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Development and Analysis of Performance Measurement Indicators Utilized by Third Party Logistics Service Providers

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ABSTRACT:
Performance is important part of a company's operations as it describes how well company is fulfilling its goals. Supply chain and logistics connect the product to a consumer from the manufacturer via different actions and actors. Transportation is required from sourcing of raw material through production to the delivering of finished products to end users, as also seen in reverse logistics. This thesis combines these two aspects related to performance and its measurement in third-party logistics transportations.

Performance and its measurement have been researched a lot but most of the time research are related to financial point of view. Environmental performance is usually used to measure performance in green logistics. Logistics performance together with environmental performance has not been research specially in third-party logistics. The focus in this thesis is to research performance from environmental and logistics point of view and especially have third-party logistics service providers as a main research area.

Research question of this thesis is: What are the key performance indicators utilized by third-party logistics service providers in measurements? The objectives for this research question are to find out what performance indicators and key performance indicators third-party logistics service providers use in their transportations environmental and logistics measurements. In addition, objectives include to finding out why are these indicators chosen. Last objective is to develop and propose alternative solutions for performance measurement and indicators.

This research is based on qualitative interview with an open-ended questionnaire as the data collection method. The interview has been built around theoretical framework what has been formed from central findings of the literature review. Literature review is consisted of three parts which cover the main topics of the study which are third-party logistics service providers, performance measurement and performance indicators. The interview was conducted with one company, so the sample size is 1 as questions were answered from a company-wide perspective.

The results showed that the significance of company goals is major in performance measurement and indicators as company goals guides indicators selection. Instead importance of performance measurement system in indicators selection can be stated to be quite minor. Results also pointed out environmental performance to be highlighted in performance measurement and especially in performance indicators.

Keywords: third-party logistics, performance measurement, performance indicators

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TIIVISTELMÄ:
Suorituskyky on tärkeä osa yritysten toimintaa, sillä se kuvaa kykyä suoriutua tavoitteiden toteuttamisessa. Toimitusketju ja logistiikka yhdistävät tuotteen valmistajalta kuluttajalle eri toimijoiden ja toimintojen avulla. Kuljetuksilla on avainrooli toimitusketjussa ja logistiikassa sillä kuljetuksia tarvitaan useisiin eri toimintoihin tuotannon alusta aina tuotteen toimittamiseen loppuasiakkaalle kuin myös paluulogistiikkaan. Tämä tutkimus yhdistää nämä kaksi aspektia ja tutkii tekijöitä, jotka liittyvät suorituskykyyn ja sen mittaamiseen kolmannen osapuolen logistiikan kuljetuksissa.

Suorituskykyä ja sen mittaamista on tutkittu paljon, mutta useimmiten tutkimukset ovat olleet talouden näkökulmasta. Ympäristön suorituskyvyn mittaukset ovat yleensä kohdistuneet vihreään logistiikkaan. Logistista suorituskykyä yhdessä ympäristön suorituskyvyn kanssa ei ole tutkittu erityisesti kolmannen osapuolen logistiikassa. Tämän vuoksi tutkimuksen pääpaino on suorituskyvyn mittaaminen erityisesti ympäristön ja logistiikan näkökulmasta ja keskittyen erityisesti kolmannen osapuolen logistiikan palveluntarjoajiin.

Tämän tutkimuksen tutkimuskysymys on: Mitkä ovat tärkeimmät suorituskykyindikaattorit, joita kolmannen osapuolen logistiikkapalvelujen tarjoajat käyttävät mittauksissa? Kysymyksen tavoitteena on saada selville mitä ympäristön ja logistiikan suorituskyvyn indikaattoreita kolmannen osapuolen logistiikkapalvelujen tarjoajat käyttävät ja mitkä niistä ovat avainindikaattoreita. Lisäksi tavoitteena on selvittää, miksi nämä indikaattorit on valittu sekä tehdä kehitysehdotuksia suorituskyvyn mittaamiseen ja indikaattoreihin.

Tämä tutkimus on laadullinen tutkimus, jossa datankeräysmetodina on avoimia kysymyksiä sisältävä haastattelu. Haastattelu on rakennettu teoreettisen viitekehyksen ympärille, joka taas on muodostettu kirjallisuuskatsauksen keskeisimmistä löydöksistä. Kirjallisuuskatsaus koostuu kolmesta osasta, jotka kattavat tutkimuksen pääaiheet. Nämä osat ovat kolmannen osapuolen logistiikan palveluntarjoajat, suorituskyvyn mittaaminen ja suorituskyvyn indikaattorit. Haastattelu toteutettiin yhden yrityksen kanssa ja kysymyksiin vastasi yksi työntekijä koko yrityksen näkökulmasta, joten tutkimuksen otoskoko on 1.

Tutkimuksen tulokset osoittavat, että yrityksen tavoitteiden merkitys on suuri suorituskyvyn mittaamisessa ja indikaattoreissa, sillä nämä tavoitteet ohjaavat indikaattoreiden valintaa. Sen sijaan suorituskyvyn mittausjärjestelmien merkitys indikaattoreiden valinnassa jäi hieman epäselväksi. Lisäksi tulokset osoittivat ympäristön suorituskyvyn korostuvan suorituskyvyn mittaamisessa logistiseen suorituskykyyn nähden.

Avainsanat: kolmannen osapuolen logistiikka, suorituskyvyn mittaaminen, suorituskyvyn indikaattorit

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Abbreviations

3pl	Third-party logistics
3plsp	Third-party logistics service providers
CSR	Corporate Social Responsibility
EPM	Environmental Performance Measurement
EPMS	Environmental performance measurement system
ESL	Environmentally sustainable logistics
ESLPM	Environmentally sustainable logistics performance management
KPI	Key performance indicator
LPI	Logistics performance indicator
LSS	Lean Six Sigma

PI	Performance indicator
PMS	Performance measurement system
SCOR	Supply Chain Operation References
UN	United Nations

1 Introduction

This chapter shortly introduce main aspects of this thesis. In chapter 1.1. the background for thesis topic and purpose of this thesis are presented. Chapter 1.2. covers the identified research gap and thesis research question and its objectives. Chapter 1.3 include keywords definitions and tells how the keywords are limited in this research. Thesis structure and short descriptions of every chapter of this thesis are presented in chapter 1.4.

1.1 Background and purpose

Performance is important for companies to succeed. It is an integral part of a companies' operations as it describes the how well company is fulfilling its goals (Domingues, Reis & Macário, 2015). Thesis subject is selected based on interests but also for successful factors for business environment. Performance is reflected from effectiveness of actions and systems. Logistics and supply chain are also important parts for company as they connect the product to a customer via different actions and actors. This thesis combines these two aspects related to performance and its measurement in third-party logistics.

The aim of this research is to provide third-party logistics service providers (3plsp) a general guideline how to select their performance measurement indicators in an efficient way. By improving these indicators companies can achieve more accurate data from its action and company success. This will help them to improve their performance. Purpose of this thesis is to study performance measurement indicators and their selection from different point of views and recognize key concepts for indicators selection. Thesis will provide information about environmental and logistics performance measurement in third-party logistics (3pl) transportation activities. The purpose is to provide useful information on the selection of performance measurement indicators and the factors that has an effect to these indicators.

1.2 Research gap, question, and objectives

Performance and its measurement have been researched a lot but most of the time research are related to financial point of view. Environmental performance is usually used to measure performance in green logistics. Logistics performance together with environmental performance has not been research specially in third-party logistics. That is why the focus in this thesis is to research performance from environmental and logistics point of view and especially have third-party logistics service providers as a main research area. Environmental and logistics performance together may also support and provide information to each other and thus are also good combination to study.

This thesis focusses on transportation as very often 3pl actions are considered as a one big wholeness so previous research has focused on that. Transportation includes many different sub-areas and modes but, in this thesis, transportation is handled as a whole and received results work as a common guideline. Even though research related to logistics performance and environmental performance are available, have most of the research left out one of the most important things – How to be better? Development and analysis to find out how to perform better and choose more efficient indicators have been left out from previous studies. Based on this information one detailed research question and three objectives for that question are created for the research:

RQ: What are the key performance indicators (KPI) utilized by third-party logistics service providers in measurements?

a) What performance indicators (PI) and key performance indicators third-party logistics service providers use in their transportation's environmental measurements and logistics measurements?
b) Why are these indicators chosen? Analyse the effectiveness and efficiency of such performance indicators.

c) Develop and propose alternative solutions for performance measurement and indicators.

Hypotheses for this research are also created. First hypothesis for this research is that performance indicators selection is based on company's goals. Second hypothesis is that more value is given on environmental indicators than logistics indicators. Third hypothesis is that performance indicators are strongly guided by performance measurement system or frameworks.

1.3 Definitions and limitations

1.3.1 Third-party logistics

According to Domingues et al. (2015) logistics is important part of supply chain which ensure to get the right product into right place. Logistics is mainly linked into production sector, but it has remarkable role in other areas like in retailers' sector. It consists multiple actors and multiple activities including transport, warehousing, and customer service for example. Third-party logistics is one of the main actors of logistics. Jazairy, Lenhardt and von Haartman (2017) tell 3pl to be an actor to whom other companies have outsourced their logistics activities which are usually related to warehousing, distribution, and transportation.

In this research focus is on third-party logistics service providers (3pl). As activities offered by these providers are broad, only transportation activities are considered in this research. Transportation modes are not limited whereas research focus on handling transportations overall. However, short introduction and main aspects of transportation modes are told in second chapter.

1.3.2 Performance measurement

Performance measurement is strongly related to performance management. Performance management is overall management of different parts of performance like setting goals and monitor these goals (U. S. Department of Health and Human Services Health Resources and Services Administration, 2011). Domingues et al. (2015) state performance measurement to be a tool for company to get information about its actions successfulness and to know if it is fulfilling its objectives and reaching goals. Performance should be measured to avoid failures and to improve efficiency according to Jazairy et al. (2017). Performance can be measured both from financial and non-financial perspectives. Can be identified for example logistics performance, environmental performance, social performance, financial performance, and customer performance (Kucukaltan, Irani & Aktas, 2016).

Wudhikarn, Chakpitak and Neubert (2018) state logistics performance to describe efficiency of logistics activities. These logistics performance measures help companies to improve its logistics activities. Environmental performance measures assist companies to monitor their waste and emissions and thus receive important information about the sustainability of the companies' operations Tung, Baird and Schoch (2018) stated. In this research the focus is on environmental performance and logistics performance. In this research transportation performance is measured from environmental and logistics view. Logistics performance in this case refers all the operational matters of transportations.

1.3.3 Performance indicators

Domingues et al. (2015) and Kucukaltan et al. (2016) tell performance indicators to be part of performance measurements. Companies base their performance measurement in these indicators and thus pursue to comprehensive measure. As performance indicators are base to performance measurement there are also indicators in several differ-

ent areas. Khan, Jian, Zhang, Golpîra, Kumar and Sharif (2018) point that environmental performance indicators are mostly related to different wastes and emissions. Also, environmental sustainability and usage of different energies are usually considered. In addition, Kucukaltan et al. (2016) highlight that environmental performance indicators can also be related to people like environmental education, environmental awareness, and satisfaction. For logistics performance indicators Rezaei, van Roekel and Tavasszy (2018) express five core components: customs, infrastructure, services, timeliness and tracking and tracing international shipments. All these components include different indicators which measure that component.

This research will focus on logistics performance indicators which give data about transportation. These indicators are strongly related to infrastructure, services, and timeliness components. In environmental performance indicators the focus is on indicators which will provide data related to waste and emissions as they are strongly related to transportation. Also, other indicators from environmental side will be used if they are seen to have impact on transportation.

1.4 Structure of the thesis

This thesis consists of six chapters. In figure 1 structure and progress of the research is presented more clearly but focusing on main aspects. Introduction and background are presented first and then research gap, question, objectives, and limitations for the research are told. These are all included in first chapter which is an introduction chapter where thesis topic, purpose, are presented and relevant concepts defined. Second chapter is an overview of transportation sector where different transportation modes are presented, and challenges related to transportation handled. Third chapter is literature review which consist of presenting relevant theories of third-party logistics, performance measurement and performance indicators. Theoretical framework is included at the end of the literature review and consist of creating theoretical framework based on literature review. Fourth chapter is about methodology where research

method and research process are clearly presented. Research method presenting includes that data collection method and data analysis method are told. Fifth chapter is results and analysis chapter which contains results and discussion part based on the interview of case company. Last chapter is a summary and conclusion where whole thesis is shortly summarized, drawn conclusions presented and future suggestions stated.

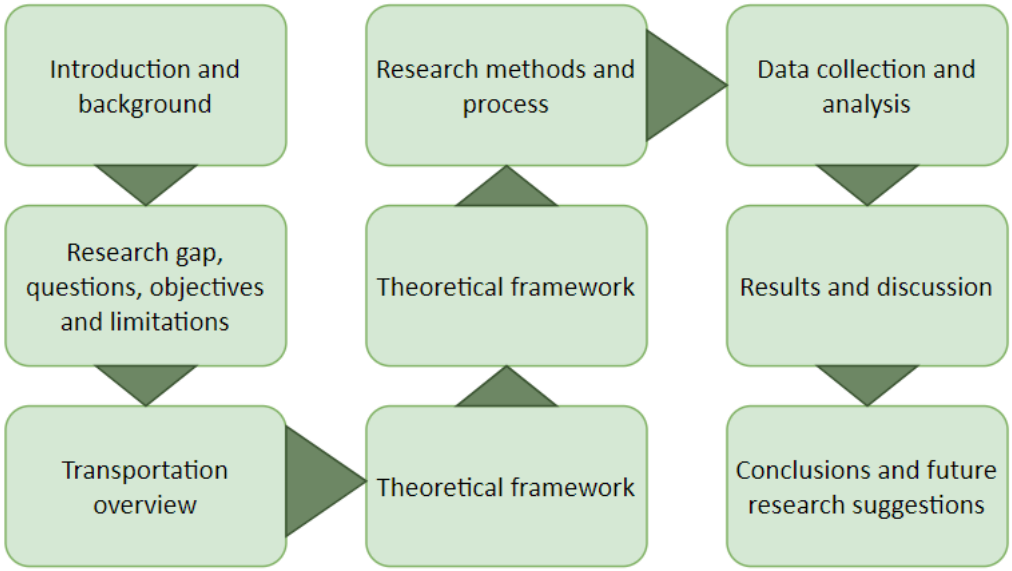

Figure 1 Structure of the thesis

2 Overview of transportation sector

This chapter present a deeper overview to transportation including different transportation modes and challenges what 3plsp may face. Transportation has key role in logistics and supply chain according to Tseng, Yue, and Taylor (2005). Transportation is needed in many different procedures from the start of production to the delivery to final customer. However reverse logistics also plays main role in transportations. Reverse logistics is logistics where product leaves from consumer and end up to producer. Term reverse logistics is used in touch with recycling as with reverse logistics can make sure that product is disposed correctly. In Figure 2 the role of transportation in supply chain is described.

