2005). Accordingly, essentialness of these speculations considered as followed:

H1: determination of Supplier selection on natural criteria is liable to instigate suppliers from waste aversion approaches at the supply base.

H2: determination of Supplier evaluation on natural criteria is liable to instigate suppliers from waste aversion approaches at the supply base.

Alongside the supply determination and assessment, suppliers are persuaded by motivations. In order to motivate suppliers, Supply incentives are allocated some rewards as follow:

a) Deliberation of prospective business;

b) Large amount of the present item and;

c) encouraging supplier condition by prize (Krause & Scannell, 2002).

Supplier development also is considered as an incentive for suppliers. Supplier development is scoped to include collaboration, progress of the supplier and training (Hoejmose & Adrien-Kirby, 2012).

The collaboration and relation is considered positive impact on waste reduction and strength of supplier relationships can improve the supply chain (Krause et al., 2000).

Hypotheses related to practices are mentioned are as follows:

H3: determination of Supplier incentives on natural criteria is liable to instigate suppliers from aversion approaches at the supply base.

H4: determination of Supplier development on natural criteria is liable to instigate suppliers in order to waste aversion approaches at the supply base.

Environmental supply chain practices can be confronted by barriers in this case, suppliers outlook has a critical part (Hamner, 2006). Low level of recognition, redesign and observation in natural exercises might be lead to low adaption in firms. Moreover, the perspective that the high expenses connected with ESMP can prompt mistaken.

adaption of this practices by fundamental organization and suppliers (Barari et al., 2012). Therefore, three forms of barriers are considered as follows:

H5: Behavioral (type 1) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

H6: Structural (type 2) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

H7: Economic (type 3) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

In order to test hypotheses 1 to 7, the method used by (Berdien, 2014) which is based on Dul and Hak (2007) study was considered. This method is guided by the accompanying following principles and overall scores are calculated by following formulas.

Independent variables (selection, evaluation, incentives and development) are assumed to be a positive approach for ESMP. The overall score related to these variables are determined as follows:

$$\text{Overall score of independent variables} = \frac{Cases\ which\ are\ ranked\ greater\ than\ or\ equal\ to\ 3}{all\ of\ the\ cases} \quad (1)$$

On the other hand, as barriers are assumed to have a negative impact on ESMP, for each barrier, the overall score is determined by formula (2).

$$\text{Overall score for barriers} = \frac{\text{Cases which are ranked less than or equal to 3}}{\text{all of the cases}} \quad (2)$$

By using these two formulas mentioned above, we can determine whether the hypotheses are confirmed or not.

In order to determine whether hypotheses 1 to 4 are corrected or not and based on the overall score for each variable related to its own hypothesis must be greater than or equal to 75% (Berdien, 2014). On the contrary of first four hypotheses, hypotheses 5, 6 and 7 would be accepted when the overall score related to each barrier are greater than or equal to 37.5%.

In order to determine the difference of opinion between related and unrelated suppliers this study tests the significant difference of each level of the dependent variables in four sections of selection, evaluation, incentive and development.

Supplementary, finding the most effective practice among different environmental supply chain practices and discover that how the practice are affected by barriers, are main aims of this research. According to Dul and Hak (2007) best practice is “a practice in use that is deemed better than all other practices used elsewhere”.

Consequently, since the questionnaire is distributed to two kinds of suppliers which currently have business with IKID and don't have business with IKID therefor the difference of opinion between both kinds of suppliers is tested in this research.

Hence, four types of hypotheses are assessed as follow:

H8: There is a significant difference of opinion between related and unrelated suppliers in supplier selection practice.

H9: There is a significant difference of opinion between related and unrelated suppliers in supplier evaluation practice.

H10: There is a significant difference of opinion between related and unrelated suppliers in suppliers in supplier incentive practice.

H11: There is a significant difference of opinion between related and unrelated suppliers in supplier development practice.

Independent variable is the relation of the suppliers with IKID which contains two level of related and unrelated. The dependent variable is the average of answers given by 6 related suppliers and 6 unrelated suppliers.

In order to test the hypotheses 8 to 12, SPSS software is used for applying the test of one way ANOVA and its related assumptions.

In one hand, Likert-type scale questionnaires belong to categorical data. On the other hand, one of the assumptions of ANOVA test is that the dependent variable data must be normally distributed. Consequently, categorical data are descriptive and using ANOVA is not appropriate for testing above hypotheses. But according to central limit theorem average of samples which taken from any distrubiution, is normally distributed (Fischer, 2010). Thus it is appropriate to use ANOVA for average of answers given by related and unrelated suppliers for each section of selection, evaluation, incentive or developement.

One of the assumptions for one way ANOVA is the equality of the standard deviations of the treatment for each independent variable. In order to test this assumption, Levene statistic test was constructed by using SPSS. If the P-value of this test is less than or equal to 0.05, it shows that the assumption of the homogeneity of the variances is not satisfied. In this case one way ANOVA is not the accurate test to use. Therefore, the judgment of the hypothesis must be based on Welch or Brown-Forsythe tests, which are robust and not sensitive to homogeneity of the variances.

Chapter 5

RESULTS

In this research data analysis is performed in five stages;

1. Analysis of the responses of managers who work in IKID.

2. Managers who work in the suppliers company.

3. Analysis of responses of both related and unrelated suppliers.

4. Comparison of responses of related and unrelated suppliers with each other.

In the first stage, the answers of managers of IKID are analyzed; hence interviews were performed only in IKID.

In the second stage the answers of both related and unrelated suppliers are analyzed.

Third, the results of stage 1 and stage 2 are compared with each other.

Table 1: Mindset of Managers 1 to 8

Questions	M1	M2	M3	M4	M5	M6	M7	M8
Company 1. Does your company have an environmental policy?	1	1	1	1	1	1	1	1
2. To what extend do you consider the environmental policy to be proactive?	4	4	4	4	2	3	2	4
3. To what degree is waste prevention a priority within the environmental policy?	5	4	4	5	1	4	1	3
4. Is your company ISO14001 certified?	1	1	1	1	1	1	1	1

Table 2 contains questions related to the company's strategy on waste and its importance for the firms in terms of environment as well as the ISO14001 certificate.

