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LAPEENRANTA UNIVERSITY OF TECHNOLOGY
Business Administration
Master's Programme Supply Management

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HUMAN FACTOR-RELATED MISTAKES IN LOGISTICS INDUSTRY AND OPPORTUNITIES FOR THEIR REDUCTION

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ABSTRACT

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The problem of human factor-related errors tends to be a tragedy of commons and have its negative damaging impact not only in the healthcare or manufacturing, but also in the field of logistics industry. The previous studies aimed at discovering the logistics errors have supported this research with deep theoretical knowledge of operational errors and errors' related risks not only in general, but also project logistics, the critical human errors in all the prevalent modes of transportation and the already identified critical causation. However, the majority of the previous studies have shown the logistics-related mistakes only from a very general perspective, and so far no studies have comprehensively considered the operational mistakes in both container shipping and freight forwarding from a perspective of not only the main actors of logistics network, such as drivers and pilots, but also from the perspective of the actual logistics coordinators. Accordingly, the key objective of this study complies investigation and analysis of the significant human related mistakes and errors in container shipping industry and freight forwarding, as well as determination of the causes of the errors in logistics coordination to attempt its mitigation in the future. The research empirically examined the risk factors of the human errors, which concentrated on

the current logistics specialists of different age and professional experience. The study is also focusing on the influence of factors, such as: employee's motivation, time management, personal lifestyle, work management and work lifestyle, as well as mistakes and errors' attitude towards thereof. To be precise, a questionnaire has been chosen and employed as the key empirical data collection tool, after which the causes of errors identified were then evaluated with descriptive analytics and examined in the Analysis Chapter. Afterwards, the study represented the key findings of most contributing factors and finally discussed them in latest chapter of this thesis. In the end of the research, the managerial recommendations were suggested, and the idea of Business Logistics Intelligence was briefly introduced, which would guide managers towards more balanced and informed decision-making and as a result, would improve efficiency of logistics and forwarding operations. The key finding of this research is that the operational performance of any logistics-related service provider is largely affected by human-related errors, especially taking into account errors in manual computing and incorrect preparation of cargo supplementing documentation. The human-related errors are either caused by the manual daily routine-type tasks, performed on the automatic level with slips, mistakes on the basis of extensive experience of employees or by imperfection of human reaction and human information processing abilities. Other significant causes for human-related errors of logistics coordinators have been identified as stress, constant hurry with many performed tasks at the same time, as well as increased responsibility for arrangement of logistics services in constantly changing external environment.

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1 INTRODUCTION

To begin with, this introductory chapter will introduce the gap in the current scientific state recognised, the main objectives of the thesis, as well as formulated research questions.

1.1.   Study background and research gap

During last decades of logistics and container shipping industries, question of risks and vulnerability has captivated substantial debate in academic community. In fact, due to progressing globalization, shortened products life-cycles and the significant demand for lean production, the global logistics chains have become much more vulnerable than ever before (Tang *et al*., 2018).

The vulnerability of supply chains constantly occurs on all levels and is very difficult to quantify. Unexpected changes and unpredictability of human reaction in logistics appear because of unstable markets, mergers and acquisitions of corporations, global sourcing and the reduction of the suppliers' base, disruptions of supporting IT systems, lean manufacturing strategies, outsourcing and human mistakes. Moreover, globalization has resulted into the volatile demand, shortened product's shelf lives and forced increase of operations' speed.

Since logistics chains imply the network of diversified organizations including, but not limited to the freight forwarding companies, the consignors and consignees, stevedoring companies, trucking companies, shipping lines, the very fierce and complicated procedures between all the described actors, as well as the long distance between them, may give a rise for various operational risks and disturb the operations (Moslemi *et al*., 2016; Chang *et al*., 2015).