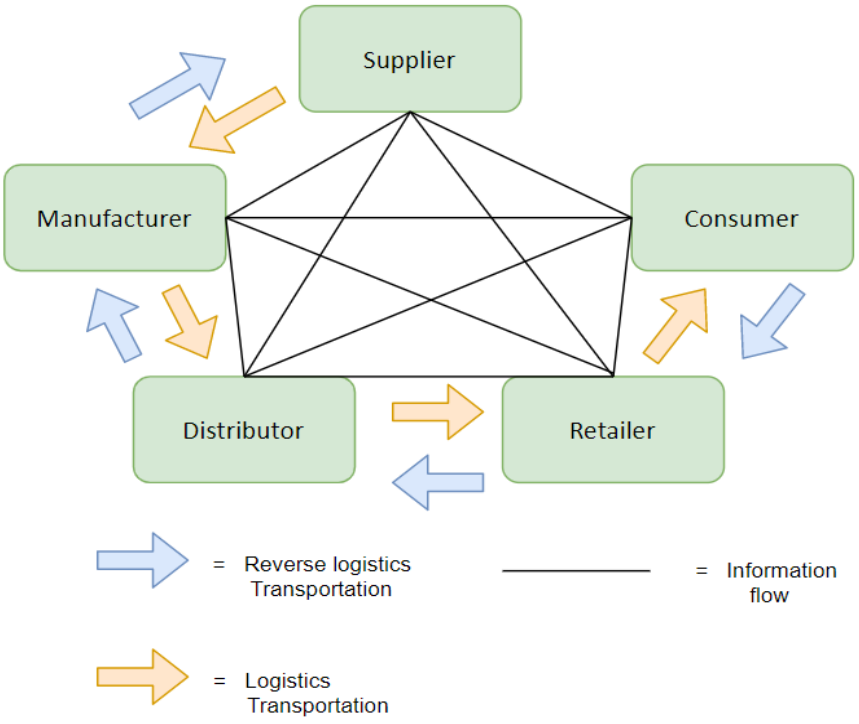

Figure 2 Supply chain with transportation and information flow (adapted from Tseng et al. 2005).

In normal logistics the chain is starting from supplier and moving to manufacturer then to distributor from where it goes to retailer and ending up to consumer. In reverse lo-

gistics chain start from consumer and go backwards the normal logistics route ending up in supplier. In addition, this figure shows the information flow between different procedures and can be seen that information is moving between every part of the supply chain. From supplier to distributor, from consumer to manufacturer, from retailer to consumer and so on.

Transportation is a link between different parts of supply chain which connects these parts into one smooth chain tells Tseng, Yue, and Taylor (2005). That is why a lot of cooperation between different operators, like supplier, manufacturer, retailer, and distributor is needed to maximize the outcome. Transportation also has major impact to customer and consumer and their experiences. Due to role of transportation, it is important to pay attention at transportation performance. Good transportation performance can have big impact to company's competitiveness so transportation's role in company's business is remarkable.

2.1 Transportation challenges

When planning transportations and deliveries must be considered financial, logistical, and social matters. Different transportation modes are air, maritime, road, rail, and intermodal. These modes are discussed more closely in chapter 2.2.

First need to be considered what freight requires from the transportation according to Tripathi, Hudnurkar, and Ambekar (2021). Service price is a key factor considering what would be cheapest mode or most cost efficiency mode. What would be the most reliable transportation mode and what mode would fit best for the situation and for the freight need to be taken into account. Time related issues are also very important as when thinking of transportation schedule needs to be considered what is the fastest and what would be the most accurate transportation mode. They also regocnize the congestion factor which is strongly related to road transportation. Punakivi and Hinkka (2006) presents that for short routes road transportation is usually the best option

whereas air transportation is used for deliveries where the freight must be delivered soonest possible. Kiesmüller, de Kok, and Fransoo (2005) also higlight the importance on warehousing when selection the appropriate transportation mode. Where the possible intermediate inventories are located to and what would be the most reasonable option from that point of view.

Kengpol, Tuammee, and Tuominen (2014) identifies in different categories possible risks what should be considered when selection the transportation mode. First one is freight damaged risks which include damaged freight, damaged form transportation, damaged from delivery at warehouse and amaged from delivery to customer. It also consider loss of freight during the transportation. Second risks are infrastructure and equipment risks which refers to capacity of port and railroad traffic and equipment material handling's facility. This also includes risk related to tunnels, capacity of bridges and slope and the width of roads. Also weather conditions like rainy seasons and tropical storms and accident rates are included in this category.

Third categorie is political and legislatorial risks which are related directly to laws and different political risks. Traffic rules and customs are also included in this. Fourth category includes operational risk which refers to employees skills and different problems related to documents like standardization and interpretation. Fifth risks relates to macro risks like financial crisis, unattractive markets and fierce competition in the transportation sector. Last category is environmental risks. These risks include climate change, toxic waste and appearance of route or building. (Kengpol et al., 2014).

2.2 Transportation modes

Air freight logistics is used for value of freight is high and need for fast delivery according to Tseng, Yue, and Taylor (2005). Via air freight can be moved fast and with lower risk of damage. Air freight is flexible and usually provides a good accessibility and frequency for most common destinations. Air freight disadvantage is high fees of delivery

but is still more dependable than maritime transportation according to Wood, Barone, Murphy (2002) as it is much unlikely early or late at the departure or arrival place.

Maritime is mostly used for international freight as it relatively cheap transportation mode and carrying capacity is high according to Tseng, Yue, and Taylor (2005). Maritime transportation problem is long transportation time compared to air freight which is also used for international freight. Maritime transportation is also dependent on weather factors. Three different types of operation can be identified in maritime transportation. First one is liner shipping where operation is happening between same routes, same price, same ship and regularly happening transportations. Second one is tramp shipping which is quite opposite of liner shipping. In this mode route, price and schedule may vary greatly. Third operation mode is industry shipping which aim is to ensure the supply of raw materials. In industry shipping also need to take care of possible special needs like high-pressure containers for natural gas.

In road freight transportation advantages are its high accessibility, mobility, and availability according to Tseng, Yue, and Taylor (2005). Road freight also has cheaper investment funds. However, road freight has relatively low capacity, slow speed, and lower safety. Tripathi et al. (2021) tell road transportation main advantage is that booking is easy compared to other modes and there is available many options for different types of freights. Road transportation still suffer from many problems like traffic congestion and crashes. Delivery of freight in time is very important part of transportation so traffic congestion is very difficult problem as it takes multiple different steps to avoid the congestion and reduce the delivery time. Another problem is energy consuming and pollution as road transportation consumes a lot of energy and thus cause a lot of pollution so even though it is very flexible and easily available transportation mode it is not very sustainable mode.

Railway transport carrying capacity is high and it is not influenced by weather as much as maritime for example according to Tseng, Yue, and Taylor (2005). Railway transpor-

tation also use a lot of less energy compared to road transportation. Railway transportation has relatively many disadvantages as essential facilities have usually very high cost and maintenance of vehicles and different equipment is difficult and expensive. Railway transport is not very good option for urgent demands as it lacks elasticity as it is very time consuming to organize railway carriages and that is why it is sometime hard to provide transportation frequency as per the customer requirement according to Tripathi et al. (2021). They also identify that railway transportation is cheaper option than road transportation if there is enough volume for the rail.

In addition to use only one transportation mode can be used a multimodal freight transportation which combines to or more different transportation modes according to Kengpol et al. (2014). With multimodal transportation possibilities to transportation routes and times is broad as different modes can be combined in many ways. In figure 3 is presented characteristics of different mode of transportation where can be noticed differences between transportation modes more clearly.

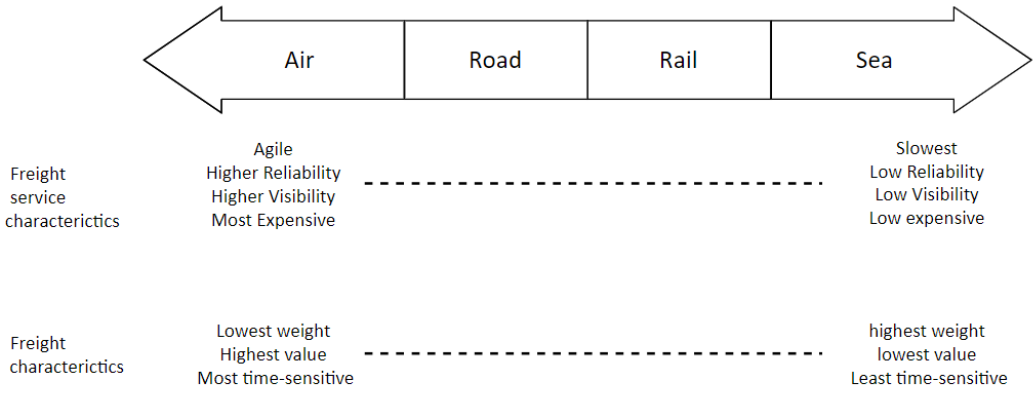

Figure 3 Characteristics of different mode of transportation (adapted from Fulzele, Shankar Choudhary, 2019).

Maritime transportation is located on right which mean that it is slowest and cheapest one and least time-sensitive, but it is not that reliable and visible. With maritime transportation high weights for freight are possible and this transportation mode is usually

used for freights with lower value. Air transportation is from the other end and located on left which means more agile but expensive and highest time-sensitive transportation mode. In air transportation reliability and visibility is much higher. Air transportation freight has lowest weight, but they have usually highest value. Rail and road transportation belong to the middle where rail transportation is left from the maritime transportation and road transportation right from the air transportation.

3 Literature review

This chapter present literature of different sub-areas related to topic. First 3plsp' environmental and logistical goals are told. Second sub-chapter deals with performance measurement and different measurement systems and framework what can be used to performance measurement in environmental side and in logistics side. Third sub-chapter is about performance indicators where different indicators for environmental performance and logistics performance are presented. Last sub-chapter is theoretical framework where key concepts of this literature review are linked to each other.

3.1 Third-party logistics service providers

Setting goals is important because they also influence 3plsp's other decisions. Isaksson, Hulthén and Forslund (2019) highlight that even though company make its own decisions about goals are these decisions usually guided by customers wishes and requirements. Being close with customer can help 3plsp to understand customer needs and wishes better. This will help company to improve its business process and make it more efficient. Goals need to be well defined and set for a specific time frame.

According to Arababadi, Moslehi, El Asmar, Haavaldsen and Parrish (2017) company should have long-term goals, medium-term goals, and short-term goals to increase the success of company business. Long-term goals are for strategic level and are usually very broad goals which may not include any specific intention. Tactical level has short-term procedures and plans to achieve the strategic level goals. Operational level provides daily activities to achieve the tactical goals and it is very focussed on short-term goals. Leal and Azevedo (2016) identifies in their research that correlation between long-term goals and short or medium-term goals is very high and if these goals for different time frames are not linked to each other the main goal may not be achieved. Gencer and Ackere (2021) support this point of view and they conclude in their re-

search that company should set some intermediate goals in addition to long-term goals as smaller and more shorter-term goals will help to achieve the main goal.

3.1.1 Environmental goals

Transportation is one of the biggest sources of pollution in Finland (Statistics Finland, 2020). Energy sector produces biggest part of greenhouse gas emissions in Finland and as transportation is part of energy sector it produces about fifth of greenhouse gas emissions (Statistics Finland, 2020). Figure 4 shows how greenhouse gas emissions are divided in different sectors and inside the energy sector based on Statistics Finland data. Energy sector produces about 74 % of all greenhouse gas emissions where inside the energy sector transportations part of emissions is 29 %. Transportation includes cargo transportation but also private motoring. Passenger cars use most energy in transportation but the energy what delivery vans and trucks use are almost as big as private cars (Liikennefakta, 2021). In addition to greenhouse gasses there is also noise emissions which are not directly causing damage to environment but irritating humans, so it is adequate reason to pay attention to them (Jacyna, Wasiak, Lewczuk & Karoń, 2017). All these prove how important it is to pay attention to environmental goals.

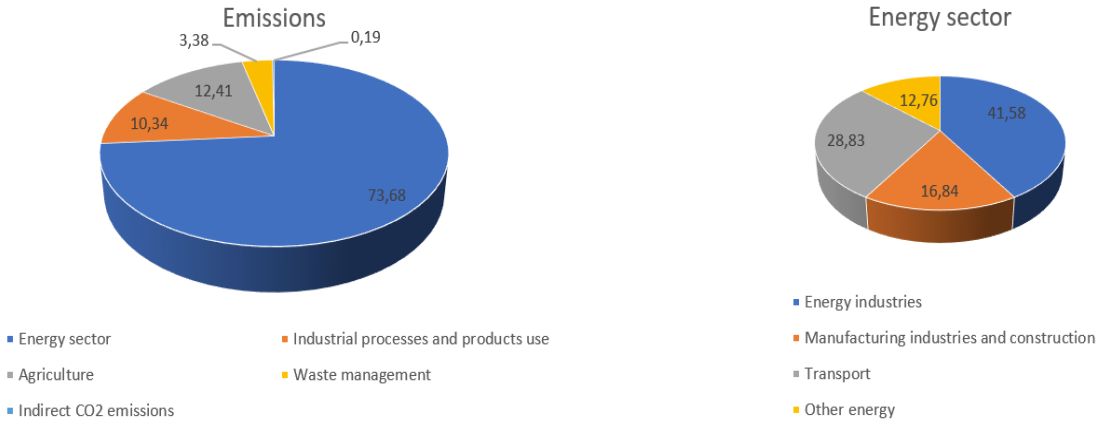

Figure 4 Greenhouse gas emissions in Finland by sector and greenhouse gas emissions distribution in Finland at energy sector.