5.1 Analysis of Answer of IKIDs managers

Accomplishing a general viewpoint among interior and suppliers managers as benchmarks is the most essential point of this part. Also, round of questioning of inward and suppliers managers are assessed.

Table 3 exhibits the final scores of the IKIDs manager's respondents. It is also the best performance from the perspective of managers 1 to 8. After answering the questions by the managers, average rank of each manager is calculated for each independent variable. Then x is allocated as an independent variable for the highest average or best practice in view point of each manager. In cases where the highest average is repeated in several places, x is divided by the number of rank replication.

In other words, table 3 shows the quantity of managers which their ranks in particular ESMP are higher or similarly to midpoint of scale. The highest number and rate of managers that score ideal ESMP are displayed in the last column. In cases where rank is repeated in several places, X is divided by the number of rank replication.

Table 2: Final scores of ESMP for IKIDs managers

Question	M1	M2	M3	M4	M5	M6	M7	M8
Selection								
5	4	4	5	5	3	3	3	5
6	3	4	5	5	3	3	3	4
7	4	4	2	4	3	3	3	4
Average	3.6	4	4	4.6	3	3	3	4.3
Evaluation								
8	3	3	4	4	3	4	3	4
9	3	4	4	5	2	4	2	4
Average	3	3.5	4	4.5	2.5	4	2.5	4
Incentive								
10	4	4	5	4	4	4	4	4
11	4	4	5	4	4	4	4	4
Average	4	4	5	4	4	4	4	4
Development								
12	4	4	5	4	2	3	2	4
Average	4	4	5	4	2	3	2	4
Best practice								
Selection		*1/3x*		*x*				*x*
Evaluation						*1/2x*		
Incentive	*1/2x*	*1/3x*	*1/2x*		*x*	*1/2x*	*x*	
Development	*1/2x*	*1/3x*	*1/2x*					

Table 3: Final scores of barrier typeI for IKID managers

Barrier questions	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
Barrier type I								
13. To what degree do you perceive (higher) management to be committed to waste prevention?	4	3	4	3	1	2	1	4
14. To what extent are the purchasing personnel aware of the environmental impacts of purchased supplies?	5	5	5	5	5	4	5	5
15. Is training of personnel seen as important?	5	4	5	3	4	4	4	4
16. To what extent do you experience awareness of suppliers on the environmental impact of their products?	4	3	4	3	2	4	2	3
Average	4.5	3.7	4.5	1.5	3	3.5	3	4

Table 5 first exhibits the singular average score for each manager on the diverse ESMP and in addition the behavioral barrier. Also, demonstrates what number of managers scored a particular ESMP at the mid-purpose of the scale or higher for independent variables and less or equal to midpoint for the barrier and the last line shows the number and rate of managers that rate a particular ESMP as ideal which are determined by following formula:

$$\text{(ESMP) (\%) | >=3} = \frac{number\ of\ managers\ that\ scored\ greater\ than\ or\ equal\ to\ 3 for\ each\ question}{number\ of\ inside\ managers} \quad (3)$$

$$\text{(Barriers) (\%) | <=3} = \frac{number\ of\ managers\ that\ scored\ less\ than\ or\ equal\ to\ 3 for\ each\ question}{number\ of\ inside\ managers} \quad (4)$$

$$\text{Num. of manager's 1st score} = \sum x \quad \text{for each best practice in table 4} \quad (5)$$

(%). of manager's score = $\frac{Num.of\ manager's\ 1st\ score}{Number\ of\ inside\ managers}$ (6)

Table 4: Inside cases singular average scores per respondent and preferences

Managers	**ESMP**				**Barriers**
	selection	*Evaluation*	*Incentive*	*Development*	*Type I*
M1	3.6	3.0	4.0	4.0	4.5
M2	4.0	3.5	4.0	4.0	3.7
M3	4.0	4.0	5.0	5.0	4.5
M4	4.6	4.5	4.0	4.0	1.5
M5	3.0	2.5	4.0	2.0	3
M6	3.0	4.0	4.0	3.0	3.5
M7	3.0	2.5	4.0	2.0	3
M8	4.3	4.0	4.0	4.0	5
(%) | >=3 (ESMP)	100	75	100	75	37.5
(%) | =<3 (Barriers)					
Num. of manager's 1st score	2.3 (29%)	0.5(6%)	3.8(47%)	1.3 (16%)	n/a

In tables, based on (Berdien, 2014) more than 75% expresses the primarily positive perspective purpose of interior cases. Supplier incentives with the most elevated score (47%) and after that supplier selection with 29% score is seen as essential driving for appropriation with waste avoidance. While rank of both development and evaluation are second place, development is marginally favored (16%).

Supplier incentives with the highest score are characterized by considering honors, awards, more noteworthy measure of present items and future business which should have a positive effect.

IKID already permits to some of its principal and indispensable suppliers to utilize brand of IKID as an honor. However some of managers would say that budgetary motivations shouldn't be given to suppliers. Besides, in perspective purpose of the majority of managers (62.5%) behavioral barriers don't assume an essential part in waste counteractive action.

According to M5 who reacted with negative answers "everything that lead to waste reduction is not necessary and concentrating specifically on productivity is constantly superior to anything waste decrease".

5.2 Analysis of Answer of the Supplier's managers

Scores of every outside manager are introduced at table 6. Besides, 3 types of barriers include behavioral (Type I), structural (Type II) and economic (Type III) are considered in table 7. Contribution between IKID and its suppliers (M9, M10, M11, M12, M13and M14) compared to cases which are not suppliers of IKID can be biased to certain practice. Hence, it is worth mentioning that reaction of outer managers can be varying as a result of the business association with IKID.

Table 6 shows the final scores which are responded by outside managers.