Thereafter, any disruption of any entity anywhere in the logistics network affects negatively the logistics actor's capacity and even competence to provide the logistics service on a satisfying level, serve the key goal to provide the goods to the end-customer from the point of origin and arrange the critical deliveries, once needed (Jüttner, 2005). In addition, any risk in the general supply chain imposes financial loses, usually results into decreased sales

and affecst assets utilization (Wagner and Neshat, 2012). Such consequences are highly undesirable by any entity in the supply chain.

In such regard, previous studies have addressed various risks categoris related to container shipping and logistics, described as: *technical or mechanic-related risks, economy or market fluctuations related risks*, *industry or business and operational risks*. The technical risks are mainly related to the manufacturing, engineering of the fleet and the losses arising thereof, whilst the market risks embrace revenue and investment vulnerability in the supply-demand uncertainty. (Chang *et al.*, 2015).

By the same token, the business risk includes the risks associated with the business character and is related to the forecast of the pricing, as well as potential levels of deviation in selling and costs. (Yip and Lun, 2009) In shipping of containers, the industry-related risks are connected to increased possibility of the container line to reduce the service prices because of the fierce competition on the market (Yip and Lun, 2009). Operational risks are out of specific interest and are the ones arising from the logistics processes, directly affecting the daily performance of corporations and success of physical goods distribution (Chang *et al.*, 2015).

With rapid and continuous growth of logistics industry, there is a strong need for agile logistics chains to deliver the goods at the right place, right quantity and right time (Chang *et al.*, 2015; Vilko, 2012). Staying competitive in an environment, where logistics activities in the majority of industries account for up to 50% of the customer promise, requires smooth operational performance and end-to-end logistics network visibility (Generix, 2018).

However, there is still high occurrence of operational risks in container shipping that are sometimes difficult to detect and require a number of resources to cope with. The risks include: documentation' arrangement errors, order placement errors, errors in making invoices, errors in customs regulation and security stndards obedience, transport congestions; all of them negatively affect the operational performance of a corporation and happen every day (Drewry, 2009). Analyzing the drivers for these risks and detecting the critical risk factors is necessary and is already half way to mitigate thereof.

There have been numerous logistics disruptions observed by the corporations and even industries in history. Such issues as lost or damaged cargo, terrorism attacks, and

transportation of empty containers or service schedule's unreliability are constant challenges faced in maritime community, imposing direct financial losses and boosting the number of customers leaving. In 2002, singularly, the transportation of empty containers has resulted into fifteen billion dollars loss for the world containership (Chang *et al.*, 2015). To be precise, Drewry (2006) has reported that empty container shipping and inappropriate allocation of containers is accounting for, at best, 20 percent of the incorrect port daily routines since the end of 90s.

It is vital to mention that the causation of error itself and harshness of errors in transportation is related to logistics information error or wrong container data setting. (Chang *et al.*, 2015; Cho et al., 2018). For instance, shipping managers in 3PL Logistics providers have been constantly complaining about neglecting attitude of shippers and the hidden cargo information.

Hidden cargo information in container shipping means that customers deliberately do not specify the vital cargo details (e.g. gross weight, quantity of bags, description of goods etc.) during the process of container and shipment booking. Consequently, these documentation errors can cause the delays, penalties and detainment of the ship for customs clearance after the cargo has crossed the borders of a foreign country. Such a risk factor is ranked first in respect to types of consequences- reputation & security incident-loss; and direct financial loss (Moslemi *et al.*, 2016; Chang *et al.*, 2015).

However, deliberately hidden information in logistics is not the only cause for problematic situations. Human error and no counter reaction for the occurrence of logistics information systems error (such as Transport management system, Enterprise Resource Planning, Business Process Management etc.), as well as disruption of information between supply chain participants are the substantial reasons for the operational disruption (Cho et al., 2018).

The loss of human attention and reliability are the ground factors for the occurrence of the operational risk, as decision-makers are involved in every entity of supply chain. Specifically, people that are playing an important role in transportation as a system, execute a diverse number of time-consuming actions including following on the status of

1.1.3PL Logistics provider is an organization, which provides arrangement and coordination over the movement of goods between origin to end-customer, including warehousing, shipping, storing, packaging etc. Source: Holden, n.d.

delivery administering the physical movement of cargo and the supporting customs operations. During the process of performing such daily routine, individuals are destined to failures due

to so called "human factor". The most common human factor-related mistakes will be discussed later on in the literature review and linked to all types of transport available.