Environmental goals 3plsp made are strongly guided by different regulations and norms what different corporations and societies have defined. While environmental matters are continuously more important and spoken thing among companies, and especially among logistics companies, are they nearly obliged to take these regulations into account. Corporate Social Responsibility (CSR) is seen a common guideline and basement for business ethics. According to Rendtorff (2019) by following CSR companies can do ethically and responsible actions not only for themself but also for whole society. It is important for companies to recognize in addition to its rights but also its duties and take responsibility about its own actions for successful business. This is not only environmental matter according to Rendtorff, but also social side need to be covered to achieve economic growth in ethically way.

In addition, Agenda2030 which is sustainable development program created by United Nations (UN) gives guideline for more sustainable environment. Agenda2030 include 17 different goals to quarantine sustainable development. Related to environment and environmental goal settled by 3plsp, goals 9, 12, 13, 14 & 15 should be considered. Goal number 9 is not directly to environmental matter, but it advocates for building resilient and sustainable industrialization and infrastructure which can be reflected to have sustainable vehicles. Goal number 12 is for responsible consumption which aim is to reduce waste by reusing and recycling. Companies should also adopt sustainable practises and use natural resources in an efficient way. Goal number 13 is strongly related to goal number 12 as it requires urgent action to fight against climate change and its impacts. This includes improving knowledge and awareness about climate change and adding climate change measures and actions into national strategies and politics. Goals number 14 and 15 aims to protect underwater life and terrestrial life. Underwater life should be protected by reducing marine pollution and minimizing the ocean acidification among other things. Protecting terrestrial life is very broad goal but it includes protecting ecosystems, sustainable usage of forests, to combat against desertification and to stop land degradation and biodiversity loss. (kestavakehitys.fi 2015)

These act as a strong guideline for 3plsp and help and guide them to set goals to support these regulations and companies own business. Tung, Baird, and Schoch (2018) recognise that 3plsp environmental goals are mainly to reduce waste emissions and air emissions which include for example greenhouse gas emission and carbon emissions. They further state that to achieve these broad goals, it is almost necessary to adopt smaller goals and activities. They deal mostly with social activities like training and raising awareness of environment and creating culture which enhance environmentally friendly actions. This can be noticed from 3plsp side also as many providers have other smaller goals or commitments to support the main goal. For example, Posti (A, n.d.) retell Agenda2030 and it has launched its aim to be zero emission until 2030. To support this goal Posti has committed to Science Based Targets initiative climate initiative and advance International Post Corporation's sustainable development goals. Postnord's (A, n.d.) environmental goal is to reduce carbon dioxide emissions by 40% from 2009 to 2020. DB Schenker's (n.d.) goal is very similar but with smaller amount in shorter time zone. Its goal is to reduce carbon dioxide emissions by 30% from 2006 to 2020. Company's aim is to be leading provider of green logistics services worldwide. These companies show that goals are very identical but only modified to fit for the companies' other goals and actions.

3.1.2 Logistics goals

When considering logistics goals, there are no similar regulations or commitments that should be considered like in environmental goals. There is usually one clear goal when speaking about logistics performance and goals. It is to get right product into right place and in right time (Jazairy, Lenhardt, & von Haartman, 2017). This goal is usually for entire supply chain and as third-party logistics is one actor in supply chain other actor have their responsibility also. Jazairy et al. (2017) highlights that to achieve the big goal cooperation between different actors and actions is needed. Taking care only transportation, warehousing and packaging is not enough but also supporting activities like communication, customer service and managing information technology should be

considered (Domingues et al., 2015). 3plsp are providing logistics services for companies so one of the most important goals for service providers is to fulfil customer requests. This goal can be strongly linked to getting product in right place in right time and with right way as doing things right depends on what customer has asked for.

This goal is very broad and universal so 3plsp have divided it into smaller goals which aim together is to reach the main goal. Domingues et al. (2015) recognize the importance to secure components and actions efficiency. One of the smaller goals can be successful communication. Information flow between company and its stakeholders is important but so is information flow between company and the customer. It is especially important to communicate with customers to be able to fulfil customers' needs. For example, Posti's (B, n.d.) goal is to build a great customer focused service both for physical and online service. In addition, Posti aims to be trustful partner for its stakeholders and highlight the importance of partnership and collaboration for creating a good customer experience. Improving routing and vehicle planning are things company should focus on and set as a goal to achieve the main goal (Jazairy et al., 2017). That is why 3plsp usually set these to be their goals as they know it will help them to get the right product into right place in right time (Domingues et al., 2015).

3.2 Performance measurement

Performance measurement is a process which includes many steps. Company can choose a performance measurement system or framework what it can follow and execute performance measurement as the system or framework guides. Choosing indicators is also one of the main steps of performance measurement. Also choosing a data analysation tool to analyse the data received from indicators is important. With proper tool company can analyse data but also create reports about the results. This will also help company to get feedback about how its indicators are getting through. (Isaksson et al., 2019). This research focusses on transportation so this part concentrate on

measurement systems which serve this area of logistics. Performance indicators and their selection is a broad subject, so it is handled as an own chapter.

3.2.1 Environmental performance measurement systems and frameworks

With environmental performance measurement 3plsp can evaluate its action successfulness and improve it. There are multiple different indicators 3plsp can use so it is important to choose the right ones. Environmental performance measurement systems (EPMS) can guide and help these service providers to work towards its goals. For example, choosing performance indicators can be done with help of EPMS. Environmental performance measurement includes many other things which help company to perform more efficiently. (Pham, Sutton, Brown, & Brown, 2020).

First and maybe most important matter is that with environmental performance measurement 3plsp can recognize a possible environmental risk and thus give a chance to react soon enough to reduce the risks with correct actions Tung et al. (2018) points out. Environmental performance measurement also provides more transparent communication about environmental matter inside the company. This enables better information flow and increase the knowledge about processes. Measuring not only advance companies inside actions and processes but also improve relationships with stakeholders. It is important for 3plsp to provide information via annual reports to stakeholder to show them their meaning. Purpose is also to support and brush up public image which is very remarkable issue on today's business environment.

International Organization for Standardization ISO (n.d.) has Environmental Management family ISO 14000 which provide frameworks, guidelines, and systems to use for better environmental outcome. Its purpose is to advance and support sustainable development goals. ISO 14000 family consists of multiple different standards where ISO 14001 is the most common standard. International Organization for Standardization (2015a) emphasize that ISO 14001 set requirements for

environmental management system and give guidance for use. ISO 14001 utilize Plan-Do-Check-Act (PDCA) model for developing an environmental management system. By following these guidelines which any kind of company can adopt environmental responsibilities can be managed in very effective way. Eco-Management and Audit Scheme (EMAS) is also a management tool for environmental performance (European Commission, n.d.). EMAS is a good tool and easier to adapt for a company who already has an environment management system like ISO 14001. As a tool EMAS highlight transparency, performance, and credibility. Company fulfilling EMAS committed to for more open and transparent information sharing and environmental impacts evaluation minimizing. Credibility is guaranteed by doing verification of EMAS by third-party actor.

Tung et al. (2018) handle in their research environmental performance measures effectiveness. Article finds usage of environmental performance measures and EMS systems important for better environmental process outcomes. A lot of value is given for operational performance measures, which can include indicators like recycled materials usage, total greenhouse gas emissions. However, the importance of management commitment is not left behind as management performance measures are lifted for second important measures considering environmental performance. Management systems help company to monitor and control its daily activities which support environmental objectives achievement.

Mareddy, Shah, and Davergave (2017) recognise Environment Impact Assessment (EIA) for one good tool for measuring and evaluating environmental performance. With EIA 3plsp can versatile assess its actions environmental impacts and decision making considering environmental issues can be done clearer. The usefulness of EIA lays on its diversity and adaptability. EIA can be adapted to many different industries and purpose depending on target of development. This framework can be directed to climate impact assessment, ecological impact assessment and risk assessment for example. In addition, targeting can be done based on different areas and partition when can be

identified regional EIA, sectoral EIA, project-level EIA, strategic EIA, and Life Cycle Assessment (LCA).

Taşkın and Demir (2020) presented Life Cycle assessment possibilities as LCA can be adapted for product, process, or a system so it is one of the EIA frameworks that can be utilized for measuring environmental performance in logistics and especially in transportation. Because LCA is usually used for total picture instead of only one part of process can 3plsp utilize this framework for also other actions it may do for customer and evaluate all actions environmental impacts together. In this case LCA's goal is to evaluate transportation process environmental impact through its whole life cycle from planning and design to phase where customer receive the product. Process for assessing the environmental impacts includes four steps: goal and scope, inventory analysis, impact assessment and interpretation. In first step goal and scope should be defined and necessary assumption together with system lifetime and boundary handled. Second step takes most of the time in this process as it includes data gathering which will be done based on first phase definitions. Third step is impact assessment itself where impact assessment methodology is used to transform input to environmental impacts. In last step results are interpreted and in first step defined goals are considered together with results. Taşkın and Demir (2020) utilize this this tool as a help for municipal solid waste management to evaluate environmental impacts to achieve more sustainable energy usage. In addition, also ISO calls for the LCA principles adopting so it is an effective tool for environment perspective (International Organization for Standardization, 2015).

3.2.2 Developing Environmental performance measurement system

Company can develop its own EPMS if it cannot find suitable system for performance measurement. Environmental performance measurement systems (EPMS) can be seen as a part of environmental management system as EPMS help companies to focus on environmental sustainability. Pham et al. (2020) identify six different principles for cre-

ating a general EPMS framework which can be adapt to specific industry if needed. Two of them are general principles and the other four are contextual principles. First principle is a strong sustainability-based view of the organization. It is important to recognize the importance of natural capital and separate renewable and non-renewable matters to guarantee sustainability. Second principle is that data quality, variable specificity and relationship clarity are required for quality decisions. This principle highlights that in addition to high quality data company should also specify the meaning of different variables and define the relationship between the variables.

Third principle is first contextual principle Pham et al. (2020) present and it states that systems architecture of the organization in relation to flows of natural resources must be understood. Principle's name basically says it all, it is important to realise renewable and non-renewable resources and understood different costs and wastes. Fourth principle is the development of a valid summary environmental and economic sustainability measure. This means developing a ratio between economic sustainability parameter and parameter which describes company's use of natural resources from the point of view of environmental sustainability. A common ratio-based summary measure is eco-efficiency, defined as the economic return (i.e., operating profit) on quantity of environmental resources used. Pham et al. (2020) state profit to resource cost ratio to be a good measure for this. It is operation profit relation to total resource cost. Other popular measure for this purpose is seen to be eco-efficiency. Fifth principle is parsimonious causal model establishes causal links between the summary sustainability measure and sustainability drivers. To ensure the efficiency of production decisions and operations, a causal model should be used to define the path to the flow of information within the system. This causal model provide multiple advantages of which most important and remarkable is that with this model can be provided good information about EPMS's key variables relationships. This will also upgrade decision quality and thus second principle. Last principle is accurate, complete and forward-looking measurement providing information with accessibility and integrity. EMPS should be able to provide accurate information about environment and economic

outcomes. Sustainability factors must not only lie within parsimonious model but also have adequate and reliable meanings to measure the value. In figure 5 all these principles are categorised for general design principles and contextual design principles and shortly presented the main aspects of each principle.

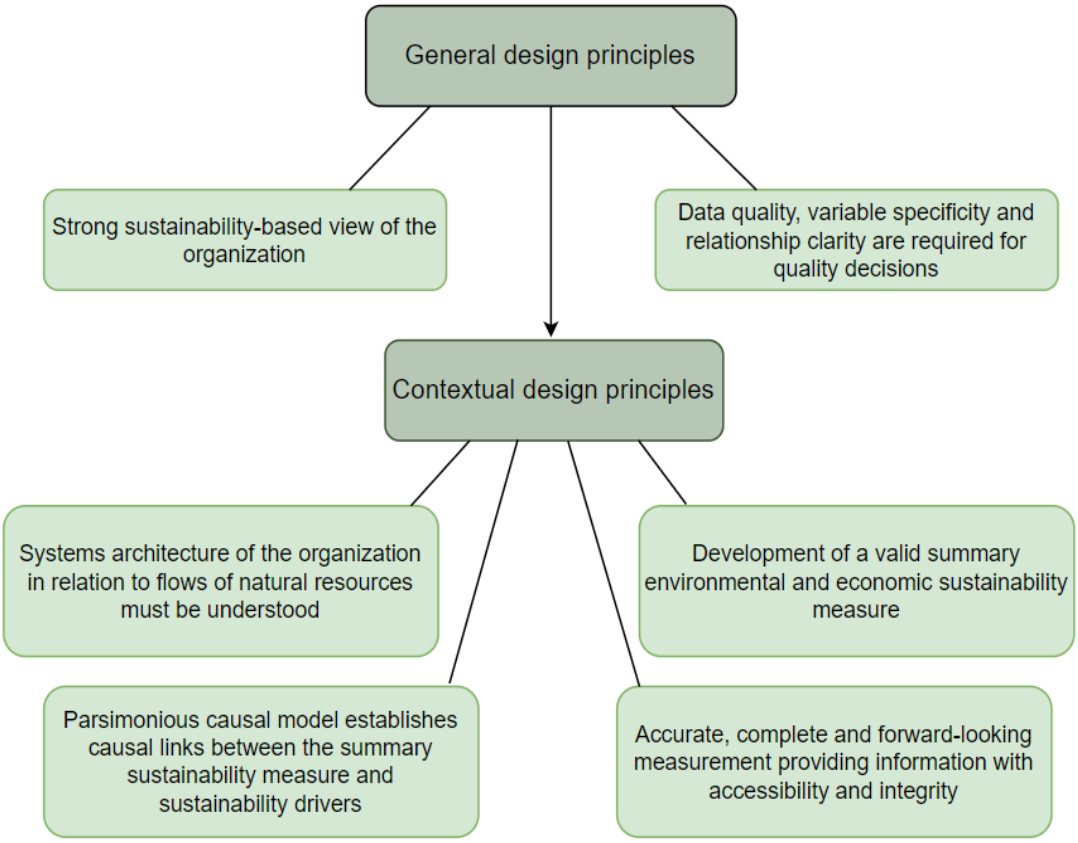

Figure 5 Key design principles for creating an EPMS framework.