Table 5: Final scores of independent variables for supplier managers

Question	M 9	M 10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20
Selection												
5	4	3	2	4	2	5	5	4	4	5	4	4
6	4	3	4	4	3	2	5	3	3	4		3
7	4	2	2	4	2	3	5	4	4	5	4	4
8	3	2	3	3	3	4	4	5	4	5	5	5
9	3	3	2	3	2	3	5	4	3	4	5	4
Average	3.6	2.6	2.6	3.6	2.4	3.4	4.8	4.0	3.6	4.6	4.5	4.0
Evaluation												
10	5	3	4	4	4	5	5	4	4	4	4	3
11	4	4	4	4	3	4	5	3	3	1	3	2
12	4	3	5	3	5	2	5	2	3	3	4	4
13	5	4	4	5	5	3	4	4	4	2	3	2
Average	4.5	3.5	4.3	4.0	4.3	3.5	4.8	3.3	3.5	2.5	3.5	2.8
Incentive												
14	4	4	4	4	4	4	5	4	4	2	3	2
15	4	4	4	4	3	4	4	3	4	3	3	2
16	5	4	5	5	5	5	2	3	3	1	2	1
Average	4.3	4.0	4.3	4.3	4.0	4.3	3.7	3.3	3.7	2.0	2.7	1.7
Development												
17	4	3	3	4	4	5	3	4	3	5	4	5
18	3	5	5	3	5	4	4	3	4	4	3	4
Average	3.5	4.0	4.0	3.5	4.5	4.5	3.5	3.5	3.5	4.5	3.5	4.5

Best practice	***Total average***											
Selection							*1/2 x*	*X*		*x*	*x*	
Evaluation	*x*		*1/2x*				*1/2 x*					
Incentive		*1/2x*	*1/2x*	*x*					*x*			
Development		*1/2x*			*x*	*x*						*x*

Moreover, table 6 illustrates the quantity of managers which their ranks in particular ESMP are higher or similarly to midpoint of scale. What's more the number and rate of managers that score ideal ESMP are displayed in the last column. In situations where rank is repeated in several places, X is divided by the number of rank replication.

All explanation was said about independent variables is true about barriers with the exception that rank of particular barrier are less or similarly to midpoint of scales shown in table 7.

Table 6: Table3 Final scores of barriers for suppliers managers

Barrier questions	M9	M10	M11	M12	M15	M16	M17	M18
Barrier type I								
13. To what degree do you perceive (higher) management to be committed to waste prevention?	5	3	4	4	4	3	4	5
14. To what extent are the purchasing personnel aware of the environmental impacts of purchased supplies?	2	2	2	2	2	2	2	4
15. Is training of personnel seen as important?	5	5	5	4	4	3	5	5
16. To what extent do you experience awareness of suppliers on the environmental impact of their products?	3	4	4	4	3	3	3	4
Average	3.7	3.5	3.7	4.5	3.2	3.6	3.5	4.5
Barrier type II								
17. To what extent do you consider the environmental policy to be proactive?	4	3	3	4	3	3	3	4
18. To what degree is waste prevention a priority within the environmental policy?	4	2	2	4	4	4	3	5
19. To what extent have processes been redesigned to reduce waste?	3	4	4	4	3	3	3	4
Average	3.6	3	3	4	3.6	3.3	3	4.3
Barrier type III								
20. To what extent do you (expect to) face lower costs?	4	4	4	3	4	4	1	3
21. To what extent do you (expect to) reduce the amount of waste?	4	2	2	4	4	4	3	4
22. To what extent do you (expect to) reduce the cost of purchasing?	4	3	3	2	5	3	1	3
Average	4	3	3	3	4.6	3.6	1.6	3.3
Largest barrier	***Total average***							
Type I: behavioral					*X*			
Type II: structural	*X*	*1/2X*	*1/2X*			*X*		
Type III: economic			*1/2X*	*1/2X*	*X*			*X*
X								

Table 7: Singular average scores per respondent and preferences related to supplier managers

Cases	ESMP				Barriers		
	selection	*Evaluation*	*Incentive*	*Development*	*Type I*	*Type II*	*Type III*
C 9	3.6	4.5	4.3	3.5	3.7	3.6	4
C 10	2.6	3.5	4.0	4.0	3.5	3	3
C 11	2.6	4.3	4.3	4.0	3.7	3	3
C 12	3.6	4.0	4.3	3.5	4.5	4	3
C 13	2.4	4.3	4.0	4.5			
C 14	3.4	3.5	4.3	4.5			
C 15	4.8	4.8	3.7	3.5	3.2	3.6	4.6
C 16	4.0	3.3	3.3	3.5	3.6	3.3	3.6
C 17	3.6	3.5	3.7	3.5	3.5	3	1.6
C 18	4.6	2.5	2.0	4.5	4.5	4.3	3.3
C 19	4.5	3.5	2.7	3.5			
C 20	4.0	2.8	1.7	4.5			
| >=3 (ESMP) (%) | =<3 (Barriers)	75	83	75	100	0	37.5	50
Num. of case 1st score	3.5 (29%)	2(17%)	3(25%)	3.5 (29%)	1(12.5%)	3(37.5%)	4(50%)

As indicated in table 8 by calculation of scores by formula (3) for independent variables and (4) for barriers identified with supplier managers all ESMP are recognized to play no less than a middle of the road part in instigating waste anticipation by the outside managers (scores≥3). In addition number of 1st score for both independent variables and barriers is determined by formulas (5) and (6).

According to table 8, highest rank is belonged to supplier development with almost all of votes and followed by evaluation. As it is shown in table 5, generally achievable results are better based on rank of M9 to M14 who tend towards evaluation which may be identified with the way that are suppliers of IKID and are interested to reply for coordinated effort. However outer managers have wide thoughts regarding the impact of supplier motivating force, the minimum elevated rank is had a place with supplier incentives. The majority of managers believe that the motivation ought to be inherent not extraneous.

As it can be seen M10, M11 and M13 have considered the minimum ranked for supplier selection and this fact that M10, M11 and M13 are IKID's suppliers may be effective on their opinions and powerful on conclusion.

Nevertheless, all organizations as of now have the compulsory system for example, ISO 9001, methodology for assessing suppliers, preparing of staff individuals and redesign technique for inside procedures.in addition all companies know about the advantage of waste counteractive action and assesment of suppliers. however around half of these cases are worried about higher expenses emerging from usage of enviromental practices. Subsequently, monetary hindrances are the most noteworthy deterrents (50%).