Notably, there have been limited studies addressing human error as one of the causes for the operational risk in logistics. In fact, human behavior in supply chains is substantially unexplored, especially the decision-makers' behavior and "wrong" decisions that in consequence lead to lower performance and influence the other stakeholders along the supply chain (Brauner et al., 2013). Among scarce literatue on this topic, Janno and Koppel (2018) have addressed the operational risks in logistics as a risk of human nature or operations-based failure caused by human error.

With all studies focusing on various operations-based risks and the factors of thereof, very limited research has focused on critical human factor-related mistakes in logistics and shipping from the view of actual coordinators, responsible for arrangement of the operations. Indeed, such a study would be useful as knowing the critical human mistakes will help the managers to mitigate the consequences from the errors that may disrupt the processes efficiency and have a destructive influence on supply chain. For example, defective or inappropriate cargo handling equipment, as a man-made mistake, in Western-African ports has resulted into rumors and reputation of ports of poor productivity, and even cargo accidents, while mistakenly shutting off the functioning engine has caused the flameout of TransAsia Flight 235 and 43 fatalities (Loh & Thai, 2015; NewsComAu, 2015).

Mitigation of this error would result into 43 saved lives and the increase of physical cargo flow as well as the wellness of Western African ports' reputation. Investigating the critical human factor-related mistakes is, therefore, necessary for the increase of investments, human training or automation for the most severe errors and cutting te financial provisioning for the small errors and mistakes.

This study represents crucial seminal research. As it has been mentioned earlier, there have been very limited research available on operational risks in logistics and from a very general risk analysis perspective (Chang *et al*., 2015, Moslemi et al., 2016), but there is not any research investigating the human errors in freight forwarding and operations of container shipping and logistics as the cause for the operational risks too. Furthermore, human-error mistakes have only been investigated in supply chains as the technical mistakes in manufacturing (Bevilacqua & Ciarapica, 2018) or port procedures or operating the vehicles

(Dhillon, 2010), which does not imply the order fulfillment or documentation errors occurring during the service provision by 3PL providers. In that regard, this research will both theoretically and empirically investigate and determine critical source of mistakes caused by humans in the container lines and 3PL providers' service fulfillment side by also employing the descriptive analytics. Later in the discussion part, the managerial recommendations on HRM assessment and mitigation strategies will be suggested.

In addition, when it comes to assessment of human errors within the context of risk management, it is vital to mention Human Error Identification techniques (HEI) employed in process management. Most of them have repeatedly focused on measurement of probability of mistake occurrence and take into account the Risk Index. Risk Index is, therefore, usually determined for human errors as the product of two factors: Probability×Consequence (Bevilacqua & Ciarapica, 2018).

Probability in this case is specified as the possibility for hazardous event, whilst, for instance, taking into consideration production, risk consequences will be analyzed based on the potential injuries of the human force, the environmental impact, the economic loss and loss of reputation. (Bevilacqua & Ciarapica, 2018). In logistics and shipping, the potential consequences considered by experts could be including, but not limited to economic loss, loss of reputation, delays, and potential injuries/fatalities. Meanwhile, there have not been any studies dedicated to Human Error in service logistics.

Most commonly used techniques to identify the human errors in other industries are:

1.1 Technique for Human Error Prediction (THERP),

1.2 Human Error Assessment and Reduction Technique (HEART),

1.3 Success Likelihood Index Methodology (SLIM),

1.4 Human Error Hazard and Operability (HAZOP) analysis,

1.5 The Human Error Identification in Systems Tool (HEIST),

1.6 The Psychological error mechanism (PEM)-based analysis, as well as

1.7 Human Reliability Analysis (HRA) and,

1.8 Human Failure Mode and Effect Analysis (Human-FMEA) (Bevilacqua & Ciarapica, 2018; Castiglia et al., 2015; Kirwan, 1998).