In addition, there is a framework for creating a good environmentally sustainable logistics performance management process (ESLPMP). According to Isaksson et al. (2019) this framework includes five steps the first of which is selecting environmentally sustainable logistics (ESL) performance variables. Selection is based for strategic priorities and 3plsp need to satisfy customer and fulfil its requirements from environmentally sustainable point of view. There are multiple different variables but fill rate, fuel type, transportation, emissions, pollution, energy consumption and logistics system design are most relevant examples for this case. Second step is defining ESL performance met-

ric. Coordinating and communication between 3plsp and customers is important for choosing right metrics. Metrics can be chosen from many different sectors like energy, 3pl's environmental assessment, fleet compositions, emissions, congestion, and mode of transportation.

Isaksson et al. (2019) describes third step to be setting environmentally sustainable goals. In previous step defined metrics need to be find suitable goals which drives ESL interests. Customer-oriented operations consider the customer's requirements as well as government regulations. Framework identifies multiple different types of goals like quantitative goals, absolute goals, intensity goals, top-down goals, and bottom-up goals. These goals can be settled as an average or a specific goal. For example, for CO2 metric quantitative goal could be to reduce use of non-renewable resources by a certain percentage or intensity target could be the reduction of CO2 per square meter. Fourth step is to measure ESL performance metrics. This involves regularly collecting data and reporting the feedback to inside the company and to the customer if needed. This can be done directly via systems or indirectly by using spreadsheets. Last step is analysis and action of ESL performance metrics. This step aims to analyse performance outcome in relation to company's strategies to see the current situation.

3.2.3 Logistics performance measurement systems and frameworks

Logistics performance measurement help companies to understand their logistics performance and get good data about the logistics activities. In logistics time and flexibility are key factors so continuous improvement to increase competitiveness and performance is needed (Jazairy et al., 2017). Logistics is crucial part of company so making it as efficient as possible should be ensured (Domingues et al., 2015). To be able to make powerful decision related to performance, should the performance metrics and indicators be chosen carefully.

There is not as good selection of performance measurement systems for logistics as for environment. For overall logistics which includes financial and social side there is many models and systems which can be utilized but only for transportation and activities related to it available systems run short. That is why companies can use models and systems which are indirectly linked to transportation. There is no separate standard for logistics but ISO 9000 Quality Management family and previously mentioned ISO 14000 Environmental Management family both can give 3plsp a good guideline for successful activities and good performance and its measurement. ISO 9000 Quality Management family's best known and only standard which can be certified to is ISO 9001 (International Organization for Standardization, 2015b). This standard provides requirements for quality management system so company can fulfil customer requirements and guarantee customer satisfaction. International Organization for Standardization (2018) ISO 45001 Occupational health and safety standard provide good guidelines for employee's safety working conditions which can be useful when creating logistics management or measurement system. Balanced Scorecard or Performance Pyramid System or Performance Prism are supporting goal management and can be used as a tool but should be noticed that these are not specialized in logistics or transportation (Irfani, Wibisono & Basri, 2019).

Lean Six Sigma (LSS) is one framework which can be utilized for logistics sector. According to Gutierrez-Gutierrez, de Leeuw and Dubbers (2016) this framework can be used to manage logistics performance. Alone Six Sigma is usually developed for total quality management. Whereas Lean philosophy aims for performance improvements like shorter lead and delivery times and better quality. So these can be utilized separately but to achieve best outcome should these integrate into one big wholeness. With LSS company can improve customer satisfaction, shorter lead times and reduce costs. In addition, Irfani et al. (2019) Identifies Supply Chain Operation References (SCOR) and Logistics Performance Index (LPI) which can be used as a tool for performance measurement. SCOR is designed for supply chain operations, and it split these supply chain processes into five different processes: planning process, procurement process, pro-

duction process, delivery process and return process. With SCOR company can figure out how these processes interact and perform (Ntabe, LeBel, Munson, & Santa-Eulalia, 2015). Rezaei et al. (2018) tells LPI to be a tool to measure logistics performance and to find out possible challenges and opportunities performance can face. Purpose of LPI is to weight six components from poor performance (1) to excellent performance (5). These components are customs, infrastructure, services, timeliness, tracking & tracing and international shipments. LPI score is calculated by using normalized scores of each component multiplied by their corresponding components loadings.

Domingues et al. (2015) present a common performance measurement system for logistics where logistics activities are categorized in three dimensions. First dimension is activities which include logistics activities like transportation, warehousing, and information and communication. Second dimension is actors who include different actors related to logistics like third-party logistics providers, manufacturers, and consumers. Last dimension is decision level dimension which include three different levels: operational, tactical, and strategic. Operational level measures low level managers' activities, tactical level mid-level management decisions and strategic level concern top level management decisions. In this way, the functions can be divided into basic elements, which help by improving only one dimension can get different indicators. For example, if improving actor dimensions like third-party logistics provider, we receive indicators which are result from the combination of activities and levels of decision for the third-party logistics provider.

Sometimes it is just better to develop own system to make sure it serves 3plsp needs. Irfani et al. (2019) recognize six phases for developing a performance measurement system for logistics sector. First phase is selecting the case which mean identifying and selecting companies which have multiple roles. Second phase is defining the problem. This includes gathering the data form stakeholder to be able to identify the problem. Third phase is performance indicators selection. Indicators are selected based on company's documents and information provided by stakeholders. These identified perfor-

mance indicators are divided into three categories: strategic resources, performance drivers and performance output. When performance indicators are identified is time to identify most relevant indicators to be key performance indicators. Fourth phase is building a system dynamics model. With this model and involved tools it is easier for company to understand systems dynamics. Fifth phase is to validate the model by establishing a base case. In fourth phase developed model should be validate in this phase with help of different procedures like comparing components behaviour, doing some testing and analysis, and having some built-in dimension checking routines. Last phase is conducting policy and strategy experiments. This can be done with different tools like simulation tool and snenario analysis.

3.2.4 Performance analysis

Data analysis is a relevant part of performance measurement and management. Data analysis gives company a feedback about its actions and selections performance. With help of analysis company can more easily make decisions and get better solutions for its problems. Choosing a correct analysing tool can be difficult as there are multiple tools which fit for different purposes, industries, and companies. (Isaksson et al., 2019). This chapter present few analytics tools. In addition to presented tools company can use other tools also.

Stitch (n.d.) present top 25 different data analysing tools where first is Microsoft Power BI tool for data analysis. It is a very broad and comprehensive tool which support many different data sources. With Power BI company can make reports and dashboards and combine them for one to get simplified view. Second tool is SAP BusinessObjects tool which allows company to analyse data and make reports. This tool is designed less technical companies, but it can still perform some complicated analysis. Third tool is SAS Business Intelligence analytics tools which provides inclusive and flexible platform for self-service analytics. This tool is more expensive than some of its competitors, but price can be explained with its diversity and good features. IBM SPSS Statistics tool is

versatile tool with many different features to use for data analysis (International Business Machines Corporation, n.d.). With this tool company can easily analyse data with developed statistical methods.

3.3 Performance indicators

Performance indicators are tools for measuring performance. With these indicators company get data about its actions and their successfulness. With this information company can evaluate its decisions effectiveness and help management to do decisions and create transparency inside company. Kucukaltan et al. (2016) and Parmenter (2015, p.4) present performance indicators selection to be important to get accurate information, but selection of key performance indicators to be even more important as KPIs provide even more detailed knowledge for better performance. KPIs are indicators which measure most relevant parts of performance for the company to succeed. Badawy, El-Aziz, Idress, Hefny and Hossam (2016) tells that in addition to PI and KPI can be identify fine result indicators and key result indicators which are not handled in this thesis. Usually, all these indicators are described as onion where KPI is the core of the onion which provide most information and PI is next layer after that. Result indicators and key results indicators are top layers which present information for big picture.

3.3.1 Indicators' selection and significance for company

CO2 emissions like many other indicators can be measured different ways. To know the correct way Parmenter (2015, p. 107–118) identifies seven foundation stones which are the base for successful KPIs. These first stone include creating partnership which requires seamless collaboration between customers, management, employees, and other possible stakeholders. Second stone is transferring power to front line workers requires training, communication, responsibility transferring to company employees. Third stone highlights importance of developing framework for performance to know

how to measure and report results. Fourth stone state that companies should choose their KPIs among their critical success factors whereas fifth stone emphasize the need for abandonment to show that they understand what initiatives work and what does not. Sixth stone highlights measurement approach which includes trained staff, counselling and supporting staff and management partnership. Last stone is understanding the meaning on KPI. Definition of KPI should be clear to management and staff to ensure successfulness.

3.3.2 Environmental performance indicators

There is multiple different indicators 3plsp can use to measure environmental performance. Companies can choose direct environmental indicators which measure the performance or indirect indicators which are more related to companies' business decisions (Oršič, Rosi & Jereb 2019). Environmental indicators related to business decisions are success of environmental standard use, reduction of energy consumption, reduction of the scope of recycling and reduction of environmental incident. Success of environmental standard use indicator shows 3plsp commitment to environmental actions from performance standard, like ISO 14000, point of view. Reduction of energy consumption indicator shows commitment to environmental policy by doing energy efficient decisions. Reduction of the scope of recycling aims to indicate companies' waste recycling management successfulness. By reduction of environmental incident indicator company can show its awareness of logistics activities possible causing incidents and minimize these incidents with this indicator. To measure directly environmental performance company can use the following indicators: Measuring and reporting on environmental performance, reduction of emissions into the air, reduction of water pollution and consumption and reduction of solid waste. With measuring and reporting on environmental performance can get information from environmental situation and actively work towards a better environment. Indicator of reduction emission into the air is very crucial indicator to use as transport produce a huge amount of pollution into air. This indicator is almost necessary not only due to multiple government guidelines

and legal requirements but also common environment program which are important for company's reputation. Reduction of water pollution and consumption indicator is important for 3plsp as in addition to air, logistics activities have an influence on water resources. By indicating reduction of solid waste help to manage solid waste produced by logistical activities.

These indicators may also be supplemented by those presented by Isaksson et al. (2019). Energy use can be measured with fuel use indicator and total fuel consumption from non-renewable sources indicator. Carbon dioxide (CO2) emissions are good indicator to measure for reducing emissions. The fuel use multiplied by heating value and emission factor is one way to calculate CO2 emissions. Also, distance travelled multiplied by emission factor is one way to express CO2 emissions and average fleet CO2 emission per unit driven another way. Article also present interesting indicator related to 3plsp environmental assessment. It is the percentage of new suppliers using environmental criteria. This helps to see the interest of other companies in environmental issues.

3.3.3 Logistics performance indicators

3plsp can choose their indicators for measuring logistics performance from multiple different indicators. Most popular indicators are on-time delivery and logistics cost which both stand out almost in every literature where logistics performance indicators are talked about. Also Domingues et al. (2015) recognize these indicators and mention that on-time delivery describes right goods delivery at right time and in agreed conditions and logistics cost in this situation refers to transportation costs (Domingues et al., 2015). In addition, truckload utilization and vehicle routing are seen efficient indicators for logistics performance according to Wong, Tai, and Zhou (2018). In truckload utilization 3plsp can consider factors like time, distance, speed, capacity, and vehicle emissions to make a successful plan. Vehicle routing includes planning as effective route as possible to avoid congestion, improve delivery time and reduce the volume of carbon

emission. As can be noticed, these logistics performance factors may not only provide information from logistics performance but they also help to improve environmental matters. Many of these indicators serve both sides which make these indicators very efficient and important for company. These indicators are very powerful to choose for both environmental and logistics performance measurements.

Along with these Isaksson et al. (2019) identifies many other indicators which companies can use to measure its logistics performance. Congestion is one of the main questions and challenges in logistics as it can have huge impact to transportation successfulness. Off-peak distribution indicator can be used to figure out transportation made outside the off-peak and percentage of delivery by modes of alternative transportation indicators be used to find out how many deliveries are replaced by another transportation mode due to congestion. Fleet compositions can be indicated with vehicle type, average fuel consumption and total number and age of fleet. To measure the mode of transportation can be used indicator which counts the number of freight deliveries by mode per unit of time. All environmental and logistics PIs are presented in table 1.