Overall, according to table 9 both IKID managers and supplier managers show up close responds. The distinction is that IKIDs managers are more positive about selection and incentives in comparison with supplier mangers that emphasize on supplier development. Nevertheless rank of selection and incentives IKIDs managers are equal and set as the highest (100%) and then at the same time rank of selection and incentives are again equal and set as lowest (75%). Subsequently supplier managers believe that economic barriers are considered as the most significant obstacle in ESMP practice.

Table 8: Comparisons of answer of IKID managers and supplier managers

	Internal respondents		External respondents	
ESMP	**#cases 1st score**	**%>=3**	**#cases 1st score**	**%>=3**
Supplier selection	2.33|29%	100	3.5|29	75
Supplier evaluation	0.5|6.2%	75	2.|17	83
Supplier incentives	3.83|47%	100	3|25	75
Supplier development	1.33|16.6%	75	3.5|29	100
Barriers	**#cases low score**	**% =<3**	**#cases low score**	**%=<3**
Type I	n/a	37.5	1|12.5%	0
Type II	n/a	n/a	3|37.5%	37.5
Type III	n/a	n/a	4|50%	50

5.3 Analysis of Finding

Accomplishing answer of the primary examination question taking into account the connection between dependent and independent variables is the point of interpretation of discoveries which are accomplished under practice in IKID. Besides, the hypotheses were prepared with a specific end goal to discovering the connection among theoretical model's contraction taking into account the new hypothesis (Carter & Rogers, 2008).

The analysis is led by taking after principles. To start with, natural store network practice are considered as a positive usage when similarly or more than 75% of managers rank more than midpoint of scale (>=3). It implies that no less than 15 managers must esteem to ESMP for achieving that planned practice have assumed positive part. Picking this rate is emerging from confirmation bias that some of managers may seem more positive in view of their business connection they have with IKID.

Second, execution of barriers is considered as a negative part inside ESMP with respect to waste counteractive action suspicion when no less than 37.5% of managers assigned not as much as midpoint scale (=< 3). Also some of cases in order to seem positive may be underestimate barriers. Hence, this percentage is selected.

The following table presents the average of percentages and constructs scores on desire.

Table 9: Average of percentages and practice scores

Construct	**IKID managers** **%>=3** **#cases 1st score**		**Supplier managers** **%>=3** **#cases 1st score**		**Overall score %>=3** **#cases 1st score**	
selection	2.33|29%	100	3.5|29%	75	29%	85
evaluation	0.5|6.2%	75	2.|17%	83	11.6%	80
incentives	3.83|47%	100	3|25%	75	36%	85
development	1.33|16.6%	75	2.25|28%	100	22.3%	90
Barriers	**#cases low score**	**%=<3**	**#cases low score**	**%=<3**	**#cases lows core**	**%=<3**
Type I	n/a	37.5	1|12.5%	0	12.5%	18.75
Type II	n/a	n/a	3|37.5%	0	37.5%	37.5
Type III	n/a	n/a	4|50%	12.5	50%	50

5.4 Hypothesis Testing Results

According to research questions which are presented in conceptual model, ESMPs are estimated by relation between respondents answer based on academic framework and answering following hypothesis.

H1: determination of Supplier selection on natural criteria is liable to instigate suppliers from waste aversion approaches at the supply base.

The majority of the managers recognize that impact of supplier selection can be sure toward system of waste aversion in car manufacturing enterprises (85 %).

Effect of supplier choice to advance their sustainability on waste anticipation and natural criteria is accepted (Wolf, 2011). Moreover greater part of managers express that reliability, cost and quality are the components ought to be met in determination of suppliers. Also these specified components are just as, issue of the better arrangement as far as waste administration ought to be given priority.

In opinion of several cases ISO9001 should be one of the significant requirements for selection of suppliers. In spite, some of managers trust that selecting suppliers based ISO9001 doesn't have constructive outcome when suppliers don't think of it as in light of budgetary or duty reasons.

Somewhere else M9 express that hopes to have ecological criteria's is unrealistic when supply base get to be restricted. In addition M15 believe that selection of suppliers straightforwardly identify with sort of items.

Eventually based on score of selection practices additionally the conclusion of cases H1 is acknowledged and taking after explanation depict the connection between supplier choices and dependent variable.

S1: Supplier selection plays a positive, however restricted part contrasted with all ESMP in the selection of waste avoidance approaches by the supply base.

H2: determination of Supplier evaluation on natural criteria is liable to instigate suppliers from waste aversion approaches at the supply base.

Evaluation of suppliers is also declared to have at least intermediate effect by most of the managers. Hence, evaluation can play a positive role to adoption of waste prevention in terms of supply base.

According to manager's statement, operational factors like delivery time, reliability, operational, number of incident or defective products and logistical measures are evaluated.

In addition 80% of managers believe that evaluation practice can be optimal in order to waste prevention.

As mentioned in selection part, some of managers express that the impacts of assessment practice rely on upon budgetary issues.

In this way M5, M7 and M18 express that control of assessment is troublesome, exorbitant and costly.

Besides some of managers remark the benefit which are arising from evaluation and the emphasize that orientation of other potential markets will be simpler for suppliers. Consequently it reasons to effective competitive for suppliers.

Elsewhere M12 express that evaluation can lead to increase environmental performance of suppliers. Also business opportunity can be gained by this practice.

According to statements and the rank of cases the ultimate statement related to evaluating is clarified as follow:

S2: Supplier evaluation assumes a positive part contrasted with all ESMP in the adoption of waste avoidance approaches by the supply base.

H3: determination of Supplier incentives on natural criteria is liable to instigate suppliers from aversion approaches at the supply base.

Supplier incentives devoted 17 instances of 20 managers (more than 75%), which indicate incentives play an efficient and positive role. Nevertheless M16 believes that incentive should be inborn. Although most of managers emphasize that incentives may be inspired by distinction of culture. The effect of incentives will be closed as follows:

S3: incentives play a positive, with all ESMPs in the adoption of waste anticipation approaches by the supply base.

H4: determination of Supplier development on natural criteria is liable to instigate suppliers in order to waste aversion approaches at the supply base.

Supplier development devoted the most elevated score among all Environmental Supply Chain Management Practices with 18 instances of 20 managers, which indicate development play an efficient and positive role. On the other hand this practice is preferred compared to evaluation, incentive and selection.