By implying these techniques companies get closer to understanding the human error causes, such as potentially inappropriate speed of performance, operation being carried out without necessary authorization, substantial procedure forgotten, inadequate control system or knowledge of the operational procedures, incorrect loading or lifting, lapse of concentration etc. In fact, such human error causes are also called in industry as performance shaping factors (PSPs) and have a direct effect on the error increased probability (Bevilacqua & Ciarapica, 2018, De Ambroggi & Trucco, 2011; Kyriakidis *et al.*, 2015).

Nevertheless, to fully comprehend human error causes, including human factor, companies require a substantial amount of data not only to come up with additional rules and methods to mitigate thereof, but also to visualize the relationships among human factor and patterns leading to the same critical consequences. For that aim, big data analytics with the help of sophisticated analytic techniques, such as: data mining, statistical analysis, predictive analytics were introduced. In Supply Chains and logistics, the integrated business analytics is called Supply Chain Analytics (Tiwari *et al*, 2018).

Therefore, the key idea behind SCA lies in the interrelationship between so called SCOR model, which is defined by a principle of planning, sourcing, delivering, and returning; and integration of various analytics tools, also including predictive and prescriptive analytics (Souza, 2014; Tiwari *et al*, 2018). The most significant objectives of employment of Big Data Analytics can be classified within the levels of strategy, operation and tactics. Strategic supply chain analytics can be utilized in procurement, as well as used in the phase of production or design of the potential cargo, whilst both in operation and tactics, particularly in the phase of demand forecasting, warehouse operations, logistics-related planning. (Wang et al, 2016).

SCA methods are divided into the following classes of descriptive, predictive and prescriptive, for a reason in supply chains. The descriptive analytics is helping in controlling the on-going processes together with constantly updated information on locations and cargo amount to adjust delivery schedules, replenishment orders, changing the transportation

modes and the agility of supply chains (Tiwari *et al*, 2018). The data sources in such cases are the global positioning system (GPS) data for the tracking ships and trucks, radio frequency identification (RFID) on pallets and cartons, as well as barcodes' traditional transactions (Souza, 2014).

Consequently, the data received is visualized and exchanged in various Information systems, as Enterprise Resource Planning, as well as Warehouse Management Systems. When integrated into supply chains, descriptive analytics helps the inventory managers to trigger the replenishment orders when the inventory level is low, whilst result into significant cost-savings by reducing the excessive orders and transportation thereof. With better grasp of descriptive analytics data, corporations also have a chance to reduce the bullwhip effect along the supply chains by improving the quality and accurateness of information transmitted between the supply chain entities, as well as reducing the total handling costs of inventory.

While descriptive analytics is used to derive the problems and opportunities from real-time high-volume data, predictive analytics aims at determining explanatory or predictive patterns with the help of text, data and web mining to predict the future trends (Mani et al., 2017). Predictive analytics can be used through all the processes of supply chain starting from forecasting the customer's demands and buying statistics up to identifying the levels of sales over the years. (Tiwari *et al*, 2018; Nywlt and Grigutsch, 2015)

Predictive analytics can also help to forecast the demand for controlling the manufacturing quantities, right time for the seasonal promotions, the safety stock of inventory, even identify the high-quality supplier's characteristics with the optimal cost of the vendor's contract. In containerized shipping, prediction of demand may help allocation of containers on the vessel ideally months in advance, to save a spot for highly important customer and avoid rescheduling that sometimes happens because of the overbooked vessel.

Prescriptive analytics is deriving the decision-making recommendation from both the predictive and descriptive analytics, and mathematical optimization modeling. The question that is answered with prescriptive analytics is, what should be happening. Optimization of production is one of the common examples of utilizing the prescriptive analytics in supply chains (Tiwari *et al*, 2018; Nywlt & Grigutsch, 2015).