Table 1 Performance indicators

PERFORMANCE INDICATORS	REFERENCE
Environment	
Success of environmental standard use	Oršič, Rosi & Jereb, 2019
Reduction of energy consumption	Oršič, Rosi & Jereb, 2019
Reduction of the scope of recycling	Oršič, Rosi & Jereb, 2019
Reduction of environmental incident	Oršič, Rosi & Jereb, 2019
Measuring and reporting on environmental performance	Oršič, Rosi & Jereb, 2019
Reduction of emissions into the air	Oršič, Rosi & Jereb, 2019
Reduction of water pollution	Oršič, Rosi & Jereb, 2019
Consumption of solid waste	Oršič, Rosi & Jereb, 2019
Reduction of solid waste	Oršič, Rosi & Jereb, 2019
Fuel use	Isaksson, Hulthén & Forslund, 2019
Total fuel consumption from non-renewable sources	Isaksson, Hulthén & Forslund, 2019
Percentage of new suppliers using envi-	Isaksson, Hulthén & Forslund, 2019

ronmental criteria	
Carbon dioxide	Isaksson, Hulthén & Forslund, 2019
Logistics	
On-time delivery	Domingues, Reis & Macário, 2015
Logistics cost	Domingues, Reis & Macário, 2015
Truckload utilization	Wong, Tai & Zhou, 2018
Vehicle routing	Wong, Tai & Zhou, 2018
Congestion	Isaksson, Hulthén & Forslund, 2019
Off-peak distribution	Isaksson, Hulthén & Forslund, 2019
Percentage of delivery by modes of alternative transportation	Isaksson, Hulthén & Forslund, 2019
Fleet compositions	Isaksson, Hulthén & Forslund, 2019
Mode of transportation	Isaksson, Hulthén & Forslund, 2019

3.4 Theoretical framework

This sub-chapter forms theoretical framework for this research based on information provided on literature review. Theoretical framework builds a theoretical base for the research and for the process of performance measurement. The chapter includes challenges what 3plsp may face during the whole process of building performance measures. What indicators to choose and how to monitor, analyse and develop the indicators are also considered.

3.4.1 Challenges of performance measurement and performance indicators

Companies can face multiple challenges during different phases of developing performance measures. Time and many decisions are needed to find successful performance indicators. Choosing goals, measuring systems, management systems, indicators, analyse tools, and development methods are all important questions what needs to be take care of. Literature review shows that performance measurement requires a lot of things to consider where the first one is setting the company goals both for environmental and logistics side.

Goals are the base for everything else and they guide the whole process, so it is important they are formatted clearly. Environmental goals are strongly guided by different environmental regulations and programs like Agenda2030. In addition to Agenda2030, company should follow CSR guidelines to ensure its ethical and responsible business. Environmental goals company usually have considers mainly emissions like greenhouse gases or carbon emissions. Logistics usually have one main goal which is to get the right product in right time in right place. This is goals which can be linked to different parts of supply chain. Logistics goals of transportation can thus be this one or then some else goal which related to whole transportation process. To get the product from production process to consumer is a complex process where different parts of the process need to work together. In addition to transportation other operators are also needed for the process and due to nature of this main goal and the complex process, smaller goals and actions are needed to fulfil the main goal. Significance of smaller goals is remarkable as they ensure that it is possible to achieve the main goal like Gencer and Ackere (2021) stated. Even though this study of Gencer and Ackere was executed for energy sector are goals creation very similar for other industries also and that is why this study can be utilize for logistics side performance and goals in addition to environmental one. Leal and Azevedo (2016) also recognize the importance of creating goals for different time frames and different levels which supports other theories.

Tung et al. (2018) discover measurement system as an effective tool for performance measurement so choosing the most appropriate and effective system for company's use is a big challenge. Company can always develop its own system if suitable system cannot be found. Performance management and measurement systems are necessary for company to keep it business up to date. Measurement systems and management systems usually give directions what indicators companies should choose but final decision is always companies' own. Indicators' selection is a biggest challenge as companies must consider how many indicators should be chosen, which are the KPIs and which normal PIs.

Usually, companies face challenges considering effectiveness of indicators and how to analyse and develop the indicators. How analysing and data gathering should be done to get good information about indicators successfulness is important question. Indicators' development is based on results achieved from analyse it is very important to do analyse in proper way to maximize indicators development. Doing small changes can bring very remarkable changes so it is challenged to realise how big changes are really needed. Even though there are own challenges in every step of performance measure selection process there are still universal challenges which should be considered in every step of the process. Transparency is important both for company and for customer and usually even required by the systems like EMAS. Reliability, validity, credibility is also factoring what should be considered during the whole process.

3.4.2 Selection of indicators

Indicators' selections are in a key position when measuring performance. Choosing correct indicators is difficult and there are multiple issues affecting to decision making but decision need to be made. Parmenter (2015, p. 26–27) highlights that it is important company just do not choose every possible indicator and hope to get some useful information. Indicators need to be selected carefully and recognising KPIs and PIs is important. KPIs should bring more and deeper information whereas PIs are giving basic information and acting as a supporting indicator. Parmenter (2015, p. 4) stated PIs tell management what they are doing but KPIs tell how company is performing with their most critical factors. It is important to spend enough time to recognise the indicators correct so in analysis phase the achieved data is accurate enough. Parmenter's (2015, p. 107–118) seven foundation stones is a useful framework to use at KPIs selection. This framework helps to handle the KPIs more deeply and gain better understanding of what is required of KPI.

Indicators' selection should be based on company goals. Company goals presents what company wants to achieve and performance measurement investigates company's success in specific area, so it is natural to base indicators' selection to company goals. In addition, different standards, or programs what company follows guide the indicators selection. ISO 14001 is common standard which many 3plsp follow and it can give company valuable information about environmental indicators and environmental performance measurement overall. Whole ISO 14000 series is a useful tool for company to focus on its environmental performance and even achieve financial benefits.

Indicators' selection is only one part of performance measurement. Performance measurement is important part of company and its successfulness so own systems for performance management and measurement are needed. Performance management system is needed to manage overall performance and especially for company goals. Performance measurement system whereas is needed so company can measure its action performance and provide information for the goals. Isaksson et al. (2019) ESLPM is a good framework to use as it focusses on whole performance measurement process from choosing the variables to analysis of results. In addition to that framework to evaluate environmental impact like LCA should be adapted. For logistics performance the systems are best to assemble with company itself by adapting different frameworks to the systems. Lean and Six Sigma are effective tools for overall performance measurement so they can be utilised also for logistics performance measurement alone or together. ISO 9001 and ISO 45001 are useful standard for company but not necessary only for logistics and transportation performance as they are designed to be used as an overall tool for whole company.

3.4.3 Analysis and development of indicators

Indicators analysing has remarkable part in performance metrics effectiveness. It is important to analyse indicators regularly to know if indicators are producing needed information. Analysis includes data gathering, reporting the information, and giving

feedback (Isaksson et al. 2019). By analysing and measuring indicators it is easier to improve indicators which help to measure performance more effective way. Analysis helps to identify if KPIs and PIs are fulfilling their positions and providing the information they are supposed to provide. However, it is not specified how often data should be gathered and analysed so that is every company's own decision and depend on their needs.

Every company has its own way to analyse the indicators and do the data gathering. Many questions should be considered when analysing indicators. Isaksson et al. (2019) state that company should consider how often data is gathered and if reports are generated from system or indirectly via spreadsheets. Data can be gathered and analysed daily, weekly, monthly, or whatever company decide. Company should also decide if metrics measuring, and analysing is average or specific measurement and how the feedback is given. Use of different tools is possible and very desirable because they can help to achieve wanted outcome. For example, Power BI, SPSS, SAS, and SAP BusinessObjects are tools what company can use as its data analysis tool. Measurement systems, management systems and different certificates guides this analysing phase as these systems usually have clear instructions what kind of measures should be used and how to gather and analyse the data.

Metrics development is last part of performance measurement process. Development is based on results of analysis as it is hard to improve actions if information about current situation is missing. Then cannot be sure how big and what kind of changes are needed. Should the indicator be changed, or does it just need some small fixing or maybe the system is the worst problem? All these decisions are based on results of analysis so focusing on analysis is important and will guide the whole development process.

4 Research methodology

This chapter introduces research methodology of this thesis starting with the research onion. Research process is also presented in this chapter step by step. This chapter goes through the data collection method which specify how the information is collected. This chapter ends with data analysis method which represents how results are interpreted.

This research is exploratory research which aims to answer question what KPIs 3plsp utilize in their transportations environmental and logistics measures. Purpose is to analyse these KPIs and other decisions 3plsp's use in their performance measurements and thus provide some development ideas. Exploratory research fit for this usage as this research focus on transportation in general at 3plsp's. This research can help to identify if there is need to study further and focus on specific transportation mode. This exploratory research features to show if there is potential to go further with the research (Saunders, Lewis, & Thornhill, 2007). Saunders et al. (2007) also describe exploratory research flexible research as received results guide the direction of the research. This means that the further the research proceed the narrower the focus is.

Research onion framework is used to create methodology. Saunders et al. (2007) present research onion which contain six different layers where outermost layers are for more general information and innermost layers for more specific techniques. Layers from outer layer to inner layer are Research philosophy, Research approach, Research strategy, Research choice, Research time horizon and Research techniques and procedures. Research onion for this research is presented in figure 6.

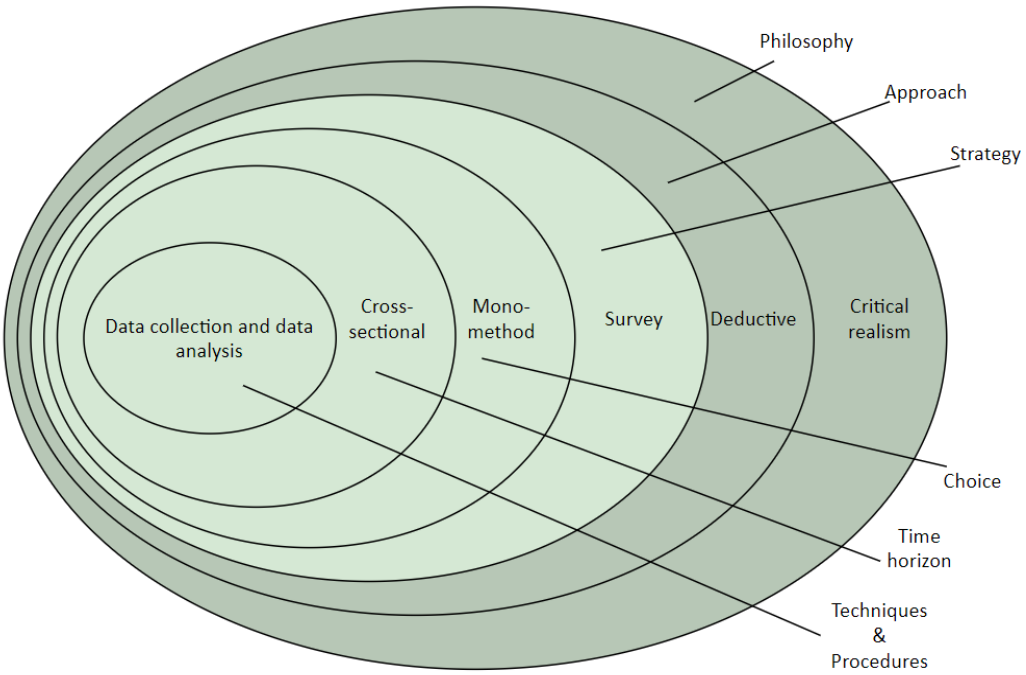

Figure 6 Research onion (adapted from Saunders et al., 2007, p. 102)

Starting from outer layer, the philosophy of this research is critical realism. Critical realist handle things as he sees it (Saunders et al., 2007 p. 105). This means that critical realist believes we are not experiencing things directly whereas sensations and images of the things. In business life critical realist identifies the significance of different levels and believes all these levels have capacity to make difference. Different levels can be for example the individual, the group, and the organization. Approach of this research is deductive which is theory testing approach. In this approach theory is first identified and after that it is time to operationalize, make observations and test the theory and last change the theory if needed according to Saunders et al. (2007 p. 117).

Research strategy for this research is survey which is very common choice for deductive study according to Saunders et al. (2007 p. 138–140). Survey can include many types of questions like what, where, who, how much and how many. Survey is chosen for this study as a research strategy because of this suitability and adaptability. Survey enables the use of different questions which is needed for this study. There are multiple different data collection techniques for survey method but in this study the tech-

nique is online interview with open-ended questionnaire. Research choice is mono method. Term mono-method refers that study is only using one data collection method and analysing methods related to it (Saunders et al., 2007 p. 145–146). In this study one qualitative data collection technique and qualitative data analysis methods is used. In this study data collection technique is online interview and data analysis method is pattern matching.

This study has cross-sectional time horizon. According to Saunders et al. (2007 p. 148) cross-sectional time horizon usually includes survey which also match for this study. Cross-sectional studies focus on certain phenomena in certain time. This study focuses on to find out how things are currently. In this case the phenomenon is environmental and logistics indicators at 3plsp at transportation sector. Last layer is techniques and procedures which refers to data collection and data analysis. Data collection is handled deeper in sub-chapter 4.1 and data analysis in sub-chapter 4.2.

Research process of this study presented in Figure 7. First step of this research process is to identify research objectives and question and to form the hypotheses. Research objectives and question are directly based on the research idea and hypotheses are relationship between two concepts or variables that can be tested. In this study there is one research question which has three research objectives. There are also three hypotheses to be tested which are based on research objectives and main aspects of this research. First hypothesis is that performance indicators selection is based on company's goals. This hypothesis requires finding out what are company's goals and what performance indicators it has chosen. Purpose of this hypothesis is to find out how settled goals are reflected in the company's operations. Second hypothesis is that more value is given on environmental indicators than logistics indicators. In its simplicity, the purpose of this is to find out what the company values in its operations. This second hypothesis requires the information of performance indicators company use and what of those indicators are chosen for KPIs. Third hypothesis is that performance indicators are strongly guided by performance measurement system and frameworks. This hy-

pothesis tries to identify where indicators action is based on and if performance measurement systems or frameworks are having great impact on indicators.

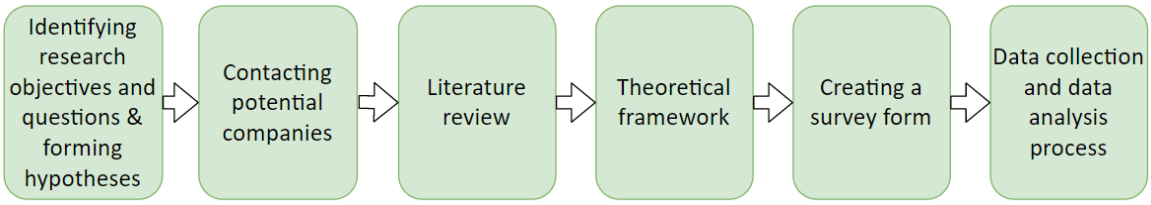

Figure 7 Research process of the study.