Moreover supplier development with 90% of managers states effect of higher than middle of the road level which implies it is more than edge esteems (75%). Hence H4 confirmed.

According view point of M20 supplier development is aiding and instructing both firms and suppliers one another by trade of their mastery and learning. On the other hand in terms of economic, this procedure can prompt money related advantages, for example, less measure of waste, packaging, discharges. In addition reducing cost will be achieved along supply chain and it can create awareness for suppliers in order to enhance their execution. Subsequently, based up on findings H4 is accepted and the following statement is expressed.

S4: supplier development assumes a positive part contrasted with all ESMP in the appropriation of waste aversion arrangements by the supply base.

H5: Behavioral (type 1) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

Only 12.5% shows a score less than the middle of the scale for behavioral barriers, it means that most of the managers determine minimum level of pro-environment attitude in the organization of managers. Considering the score of ESMP which is less than threshold point, it can't have strong influence on dependent variable. Hence H5 is rejected.

H6: Structural (type 2) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

Structural barriers are rated exactly on the edge value (37.5%). Consequently as indicated by principle of analysis the ESMP has negative impact on basic barriers, therefore H6 is rejected.

Considering the elements and their scores which were seen in behavioral and structural barriers, some general result can be implied.

Initial, three managers comment that the commitment of administrations can be considered as an approach that conveys financial advantages. Also two cases express that incorporating behavioral and basic components along inventory network build responsibility of administrators and representatives to waste aversion.

Second, majority of managers state that state that setting up a proficient arrangement for purchasing with respect to ecological and environmental strategy can impact waste aversion. In addition security objectives for example ISO14001 can improve the system.

Besides, some of managers stress on updating and redesigning process along inventory network administration process.

Third, a large proportion of managers demonstrate that the significance level of environmental criteria through work force is relied upon to medium sustainable operation taken at supply chain. Hence tasks and training of personnel can be effective policy and successful arrangement on waste avoidance.

H7: Economic (type 3) barriers are liable to adversely affect the reception of waste avoidance strategies at the supply base.

Barriers which are associated with costs set as highest and most significant negative influence on the adoption of waste prevention with 50% score of the cases. Hence H7 is confirmed.

Main focus of managers is actually on lessening costs and general cost level. In view point of several managers cost of performance of waste prevention was mentioned as a barrier Costs. Still some cases specify that costs will steady against benefit, so waste is also a cost. Furthermore, large amount of cases believe that any efforts about environmental shouldn’t increase costs.

Research question: What are the best practices in affecting the supply base to embrace waste counteractive action strategies?

Related to ESMP practices, M15 ranked the questions in the most positive structure. This case mostly focused on the Development part of the questionnaire. There for the

best practices in affecting the supply base to embrace waste counteractive action strategies is Development. It is good to mention that M15 was related to Saipa Yadak Company. This company is also an automotive industry and has a close competition with IKID in Iran. In addition, the best practice qualities the consideration of ecological worries into its inventory network administration to the improvement of procurement policy. This manager corresponds as often as possible with its suppliers and guarantees a consistent dialog for information trade and observation. The best practice has actualized the ISO14001 standard and is included in consistent change programs. Moreover, no motivations are utilized; despite the fact that this case trusts that it can have an effect. These specific factors may have been the key elements to induce the sustainable supply management practice in the company.

At first a descriptive has been taken from the input data. Table 11 demonstrates some descriptive statistics such as mean, standard deviation, confidence interval and etc.

Table 10: Descriptive statistics

				95% Confidence interval			
	n	Mean	SD	Lower bound	Upper bound	Minimum	Maximum
Selection							
Related suppliers	6	3.03	0.56	2.45	3.62	2.40	3.60
Unrelated suppliers	6	4.25	0.45	3.77	4.73	3.60	4.80
Total	12	3.64	0.80	3.13	4.15	2.40	4.80
Evaluation							
Related suppliers	6	4.00	0.42	3.56	4.44	3.50	4.50
Unrelated suppliers	6	3.37	0.79	2.55	4.20	2.50	4.75
Total	12	3.69	0.68	3.25	4.12	2.50	4.75
Incentive							
Related suppliers	6	4.22	0.17	4.04	4.40	4.00	4.33
Unrelated suppliers	6	2.83	0.86	1.93	3.74	1.67	3.67
Total	12	3.53	0.94	2.93	4.12	1.67	4.33
Development							
Related suppliers	6	4.00	0.45	3.53	4.47	3.50	4.50
Unrelated suppliers	6	3.83	0.52	3.29	4.38	3.50	4.50
Total	12	3.92	0.47	3.62	4.21	3.50	4.50

One of the assumptions for one way ANOVA is the equality of the standard deviations of the treatment for each independent variable. In order to test this assumption, Levene statistic test was utilized. Table 12 illustrates the outcome of the homogeneity of the variables. If the P-value of this test is less than or equal to 0.05, it shows that the assumption of the homogeneity of the variances is not satisfied. Hence one way ANOVA is not the accurate test to use. Therefore, the judgment of the Hypothesis must be based on welch or Brown-Forsythe tests were constructed.

Table 11: Outcome of the homogeneity of the variables

	Levene statistic	df1	df2	P-value
selection	1.976	1	10	0.190
incentive	16.233	1	10	0.002
evaluation	0.845	1	10	0.380
development	0.769	1	10	0.401

As table 12 shows, incentive has the P-value of 0.002 which is less than 0.05; therefore, for testing the hypothesis 10 welch or Brown-Forsythe test are the appropriate for judgment.

Null hypothesis for the selection, evaluation, incentive and development variables are:

(i) There is no significant difference between the related and unrelated supplier's opinion in selection, evaluation and incentive and development part of the questionnaire.

(ii) Results of one way ANOVA has been gathered for the selection, evaluation and development in table 13.

Table 12: Results of one way ANOVA

	Sum of squares	Df	Mean square	F-statistic	P-value
Selection					
Treatment	4.441	1	4.441	17.157	0.002
Error	2.588	10	0.259		
Total	7.029	11			
Evaluation					
Treatment	1.172	1	1.172	2.953	0.116
Error	3.969	10	0.397		
Total	5.141	11			
Development					
Treatment	0.083	1	0.083	0.357	0.563
Error	2.333	10	0.233		
Total	2.417	11			

Table 14, shows the Welch and Brown-Forsythe test results related to Incentive variable.