Second step is contacting potential companies. This step includes finding potential companies and sending them email to figure out if they are interested to participate or not. Some examples of interview questions were also provided to companies who were interested to participate so they could get clearer vision what kind of research this is. Third step is literature review which includes theories which are relevant to this study considering research objectives and question. There are three main themes which are strongly related to this study: third-party logistics, performance measurement systems and performance measurement indicators. After literature review can be frame a theoretical framework for this research. Theoretical framework is kind of summary of literature review where most relevant theories and framework for study have picked up to form a theory what to test for. Fifth step is creating an interview form. The interview questionnaire consists of different questions which are based on literature review and theoretical framework. These questions are formed in a way that information from different views is received for the research question and objectives.

Last step is data collection and data analysis process. Data collection process including data collection method is clearly presented in next sub-chapter. After the data has been collected next sub-chapter presents data analysis. This focusses on different aspects related to data analysis including data analysis method and results transcibing. Results are presented and analysed in own chapter to in order to clearly distinguish methodology and results. Suggestion how case company could develop its actions are

also included to results part. Last sub-chapter in results chapter is reliability and validity chapter which focus on to discuss research findings credibility.

4.1 Data Collection

Finding case companies was first phase in data collection. Finding case companies was difficult as some companies did not even answer back. Few answered back, where one answer was refusing and two were corroborative. However, other of these companies cancelled later so one company remain for the research. Data for this research is gathered from the case company which is a Finnish logistics company which provides different transportation solutions for its customers. This company is a good case company as it provides transportation in multiple different modes. Sample size is 1 as one respondent from the case company answered the questions on behalf of the company.

Interview used for this research is semi-structured interview which is non-standardised interview, and these are usually used for qualitative research (Saunders et al., 2007 p. 312). Interview was fulfilled via email and questionnaire were sent to respondent. Open-ended question was used at this interview as they allow respondent to describe the situation and provide broad answer according to Saunders et al. (2007 p. 329). Open-ended questions are preferred in this research also before multiple choice questions as latter may have guided company's answers too much. Interview consisted of 12 open-ended questions and company was supposed to answer each question both from environmental performance view and logistics performance view excluding two first questions which were indicated either one. Respondent answered to all the questions but for one question the answer was incomplete. Interview questions were constructed to same order as this study. This is study is organised the way that the subject area goes deeper chapter by chapter. Interview questions are formulated with same way to ensure the chronological order and understandability. First three questions focus on goals and their monitoring. Fourth question focus on performance measurement systems. Rest of the questions are focusing on performance indicators and com-

pany's experience about using the indicators. Interview questions can be found from Appendix 1.

Interview includes questions from company goals, performance indicators and performance measurement systems and tools. Questions are chosen based on identified theory and chosen the way which give as comprehensive image from case company's actions related to performance measurement as possible. Questions were answered by case company's traffic manager and his team. Fulfilling with email raise up a chance for misunderstandings from both sides. Respondent was asked few times to specify its answers as some questions were not answered or answers were short.

4.2 Data Analysis

Received answers are unwrapped and transcribed to written text for narrative mode from short answer written with bullet points. This study use pattern matching as data analysis method which is deductively based procedure (Saunders et al., 2007 p. 490). First variation of pattern matching is referring to dependent and independent variables and them relationship. This variation is used in this research and performance indicators are dependent variables and independent variables consists of company goals and performance systems and frameworks.

Theoretical framework is used to evaluate and explain company's answers. At the same time theoretical framework can be tested and make conclusions about its validity. Results are case company's answers to interview questions and all the information presented in result section is received from the company. In results section all these answers are presented, unwrapped, and explained. After presenting the results can discussion and analysis be made about the results. Discussion section considers more deeply the meaning of results and what are reasons for these results. Discussion section also aims to find the relation between results and theoretical framework that conclusions related to research question can be drawn in next chapter.

5 Results and analysis

Results are presented and discussed in analysis section and also some development ideas are given at the end of analysis section. This chapter is concluded with the evaluation of research validity and reliability.

Interview started with defining company's short-term, mid-term and long-term goals for transportations environmental performance and logistics performance. Company defines its environmental goal between years 2020 and 2025 to be reducing emissions and increase commissioning of alternative fuels. Goal for logistics performance is to maximize production rate. This goal aims to increase load size and improving mileage of vehicles. Goal will be reached by investing as diverse vehicles and equipment as possible that are suitable for the tasks of as many customers as possible. Company monitors these goals yearly and update the goals for present if needed.

Company measures its transportations environmental performance with CO2 per tonne km, NOX per tonne km, the percentage of alternative fuels in total kilometres and Euro emission classes for engines. CO2 refers to carbon dioxide and NOX refers to nitrogen oxide. Euro classes are linked to a harmful emission maximum limit to the health of vehicles and these classes are legislated in European Union according to Autotuojat (n.d.). To measure transportations logistics performance company has chosen to measure load balance, output, reliability of pick-up, reliability of delivery, loading time, unloading time, retrieved on time, delivered on time and load distribution daily. In addition, company also use idle transitions, idle driving percent and idle driving percent by segment. From all these indicators company has chosen Euro classes, CO2 per tonne km, NOX per tonne km, the share of alternative fuels in total kilometres, idle driving percent and idle driving percent by segment for its KPIs.

Company has based its indicators selection to effectiveness which means it has chosen metrics which measure things what company see it can affect by itself. In addition, customer needs and requirements are affecting company's decisions about indicators.

Data from these indicators are collected and analysed weekly. This collected data is utilized by Power BI analytics which is reporting and analysis tool to combine and visualize data. Power BI reports are viewed once a month. Information and data received from indicators has been experienced very useful as for example investments has been able to justify with concerned values. None of the indicators has not been experienced useless and all indicators have provided information what was expected.

In addition to Power BI tool other used tools, systems or frameworks weren't reported. The person who responded to the interview did not know if company use some other tools, frameworks or measuring systems for environmental performance and logistics performance like Lean, Six Sigma, EIA or LCA. However the company has been awarded with ISO 9001:2015 Quality management system, ISO 14001:2015 Environmental management system and ISO 45001:2018 Occupational healt and safety system. From table 2 all the questions and answers all presented. Questions are also included to appendix 1 where they are presented more clearly and divided into groups.

Table 2 Answers from the interview

Question	Answer
What are company's short-term, medium-term, and long-term goals for environmental performance?	Reducing emissions and increase commissioning of alternative fuels during 2020-2025
What are company's short-term, medium-term, and long-term goals for logistics performance?	Maximize production rate
How often are the targets reviewed and updated?	Yearly
What performance measurement systems, frameworks or standards company have?	ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018
What performance measurement indicators company use and for what purpose?	CO2 per tonne km, NOX per tonne km, the share of alternative fuels in total kilometres, Euro emission classes, Load balance, Output, Reliability of pick-up, Reliability of delivery, loading time, unloading time, retrieved on time, delivered on time, load distribution daily, idle transi-

	tions, idle driving percent & idle driving percent by segment
What are the key performance indicators among your performance indicators?	Euro classes, CO2 per tonne km, NOX per tonne km, the share of alternative fuels in total kilometres, idle driving percent & idle driving percent by segment
For what the selection of these indicators are based on?	Customer needs and requirements and to what company see it can affect by itself
How often is data collected and analysed from indicators?	Weekly
Has company managed to improve performance significantly? In other words, has the information obtained from the indicators been useful?	Information and data received from indicators has been experienced very useful as for example investments has been able to justify with concerned values
Which indicators the company may have found to be irrelevant or useless?	None of the indicators has not been experienced useless
How often efficiency of indicators is monitored?	Once a month
How are these indicators measured?	Power BI tool

5.1 Analysis about company's goals

Case company's environmental goals is very similar than other 3plsp environmental goals are. However, one thing that make a difference are a percentage. Posti and Postnord have published specific percentage to decrease their emissions whereas case company does not tell any specific percentage but only state the goal to be reducing emissions. Even though these goals sound very similar a clear difference in their meaning can be spotted. Goal with specific percentage make the goal more determined and realistic. It also shows that company has familiarize itself with different aspects of environmental goal and thus knows how much it can decrease its emissions. Setting precise percentage for decreasing emissions may create pressure for achieving goal but on the other hand it can motivate to push harder to reach the goal. Tolerating pressure is anyhow needed in business life so company should also be able to tolerate pressure about goals.

Other matter that caught attention is environmental goals scope. Short-term, mid-term and long-term environmental goals were asked but answer was received only for a long-term goal. Case company did not highlight it was a long-term goal but as the goal was made for five years, can be assumed the goal to be long-term goal as usually long-term goals are set for several years. Changes in environment can take time and thus reducing emissions and commissioning alternative fuels are not happening in fast schedule so that may be the reason for missing short-term and mid-term goals. On the other hand, case company environmental goal can include smaller goals for shorter time frame and these goals are not mentioned because they have same aspects but for shorter time frame. This idea would be much more probable if case company has specific percentage by which emissions are to be reduced. Then it would be easier to set short-term goals for smaller percentage than long-term goal. However, settled goals for environmental performance are very broad and that is why they are probably long-term goals, as these are strategic level goals and usually very broad. No short-term or mid-term goals is presented which can decrease the likelihood for success as these intermediate goals are stated to help to receive the main goal.

It is also interesting that case company did not specify what emission its goal includes. Usually, emissions are linked to CO2 emissions and in some cases NOX emission and probably this is the answer for this also as company have indicators for NOX and CO2. Emission can however include noise emissions, which are part of transportations. Other 3plsp's did not mentioned about these noise emissions at their websites so accurate information is not available. However, it may be that company want to focus on CO2 and NOX emissions first and after these have been brought under control company can focus on less dangerous emissions like noise. Anyhow case company has clearly understood the importance of reducing emissions and want to work for common good. Case company's environmental goals are following Agenda2030 regulations and especially goals 12 and 13 which are focusing on fighting against climate change and enhance responsible consumption.

Case company's logistics goal is to maximize production rate. This goal does not have time target, but it can still be seen valid all the time as maximizing refers to continuous improvement and purpose is always to make sure that production rate is maximized. However, this maximization of production rate is certainly planned for the longer term as it is very broad goal, and these kinds of changes are not happening in short notice. Company have settled smaller goals which intention is to help company to maximize production rate. For example, in short-term can be focused to increase load size and improving mileage of vehicles which in long-term can be seen as improved production rate.

Compared to other 3plsp's goals can be noticed that logistics goals are very common but may be disguised different ways. This means that companies can pursue for same goal but with different actions and smaller goals. For example, case company and other 3plsp's did not highlighted that their goal is getting right product in right place, but the focus was on different aspects like fulfilling customers' requests and being trustful partner. This shows that to get the right product in right place in right time is more like prerequisite for companies and they create different goals which support this right product in right place in right time mentality.

Related to second hypothesis the way both goals are presented not yet reveals if company highlights either one more. Environmental goals have time gap, but they are missing some shorter-term goals. Logistics goals has one bigger goal which includes some smaller goals, but the time is missing from the goals. Case company monitor both environmental and logistics goals yearly which is a good interval in this situation. In one year enough has happen and can be seen some changes and development already. If company had some short-term goals, would it be good to monitor them more often. However now when have been stated logistics goals to be long-term goal and environmental goals are clearly long-term goals, one year gap between monitoring is long enough but not too short. There is still time to make chances in actions if case company notices that goal is already achieved or may even be impossible to achieve.

5.2 Analysis about performance measurement systems

Respondent was not sure what kind of frameworks case company use for its performance measurement and performance management. Company was asked if it uses Lean, Six Sigma, EIA or LCA but respondent did not know if these are utilized in company's performance measurement. This was very crucial part of this thesis as the purpose is to find out why some indicators are chosen and how systems or frameworks guide indicators selection. As there is not precise knowledge if company use any of these systems it is much harder to understand company's decisions and what is the real situation with PMS's. Company's response does not support that hypothesis that PMS has a great impact on indicators selection. Rather can be concluded that indicators selection is based on different things and PMS is only playing a background role in this part. In total performance management PMS can have a huge and remarkable role but it does not reach to indicators selection. That is why this answer from company does not support the theoretical framework about PMS systems importance in performance measurement so cannot fully agree with Tung et al. that PMS role in performance measurement is very important. It can be important for overall performance but for indicators selection PMS does not give straight guideline.

However, company has ISO 9001, ISO 14001 and ISO 45001 so can be stated that company follows these certificates' regulations and guidelines. ISO 14001 includes basic elements for environment management system and highlight the use of PDCA for creating the system. It is very likely that company has developed its own system and use ISO 14001 guidelines for that. There is also chance that company utilize some previous mentioned frameworks, but the respondent just was not aware about them. It is very unlikely that company have no environmental management system or EPMS as benefits received from these systems are invaluable.

Company has probably created own system for measuring and managing logistics performance. One reason why it might have been easier to company to plan its own sys-

tem is its status at Finnish logistics sector. Company has ISO 9001 and ISO 45001 certificates, so it is very likely utilizing guidelines these two certificates are providing. Even though these certificates can provide good guidelines for logistics systems these certificates alone do not provide enough to create system for logistics as these certificates are eventually focusing on overall quality and occupational health and safety. Therefore, it is reasonable to believe that company do utilize some other frameworks for logistics measurement or management systems, but respondent just were not aware what frameworks. Other potential chance is that company has no logistics measurement or management systems, but it is fused in some other system.

It was surprising that respondent was not able to answer the questions about performance measurement frameworks and systems. It is understandable that employees have their own specialties and there is no need-to-know every part of the company, but still raises a question why this specific question was not guided to person who does know about it. Reason might be that company did not want to put too much time for this, so they were not ready to recycle these questions from person to person. Respondent did know about performance indicators, for what indicators are based on and what analysis tools company is using. That is why it is weird that respondent did not know about measurement systems. These systems are after all base for performance indicators or at least guiding how to choose the indicators effectively.