Table 13: Brown-Forsythe test results related to Incentive variable

	Statistic	Df 1	Df 2	P-value
Incentive				
Welch	14.952	1	5.397	.010
Brown-Forsythe	14.952	1	5.397	.010

Based on Tables 13 and 14 the hypothesis could be judge as follows:

Table 13 shows a significant different in Selection part. Therefore null hypothesis is rejected and it can be conclude that there is a significant difference of opinion between related and unrelated suppliers in selection part of the questionnaire (P-value = 0.002).

On the other hand, based on the same table, the null-hypothesis related to Evaluation and Development part of the questionnaire can are failed to reject and therefore there

is not enough evidence to claim that there is a significant difference of opinion in Evaluation and Development part of the questionnaire (P-values > 0.05).

At the end based on table 14 the hypothesis 11, both methods result a p-value less than 0.05, therefore the null hypothesis is rejected and it can be said that there is a significant difference of opinion between related and unrelated suppliers in incentive part of the questionnaire.

As the variables have only two levels (related and unrelated) the multi-comparison test for these types cannot be applied. However, Means plots related to the significant variables has been drawn by SPSS software. Figure 4 and 5 are the means plot for the selection and incentive variables.

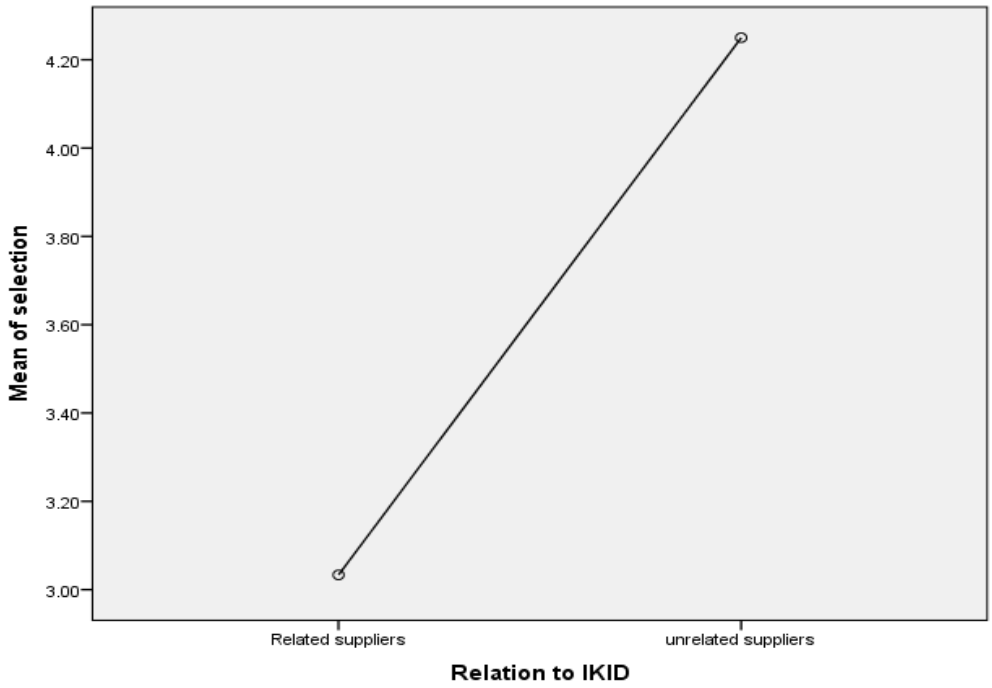

Figure 4: Means plot for selection variable

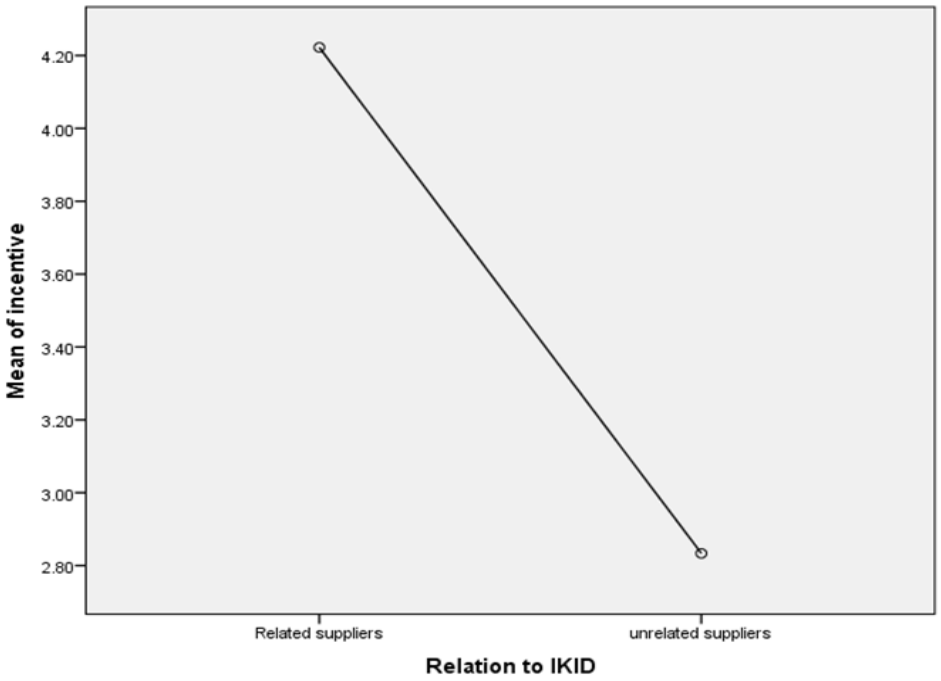

Figure 5: Means plot for incentive variable

Figures 5 and 6 illustrate that in selection part, unrelated suppliers scored higher point than related suppliers; on the other hand, regarded to incentive part related suppliers were more agreed to the questions than unrelated ones.

Chapter 6

DISCUSSION AND CONCLUSION

6.1 Discussion

Many researches related to the environment have been done in which the most of them emphasized the critical role of supply chain and the importance of accurate assessment of suppliers by companies to avoid waste and environmental protection.

(Berdien, 2014) has assessed the effect of ESMP on waste reduction at the shipyard industry. The results of this research show that supplier development in spite to supplier selection has the most effect on waste prevention.

On the other hand, (Handfield et al., 2002) represents the utilization of the Analytical Hierarchy Process (AHP) as a model to offer administrators some assistance with understanding the exchange between natural measurements. The results show that AHP by assessing suppliers can has a positive effect on environmental issues. Also, this method by study of supply chain performance can cause to preserve natural sources which are declining.

A fuzzy approach is also another way to evaluation and selection of suppliers. In this way by describing both fuzzy negative and fuzzy positive ideal solution and determining difference between FPIS and FNIS by Using the vertex method, we can reach to closeness coefficient of each alternative is described to choose the most appropriate situation of all choices (C.-T. Chen et al., 2006).

In general talking, we can infer that supplier choice might include several and diverse form of criteria, mix of distinctive choice models, cooperative choice making

and different types of instability. It is hard to locate the most ideal approach to assess and select supplier, and organizations utilize an assortment of diverse routines to manage it. In this case, in order to choose the right supplier the most critical issue is considered during the supplier choice.

6.2 Contribution of this Research

In order to contribute to the theory, in this research, an empirical test that feasibility of ESMP on environmental activity is considered in the view of multiple managers within a car manufacturing industry and its related and unrelated suppliers.

This research endorses that supplier incentives are preferred to promote waste prevention in supply chain. Conversely, supplier evaluation is seen as the lowest stimulus to promote waste prevention along supply base. Complemental to former studies related to ESMP, necessity for supplier development has expressed. Hence it should be noted that it is possible that this results be true for a particular industry.

Furthermore, in contrast with recent researches still, the old transaction methods are not substitute for proper management of resource which can leading to waste reduction. Then again, this might not be true for all industries.

Although evaluation and selection are seen as two actions that should be run together before other practices, supplier evaluation compared with selection practice is more limited.

On the other hand the selected cases rank evaluation as a more effective practice to promotion of waste prevention.

6.3 Limitations of the Research

First, due to unavailability of required resources, separation of wastes with different materials was not possible.

Second, since senior managers are more capable and more informed in comparison with other employees, they were preferred to answer the questionnaire.

In addition, sample size of this research is little because of points of limitation in time, as well as eagerness and accessibility of case respondents.

Also, a bigger or more particular specimen concentrated on the die industry is required.

6.4 Further Research

This study can be considered in various industries for instance it can be effective in prepared food industry or medical industry that delivery time and generally role of suppliers are very important. Although, this apply has already been discussed in the shipbuilding industry. Since, the industries mentioned above are primarily B2C also they are in direct contact with customers and are more responsible toward social and environmental. Hence the focus of this kind of companies is different with companies such as IKID (which is B2B).

Second, the result of the cases that have run ESMP can be compared with the result of the cases that have not implemented.

Moreover, in further research instead of only qualitative method, quantitate method or combination of qualitative and quantitate can be implied.

Also, the effect of variables could be concentrated into more noteworthy point of interest.

Subsequently, it may be significant to research whether the foundation or (force) status of corporate leaders has an impact on the likeliness that ESMPs are embraced, whether at the central company or at the suppliers.

Eventually, it could be interesting for IKID to research that whether the customers lack of attention to environmental issues can be a cause of neglect of companies in third world countries compare to development countries or not.

6.5 Conclusion

Various numbers of managers state that in order to reach sustainable supply chain system and waste prevention, ESMP has a positive impact on the upstream chain. However, some ESMP were illustrated to have a better impact than other practices.

This conclusion indicates which practice are preferred in order to motivate suppliers to waste prevention and protect environment. Also the roles of variables are explained. Subsequently, answering the general research question: How can waste prevention promote supply upstream in the car manufacturing industry.

Based on the achievements in data analysis, the conceptual model can be more accurately investigated as follows: possibility of the supplier evaluation in order to promote the appropriation of waste prevention strategies at the upstream chain is less effective than other practices as illustrated in the figure 7 in red color. Conversely, development with green color followed by incentives and selection are discovered to be fundamental or essential encouragements for suppliers.

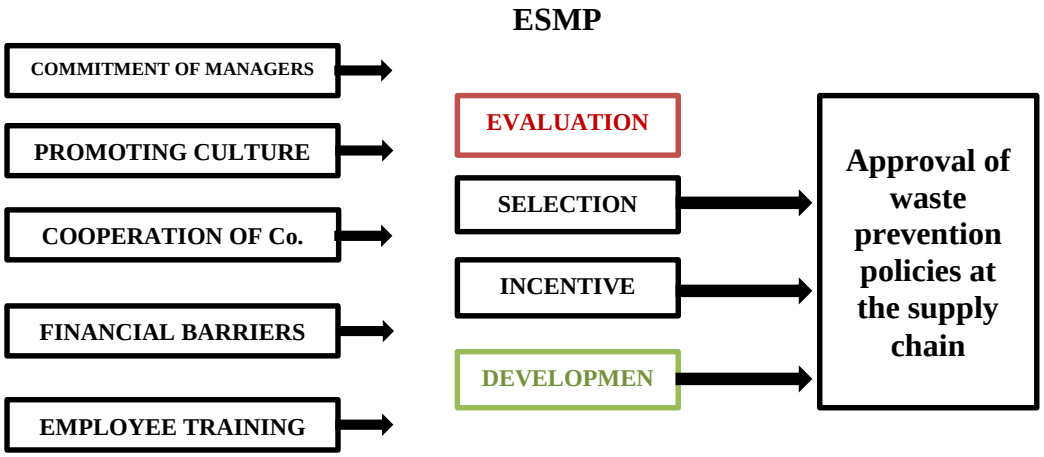

Figure 6: Modified conceptual model

It should be noted that in the view point of IKIDs managers, incentives and principally financial incentives are primarily approved for changing supplier perspective.

Generally considering environmental practices, various factors are discovered to influence of environmental supply chain practices.