5.3 Analysis about performance indicators

Company has environmental indicators and logistics indicators, and selection was not very surprising. CO2 per tonne km and NOX per tonne km are common and clear indicators for company as carbon dioxide emissions and nitrogen oxide emissions are topical emissions at transportation sector due to pollution produced by vehicles. These indicators also help company to monitor its environmental goal achievement related to pollution. The percentage of alternative fuels in total kilometres indicator is directly related to company goal to commission alternative fuels. This indicator tells straight

how well company has managed in its goal. Together with these three indicators company can find environmentally efficient solution and see concretely how use of alternative fuels is affecting to count of emissions. However, company did not have any indicators related to noise and vibration emissions and most probable reason is that these emissions were not included in company's environmental goal. Euro classes was totally new indicator for me, and it was not even represented in literature review as no other research presented or mentioned it. Euro classes is set out in European Union, so emissions need to monitor carefully. This indicator help company to better understand its situation with alternative fuels. Euro classes indicator also fulfil company's CO2, NOX, and the percentage of alternative fuels in total kilometres in indicators and these indicators together help company to understand its actions effectiveness linked to company's vehicles. Chosen environmental performance indicators shows company's desire to achieve its environmental goals and act as Agenda2030 guides for better environment.

Idle transitions, idle driving percent and idle driving percent by segment are three crucial indicators for logistics performance and it is good to have different point of views. This allows to identify in where segments idle driving percent is biggest and put it into perspective with big picture with idle transitions and idle driving percent. Idle driving percent by segment also make it easier to figure out how it should improve route planning and delivery planning. Idle driving percent by segment is a useful indicator by itself but maybe the benefit could be even better if company have other indicators with segment focus. For example, if delivery time or reliability of delivery also have delivery time by segment and reliability of delivery by segment company could figure out if idle driving percent at specific segment have an impact on delivery time at that certain segment. Company did not classify what is meant by a segment in their case as segment can be many different things like customers, location, vehicles. This has an effect to selection of what kind of indicators should be chosen with segment focus.

Another good example about company's comprehensive actions for logistics performance is deliveries and pick-up's measurement. Company has chosen retrieved on time

and delivered on time which may seem similar with reliability of pick-up and delivery. Difference is that retrieved on time and delivered on time are focusing only for time where reliability of pick-up and reliability of delivery are focus on time and other things like right product and right place. This shows that it is important for company to fulfil customer request and to identify what is causing possible problems. For example, if product is delivered on time but reliability of delivery is still not good it is easier to identify what can be done better. In addition, loading time and unloading time shows that company wants to focus on time handling which is necessary part of good logistics performance. All these together support company's goal to maximize production rate. Indicators diversity like focusing on different point of views in measurements and the focus on whole transportation process ensure that versatile information is received to evaluate performance.

Other logistics indicators like load balance, output and load distribution daily support these other indicators also and provide useful information for logistics performance and goal achievement. For example, with load distribution daily can be figure out is day of week has some impact on load distribution or if load distribution can be linked to delivery or pick-up reliability. Indicator focusing on congestion transportation somehow would have been a good indicator to supplement other indicators. With congestion driving indicator company could better explain other indicators' results like why delivery time is bad or pick-up reliability frail. This could help company to improve its action and make more precise plans. From figure 8 can be seen all PIs company use divided to environmental and logistics indicators and KPIs company has chosen among them.

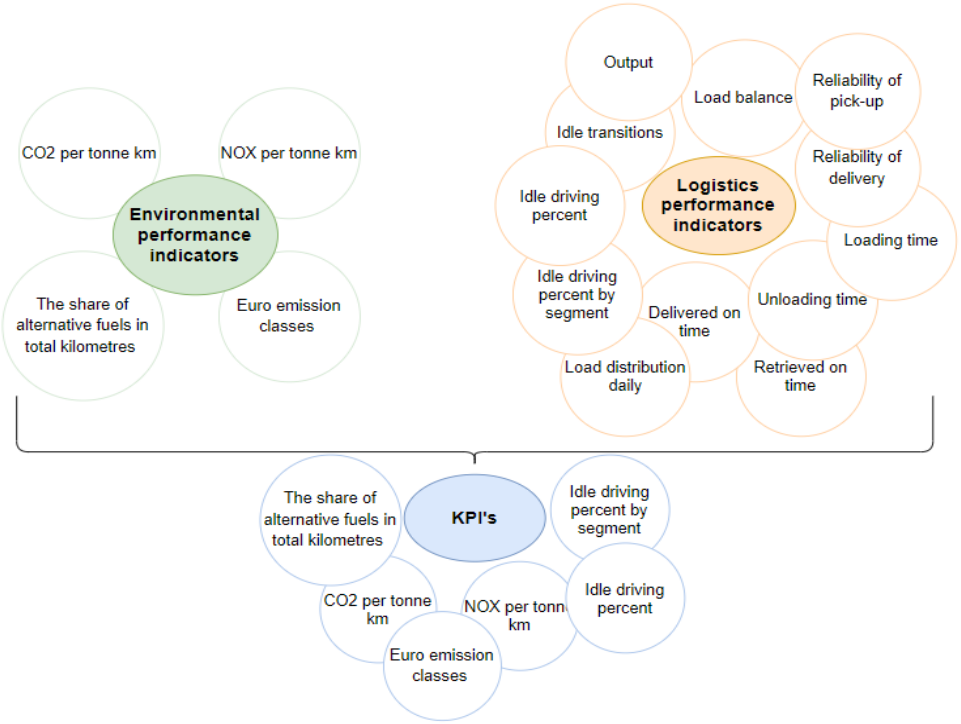

Figure 8 PIs and KPIs used by the case company.

Indicators company has chosen are strongly related to company's goals. Company aims to reduce its emission and has chosen its indicators to CO2 per tonne km and NOX per tonne km which directly refers to emissions. This same can be noticed from the alternative fuels side as increase of alternative fuels commissioning is company's goal and it use the percentage of alternative fuels in total kilometres as its indicator to measure environmental performance. Connection between company goals and performance indicators can be noticed from logistics side also as company name maximizing of production rate as its logistics performance goal. Indicators for logistics performance are not as clearly linked to goal as in environmental performance but the connection can still be noticed. All the indicators company use for measuring logistics performance describe company's ability to manage its transportations. To maximize the production rate, company need to monitor these indicators and make decisions based on the information received from the indicators. Thanks to these points the first hypothesis can be accepted and stated to be true.

However, company tells to choose indicators based on customer requirements and things they fell they can have an impact on, so it is interesting to find this strong link between company goals and indicators selection. The key thing in this case is that effectiveness and customer requirements are also linked to company goals. When company is setting its goals, it should think what customer requires from the company and base the goal at least partly for that. In 3pl customers and their requirements plays a big role as without happy customers there is not a successful business. This also fits for effectiveness as it is very likely to set goals which company feels they can reach so they will make changes on things they feel they can affect. Even though company would choose their performance indicators based on company goals but also on effectiveness and customer requirements first hypothesis can still be accepted as there is not limited that selection should be only based on company goals. Combination between all these three would probably be the most effective as then is ensured that both customer requirements and company own needs and desires are fulfilled.

Third hypothesis is that performance indicators are strongly guided by performance measurement system and frameworks. Testing this hypothesis was not that easy as company's answer related to performance measurement systems and framework remained quite unclear. ISO 14001 has very likely guided company its issues related to environmental performance but the link between environmental performance indicators and ISO 14001 is not very strong. Situation is same at logistics performance measurement but there the link between ISO 9001 and ISO 45001 is even smaller as either standard is not directly for logistics and its performance measurement. These frameworks are more likely related to comprehensive performance measurement than directly to performance indicators. Even though it is very likely that company has developed its own systems for performance measurement, there is not any proofs and that is why cannot be acted like the case company have a system for that. That is why the truthfulness of third hypothesis remains unclear and as there is not enough links which proves that performance indicators are strongly guided by performance measurement

system or frameworks and hypothesis need to be rejected. Needs to be noticed that this does not mean that performance measurement systems and framework can guide performance indicators. They still can guide but the significance is not that strong.

5.4 Analysis about KPIs

Can be clearly seen that company's KPIs are more focused on environment than logistics. Company has chosen CO2 per tonne km, NOX per tonne km, Euro emission classes and the percentage of alternative fuels from environmental indicators for KPIs which means that all environmental indicators company have are also KPIs. From logistics indicators company has chosen idle driving percent and idle driving percent by segment which is only two indicators out of 12. These two logistics indicators selected to KPIs are also indicators which brings information to evaluate environmental performance and interpret environmental indicators. With idle driving percent company can help to explain its CO2 and NOX emissions as idle driving increase unnecessary emissions. Idle transitions were one of the PIs and it can be seen as a helping indicator for environmental measurement, but it has not selected as a KPI. There are also many other logistics indicators what company did not select for KPIs. Delivery time and reliability of delivery are both very important things for performance but as an individual indicator they may not bring as much and deep information for company as KPIs should. These other indicators are still good indicators to give supportive information for the KPIs even though they are not selected for KPIs.

Considering KPIs regarding to company goals can be clearly seen that those environmental goals achievement is supported more than logistics goals. Selected indicators are more focused to monitor environmental matters and logistics goal is paid a much less attention. Environmental indicators are strongly related to company's environmental goals as CO2 per tonne km and NOX per tonne km are linked to reducing emissions. Euro classes also refers to emissions reducing and share of alternative fuels in total kilometres is related to increase commissioning of alternative fuels. Supporting logis-

tics goals achievement is very small part of KPIs and now company is monitoring its logistics goal only with idle driving percent and idle driving percent by segment. Still the chosen logistics indicators are supporting logistics goal achievement, so indicators are chosen well. Table 3 shows all KPIs and the goal each KPI is referring in one table. These are both very crucial part of production rate maximization as idle driving is very worthless for the company and thus by minimizing idle driving can company improve performance and maximize its production rate. These two are very effective indicators but still adding one more indicator would complete KPIs selection and bring more logistics focus on KPIs. Developing an indicator which measures on-time deliveries or reliability of deliveries by segment would be an effective indicator to add among other KPIs. It would give information about in which segment the delivery or delivery time is most reliable and would give a much more information than just on-time delivery or reliability of delivery.

Table 3 KPIs and goals they are related to.

Key Performance Indicator	Performance goal
CO2 per tonne km	Emissions reduce
NOX per tonne km	Emissions reduce
Euro classes	Emissions reduce
Share of alternative fuels in total kilometres	Increase commissioning of alternative fuels
Idle driving percent	Production rate maximization
Idle driving percent by segment	Production rate maximization

Second hypothesis is that more value is given on environmental indicators than logistics indicators. The difference between quantities of performance indicators and logistics indicators is remarkable as there is much more logistics indicators than performance indicators. However, situation is not that unambiguous as quantity is not the only thing what matters. If we look at KPIs we can notice that company has chosen all

its environmental indicators to be as KPIs and only two logistics indicators. These two logistics indicators are also indicators which support environmental indicators as they can explain some results what environmental indicators give. Thus, can be noticed that company values more environmental indicators than logistics indicators and second hypothesis is accepted.

These KPI selections shows that company values environment and it want to focus on environmental performance especially. This is not only typical for case company but also many other research highlighted environmental performance importance and chose it before anything else. Today is also very common that environmental matters overpower other things like logistics. Things that have previous been thought from logistics side have now also environmental point of view. If company earlier based its vehicle selection only to logistics side now it focuses to choose correct vehicle from environmental side also. Vehicles need to be able to utilize alternative fuels which do not produce as much emissions as normal fuels. Environmental matters are very visible in today's business life so 3plsp's need to focus on environmental problems first and then solve other issues in a way that support environmental solutions.

5.5 Analysis about indicators overall

Company has a very realistic vision how to choose indicators and what are the suitable indicators for the company. Company realise that it is reasonable to focus on things what you can have an influence on and do what you can instead of focusing on issues that are independent of company. Another thing affecting to indicators selection is customer and its requests'. It is great to notice that customer has an impact on company's actions but same time it is necessary as in this industry it is very important to fulfil customer requests. Unsatisfied customer will find another company which provide services it needs. There can be things what company cannot provide for its customer like correct vehicle but if problems are placed to delivery and pick-up times and reliability of delivery and pick-up it can be a sign to a company that something should be improved.

Company did not highlight that if they monitor how indicators work together like if they support each other and help to interpret other indicators results. Now company seem to have indicators which support each other and help company to better realise what should be improved. For this reason, the indicators used by the company are certainly compatible. This argument is also strengthened by the fact that company has not experienced any of its indicators to be useless. In this case every indicator seems to provide something useful to other indicators as well as being informative enough by themselves. This also shows company to succeed in indicators selection as there are not involved any indicators which provide useless information for company but only indicators which information is helpful and guide company onward. Company has been able to justify investments with concerned values which also points out successful selection of indicators.

Company is collecting and analysing data weekly which sound very reasonable as a lot of data is accumulated in short time when you have many indicators. Analysation is done by Power BI tool which is for sure a good tool for company as it is broad tool with versatile features. In addition, with Power BI there is a possibility to create visual reports which is very needed feature and help to understand the results. Report created with Power BI are going through once a month. This is adequate time as in month company can already see some changes and fluctuations clearer than if reports were going through every week. Time gap between reports could be longer like every quarter year as company's goals are long-term goals but with one month gap company can react quickly if something urgent appears.

5.6 Discussion about possible development ideas

Company's performance decisions considering environmental and logistics performance have overall quite well condition. However, clarity to company goals should be increased. It remains unclear if company has settled environmental goals for shorter

time zone and if logistics goals even have specific time zone when they supposed to achieve. By settling smaller goals for shorter time zone as they would work as an intermediate goal for main goals and help to achieve it. Logistics goals has one bigger goal which is maximising production rate and other logistics goals are smaller goals which help to achieve the main goal and drive towards it. This should be done for environmental goals also and one theme what was completely left out from the goals and indicators is employees' know-how and education. Employees' actions have great importance, and they can bring company a major benefit for performance but also for other matters like costs. Well-trained employees know how to act correctly in situations and help the company to develop. For example, by adding employee's environmental awareness employee can learn better route planning, vehicle handling and non-idling policy.