One of these factors is commitment of managers to environmental issues to aim of waste prevention. In addition, commitment of head managers is highlighted as a fundamental key to effect on culture of supply management. Promoting culture in the field of supply management and awareness of managers about prevention of waste not only has a positive effect on environmental issues but also, increase net income and reduce costs.

However, cooperation of companies to implement the process of waste prevention could play a very important role.

Furthermore, regarding to development of the supply chain, there is a gap between current system and potential system that is expected to be implemented. The current exposure is based on the transaction. Whereas, supplier development is considered as a significant factor to progress environmental performance, still environmental issues are not priorities in most of companies. While large numbers of companies focused

on financial profits and lower cost and in their opinion, ESMP is looked as a cost and a limitation of run. However, association with social responsibility can promote supply chain under consideration of waste prevention.

Therefore, in order to implement proactive waste prevention along supply chain, companies have to be aware of commitment of their managers specially head managers with regard to responsibilities in field of social, economic and environmental.

Moreover, with comparison of related suppliers and unrelated suppliers and by considering the fact that P value of selection and incentive is less than 0.05 it can be concluded that there are significant differences between these two practices which association of them with ESMP should be reconsidered.

Eventually, with the integration of three factors mentioned above, the supply chain can be improved to achieve the common interest in the field of environmental.

Supplementary, suppliers should be supported by companies either in the form of training and collaboration or in the form of incentives.

As a result, a supplier incentive is found as a foundation for promoting waste prevention policy at supply chain.

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APPENDIX

Appendix A: Practice Questionnaire

Subject	Question	Type
General info (External cases)	Company: Date: Interviewee job function: Company size/Number of employee: Plant Size/Number of employee: Number of suppliers:	Open Open Open Open Open Open
Company (external cases)	1. Does your company have an environmental policy? 2. To what extend do you consider the environmental policy to be proactive? 3. To what degree is waste prevention a priority within the environmental policy? 4. Is your company ISO14001 certified?	Binary Likert-type Likert-type Binary
Selection	5. To what extent does supplier selection play a role with regards to waste prevention? 6. To what degree it is necessary to include waste prevention criteria in supplier selection? 7. To what degree should suppliers be required to have an environmental management system? 8. To what extent are suppliers asked to commit to your waste reduction goals? 9. To what degree is waste prevention important in supplier selection?	Likert-type Likert-type Likert-type Likert-type Likert-type
Evaluation	10. Supplier evaluation to have an impact on the supplier's performance? 11. Can supplier evaluation on environmental performance play a role in reducing waste?	Likert-type Likert-type
Incentives	12. Can you motivate suppliers by means of incentives to improve their environmental performance? 13. To what degree do incentives on waste prevention impact the suppliers' environmental performance?	Likert-type Likert-type
Development	14. To what extend do you believe that collaboration can engage suppliers in waste prevention?	Likert-type

Appendix B: Barrier questionnare

Subject	Question	Type
Barrier type 1 (behavioral)	1. To what degree do you perceive (higher) management to be committed to waste prevention?	Likert-type
	2. To what extent are the purchasing personnel aware of the environmental impacts of purchased supplies?	Likert-type
	3. Is training of personnel seen as important?	Likert-type
	4. To what extent do you experience awareness of suppliers on the environmental impact of their products?	Likert-type
Barrier type 2 (structural)	5. To what extent do you consider the environmental policy to be proactive?	Likert-type
	6. To what degree is waste prevention a priority within the environmental policy?	Likert-type
	7. To what extent have processes been redesigned to reduce Waste?	Likert-type
Barrier type 3 (economic)	8. To what extent do you (expect to) face lower costs?	Likert-type
	9. To what extent do you (expect to) reduce the amount of waste?	Likert-type
	10. To what extent do you (expect to) reduce the cost of purchasing?	Likert-type

Appendix C: SWOT Analysis

Strength	Weaknesses
1. Communication is stablished between the leaders of the organization, customers and stakeholders. 2. Providing products and services in all sectors in the field of technical and engineering designer and producer of dies and press parts and a set of car body. 3. There are proper systems of financial accounting software and industrial. 4. Portfolio investment in designing and manufacturing sectors, production and acquisitions been applied referendum. 5. Quality management system certification at the corporate level and the relevant international standards. 6. Design and manufacture of dies, die cast and plastic and transfer of technology from a German company. 7. There are creative people with knowledge of the company to cooperate in R & D. 8. Communication networks and hard ware required for the operations is well established. 9. Integrated software system used to perform in all areas of the company is established. 10. There are young experts with appropriate experience and young age, mostly local.	1. Low capacities of local suppliers in the supply of raw materials casting 2. MONOPOLE of Iran Khodro Industrial Group as the company's main customer. 3. There is a lack of financial resources. 4. Not taking full advantage of existing capacity in the design and manufacture of dies, press parts production and assembly. 5. The company needs to continuously improve its productivity. 6. Energy management in the company needs to further deepen. 7. Complete settlement of employee performance evaluation system. 8. The absence of a proper competency model in the company. 9. Increase staff motivation and enhance their productivity. 10. Lack of full implementation of knowledge management in the company.
Opportunities	**Threats**
1. Contracts with foreign companies and foreign cooperation. 2. Use of cheap labor and youth in the region. 3. Chance to enter the project of oil, gas and petrochemical industries, power plants, rail industry. 4. The willingness of customers to purchase dies and pieces because of suitable support and coordination. 5. Transfer of technology, design and production of dies and pieces in future projects. 6. Improve the technical knowledge of design and die making in cooperation with a German company. 7. Development of information technology and communications companies. 8. Possible use of resources, competition and bilateral contracts.	1. Growth factor prices and the resulting increase in the cost and the failure to achieve breakeven. 2. US economic sanctions and Europe. 3. Adverse effects of the implementation of targeted subsides. 4. Political instability in the region and as a result of the unwillingness of domestic and foreign investment. 5. The loss of existing customers due to declining circulation car production. 6. Reduce employee motivation factors such as inflation, no increase in salaries due to inflation, etc. 7. Away from the industry and lack of information on emerging technologies. 8. Login foreign active companies in the field of design and manufacture of dies to the Iranian market.