Performance indicators are also something to develop. Isaksson et al. (2019) use at its environmentally sustainable logistics performance management process targets for performance indicators. This ideology could be utilized for company's action also as giving goals for performance indicators can help company to more easily find out how useful some indicator is and if the indicators has provided what was expected. This can prevent company to become "blind" about good and effective some indicator really is. Even though company have not yet fell any indicator to be useless but so far, the indicator may have brought information it is assumed to be very useful indicator. By setting every indicator an own goal can find out how specific information it really provides and if there is another indicator which could provide better and more relevant information. This would allow a better development for indicators.

Company could also develop some congestion indicator to complete its other indicators. Congestion indicator could measure ingestions by segment where the segment could be vehicles or different areas or both. Then indicator would provide information about what kind of vehicles are most likely to get stuck on congestion and what areas have biggest congestions. Even though company's indicators seem reasonable, and

company is satisfied with its own decisions in future it could focus more on indicators which provide information multiple things. Idle driving indicators what company already use provide information about idle driving but at the same time they give information how well company has planned its deliveries and routes for example. Adding segments to different indicators can provide more value to indicators if indicators quantity in otherwise stays reasonable. After all it is important that there are not too many indicators whereas indicators should be carefully selected and suitable for company itself.

5.7 Reliability and validity of the study

5.7.1 Reliability

Reliability refers to how consistent findings used data collection methods and analysis methods can provide (Saunders et al., 2007 p. 149). Reliability in qualitative study is referring to if other researchers have reach same kind of observations (Saunders et al., 2007 p.318). This study is very universal study for whole transportation sector so results would have not differed considerably if this same study were done by different researcher. Of course, there is always a chance for different opinions and ways to interpret achieved results so conclusions could have been different. If other researcher uses different companies, then there is a great chance for major differences. It is important to notice that there is only one company participating in interview. Even though the results received from this company are informative and they support theoretical framework cannot be abandoned the fact that with more respondent the results can be different. This means that now this study has one company which happens to support the theory but if there would have been ten different companies the result could have been totally different.

Saunders et al. (2007 p. 149–150) also identify different threats to reliability which overcome can raise the reliability. First one is subject or participant error which refers

to choosing proper date and time for the interview. Neutral time would be the best option for date and time according to Saunders et al. (2007 p. 149–150). Friday and Monday are dates which are not so neutrals as on Friday people are looking forward on weekend and on Monday the work week has just started. Interview questions were sent to company on Monday afternoon which means that company have probably seen email about interview questions at Tuesday morning. The company was given two weeks to answer to interview questions to maximize that they can choose the best possible time for themselves to answer the questions. Company sent their answer back at on Monday. It necessarily does not mean that they have answered them on Monday morning but very likely this is the case. That is why can be identify a small participant error for this study.

Second threat is subject or participant bias (Saunders et al. 2007 p. 149–150). This is referring to fact if respondents say something what boss wants, or they think boss wants them to say. Interview questions was fulfilled online via email, so it is hard to identify if there is something what sound like coming from other person mouth than respondent. Therefore, this bias cannot be acknowledged but also not deny. Third threat is observer error which is about different researcher have different ways to express the survey questions during the interview (Saunders et al. 2007 p. 149–150). This study has only one researcher so observer error should not exist. However, this raises a question about way of asking questions in this research. Have the way been proper or is there some else way which would have fit better for the respondent? Last threat is observer bias which refers to different ways to interpret results according to Saunders et al. (2007 p. 149–150).

5.7.2 Validity

Validity is referring to finding's appearance and if the findings really are about what they are showing up according to Saunders et al. (2007 p. 150). Like in reliability there is also threats to validity which are concerning research process comprehensively. First

threat this study faced was mortality as at the beginning of the study one company left out of this research. This caused problems with participants as study was conducted with one company. Even though this one company gave informative answers and conclusions could be drawn but the validity of these findings should be questioning.

After all, one company is very small part of whole 3pl industry so with multiple participants findings could have been totally different. Not to take all the validity out from this study is important to consider that findings of this study strongly support the theoretical framework and they are very similar compared to other studies. This research is supposed to be a general description for all 3plsp at transportation sector. This research is very likely to work well for transportation sector for different transportation modes but due to small number of participants cannot straight generalise the findings for all other organisations, but small questioning is needed. Research does not classify the indicators for some specific transportation mode, so it is easy to adapt this study for different transport modes from this point of view also.

Interview as a data collection method for this kind of research is very common method (Saunders et al., 2007 p. 138–140). Interview as a data collection method was a good choice and fit well for this research. Interview was fulfilled via email so there was not any face to face or video contact with respondent. This may cause some issues as via email it is very important to form the questions so they are understood correctly, and no multiple emails related to what some question might mean is needed. In this study questions were understood quite well, only one question was problematic and it was clarified to respondent once. Respondent still was not able to answer this question properly, but the reason is probably the fact that it was not his speciality. Problems with answering interview questions were tried to avoid by sending themes of questions before the interview and provide enough time to answer the questions.

In this type of interview, it is also hard to notice if something said is coming from respondent's mouth or if it is something what someone else wants him to say. Interpreta-

tion of the data can also cause some validity problems and in this study only interpretation problem related to questions number four which is the questions which was clarified to respondent once. Answer for these questions can be interpret in two ways: either company does not use any performance measurement systems or then the respondent just was not aware of them. This study ended up in the latter one as it is unlikely that company have no performance measurement system.

Despite the problems this research was fulfilled in valid and reliable way. Research would be more valid if there were more companies involved. Considering this situation one company is enough and better than no companies involved. Even though company's answers were short, but they still told most relevant things and only what was asked for. Company's answer can be seen reliable as traffic manager answered for questions. Results need to be interpreted in rational way and not draw too much and too strict conclusions. Based on achieved results cannot crush any theories but will get good directional results.

For this type of research there are multiple sources and previous research to utilize. Most research are not directly linked to transportation or 3pl but as in different supply chains actions and actors can have very close connection to each other. This allows to use research which are linked to transportation but may not be executed by 3plsp or research which are executed by 3plsp, but focus might be also in other actions in addition to transportation. Also, from 3plsp websites can found useful information which can use to support case company's answers or opposite.

6 Summary and conclusion

6.1 Summary of the research

Objectives of this study was to find out what PIs and KPIs 3plsp use in their transportations environmental and logistics measurements and clarify why are these indicators chosen. In addition, objectives include to finding out why are these indicators chosen and analysing the effectiveness and efficiency of such performance indicators and developing and proposing alternative solutions for performance measurement and indicators. Performance describes how well company is fullfilling its goals. That's why performance is very important and crucial part of company's business and as performance indicators are strongly related to performance itself should these indicators pay attention to. By focusing on these indicators' improvement and efficiency maximization can be ensured that the needed information which help company to improve its business is received.

This study includes three hypotheses which were chosen based on main aspects of this research : performance indicators, enviromental performance and logistical perforamnce. First hypothesis for this research is that performance indicators selection is based on company's goals. Second hypothesis is that more value is given on environmental indicators than logistics indicators. Third hypothesis is that performance indicators are strongly guided by performance measurement system or frameworks.

The researh was a deductive study which includes survey as a data collection method. Survey was fullfilled as an interview which was conducted via e-mail using open-ended questions. This research has one company as a participant for the interview and company's traffic manager answered the questions on behalf of the entire company. Answers were interpreted as well as analysed and results were compared to theory. Depent variables for this case were performance indicators and independent variables consists of company goals and performance systems and performance frameworks. Purpose was to figure out the relation between different variables and thus investigate

from what variable and variables performance indicators are dependent on. For open questions respondent has possibility to explain issue clearly and give answer by own words but this chance was not utilized in this research. Answers received from company were adequate but not broad and they did not gave a any groundbreaking information.

Company choose indicators related to emission and alternative fuel usage but also a lot indicators related to transportations times and reliability. KPIs consists only of environmental indicators like CO2 per tonne km, NOX per tonne km, Euro emission classes and the percentage of alternative fuels. These questions helped to answer on second hypothesis like did company goals which in environmental performance are focus on reducing emissions and increase commissioning of alternative fuels and in logistics performance is to maximize production rate. PIs, KPIs and company goals also strongly guided the first hypothesis and its outcome. All these selected indicators seemed to fit together and support each other. Can be stated that chosen indicators really hit it right as every indicator can tell something by its own but also be used to explain other indicators' results. Results from PIs, KPIs and company goals had the lead role where other questions and answers supported these and provided more precise information.

Results showed that indicators selection is strongly based on company goals like stated in theoretical framework. However it is not the only source as customer requirements can have an impact too but it is the strongest one. Result also showed that company invest a lot more on transportations environmental performance measurement before logistics performance. This can be seen from KPIs for example as all KPIs were environmental indicators. Even though this was one of the hypothesis of this study it still surprised how big the gap between environmental performance and logistics performance were. These allow first and second hypotheses to be accepted.

Question about performance measurement systems and frameworks was directed to third hypothesis to figure out is performance measurement systems or frameworks guides indicators selection. Unfortunately, in this research the benefit from that question was kind of small due to incomplete answer. However, the answer showed that PMS importance in performance selection is not that huge as was expected and highlighted in theoretical framework. That is why third hypothesis is not accepted. Other questions about performance indicators and analysis related to indicators like, how often data is both collected and analysed, and what analysis tool is used turned out very needed also as they helped to strengthen the theory and helped to receive research objectives.

Based on the results few development ideas were given to company. These mainly focus on goals as company should focus to divide goals on different time period and include both shorter and longer term goals on its business. Goals should be taken into account at indicators also as adding every indicator a own goal whould help to identify how well indicator is fullfilling its purpose.

The aim of this study was to provide information to 3plsp general guideline how to select their performance measurement inficators and give useful information on the selection of performance measurement indicators and the factors that has an effect to these indicators. Research succeed to provide a relatively good guideline despite the challenges in data gathering. However research was able to answer in main research question and fullfilled research objectives. To summarize the final answer to the main research question of this study “What are the key performance indicators (KPI) utilized by third-party logistics in measurements? “, can be stated that KPIs used to measure transportations performance are more likely environmental indicators which specially focus to monitor different emissions.

6.2 Managerial Implications

The managerial implications are recommendations developed for the case company's people who are responsible on managing. The recommendations are based on findings and development ideas presented in chapter 4. In this study used theory about performance measurement and indicators selection was testes via case company and it finded out to be a good common guideline for performance indicators among 3plsp.

Company has a very good situation with its performance measurement indicators in environmental and logistics performance. However there is some small things what should be pay attention to. One of the key findings of this research was company goals significance in performance indicators. That is why goals should be specified and expressed more clearly from the time and scope point of view. This means that goals would be good to divide on short-term, mid-term and long term goals and specify what goals are the main goals and what kind of smaller goals it may include.

Another implication for company is setting goals for performance measurement indicators. Every chosen indicator should have it own goal as then it is possible to follow up how indicators work for the company and if employees really have a right idea about what every indicator can be used for. Focusing on these two aspects could clarify company actions and functions to company employees and help to realise the current situation better. Company could also make sure that performance indicators really are up to date and serve what they are meant to serve. When goals are specified clearly it is easier to select indicators which make it much more likely that selected indicators are effective. By adding goals for every indicator can increase the consciousness about indicators efficiency and use but also help to understand the information indicator is providing.

6.3 Future research suggestions

Topic of this research is very universal, and this research aims to provide an overview for whole 3plps transportations. Most natural research suggestion for the future is to focus on specific transportation mode. Focusing on specific transportation mode enables to gain much deeper information about performance indicators and measurement systems. Different transportation modes have different requirements and challenges so more deeper conclusions and more explanations for different variables can be made.

Another way which this research can be guided to is 3plsp other actions. 3plsp can provide their services in different areas like distribution, packaging, warehousing etc. so this study could be adapted to those. Environmental and logistics performance are similarly measurable in other areas and very needed part of the business. Even though environmental performance is very suitable for transportation due to its environmental impacts there is environmental issues related to packaging materials for example. In warehousing warehouse location and operational issues of warehouse are important issues for successful business.

Future research topics are now suggested for different transportation modes and different actions 3plsp do. What is not yet discussed or proposed is the logistics without a 3plsp. This study focusses on 3plsp their transportations which they do for their customer which is usually another company. Doing this research for company's internal logistics transportation which mean to focus on transportation which happen inside the company.

Significance of economy is usually major as all decision have some affection to the company financial issues. This research is about non-financial performance so one of the future research topics could be about financial performance. Finding out what transportations' performance measurement indicators 3plsp have for financial performance would give a whole new view for transportations performance indicators. In future could be also studying performance indicators and their selection from the

economy point of view and what is the significance of economy when selecting performance indicators for environmental or logistics performance. Also linking competitive advantage to indicators and to how achieve competitive advantage with indicators or their selection is one very potential option for future research.

One very potential way for future research is to do this same research but reassessing theory or framework or changing research method. Involving more participants would be one future research topic as then results of different companies could be compared. This research showed that company goals have great impact in performance measurement so another idea would be to focus mainly on goals affection and significance on performance and built the theory around them.

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Appendices

Appendix 1. Interview questions for environmental and logistics performance

Company goals

1. What are company's short-term, medium-term, and long-term goals for environmental performance?
2. What are company's short-term, medium-term, and long-term goals for logistics performance?
3. How often are the targets reviewed and updated?

Performance measurement systems

4. What performance measurement systems, frameworks or standards company have?

Performance indicators

5. What performance measurement indicators company use and for what purpose?
6. What are the key performance indicators among your performance indicators?
7. For what the selection of these indicators are based on? Are indicators selection based on goals or are goals built around selected indicators?
8. How often is data collected and analysed from indicators?
9. Have company managed to improve performance significantly? In other words, has the information obtained from the indicators been useful?
10. Which indicators the company may have found to be irrelevant or useless?
11. How often efficiency of indicators is monitored?
12. How are these indicators measured?