In essence, a number of studies have approved the usefulness of big data analytics (BDA) in supply chains by stating that BDA helps in efficient clarifying flows of information for constructive decision-making with the goal to increase firm's performance, automate the routine-based actions. BDA is now, in fact, a major differentiator between high-performing and low-performing firms, which allows to decrease the customer's acquisition costs by 47 percent and increases the revenue by 8 percent (Tiwari *et al*, 2018; Nywlt & Grigutsch, 2015; Pearson, 2002).

There are several BDA techniques that support operations decisions and include data mining, data analysis, business intelligence, machine learning that all are capable of handling vast volume of unstructured data and help in making fact-based decisions (Tan *et al*., 2017). However, it seems there is still a difference in big data theory stating the positive changes of traditional supply chains and companies that manage supply chains and integrate the BDA empirically (Brinch *et al*., 2017). There are two reasons behind: 1) lack of knowledge of decision-makers regarding the analytical techniques, and 2) lack of substantial basis for the data analytics (Tan *et al*., 2015; Tan *et al*., 2017).

Understanding decision-makers' behaviors in supply chains is still not complete. Due to the natural irrationality of humans, they can be subject to many internal (inside-firm) and external (private) influences that are reflected on their corporate performance (Dayer, 2018). Thus, by discussing the human-errors as the cause for disruption of supply chains and the consequences human errors can lead to, the 3PL providers and container lines, with a deep analysis of the high-volume real-time data, can agree on a set of critical contributing human and corporate factors, and later on attempt for an improvement. So, the operational results will get better and the operational risks in supply chains will decrease.

Therefore, with the most important points of the theoretical knowledge described previously, the figure below shall represent the research gap identified for this study.
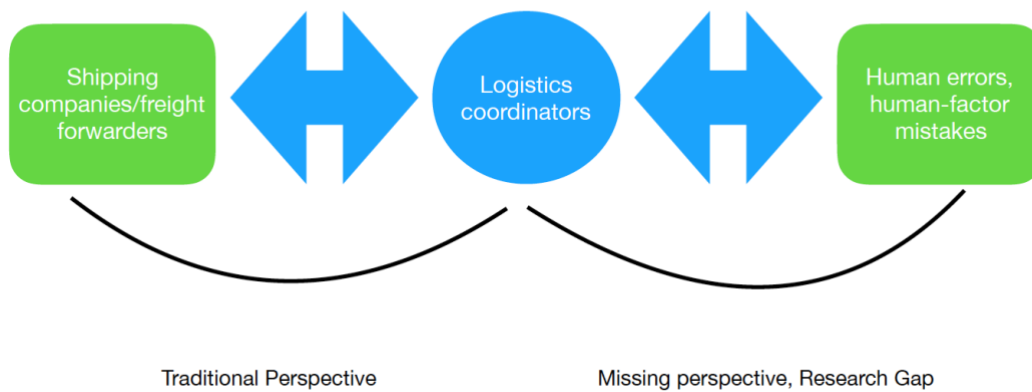
Figure 1: Research gap in causes for operational risks in Supply Chains. Source: The Author

1.2.   Goals of the research and research questions

As per the previously presented research gap, this study will empirically investigate causes of human factor-related mistakes in container shipping and freight forwarding companies.

In order to be precise, this research will assess the causes for human-factor related mistakes as the reason for the operational inefficiency. The research will examine the critical human factors affecting the human mistakes in logistics and transportation industry, as well as the consequences of thereof.

There is a primary goal in this thesis:

1. To analyze the role of human factor-related mistakes in logistics,

   1.1. with the help of previous literature, to identify the potential Human-related mistakes in logistics,

   1.2. to determine the causes of HRM with the help of available literature and find out the relevance of the HRM causes for the logistics coordinators by employment of descriptive analytics,

The expected outcome of the thesis is:

   1.   Determination of the causes of the human related mistakes in logistics industry, particularly for the logistics coordinators in freight forwarding and container shipping,

The study is determined to obtain the answers, by the end of the research, to the following key research questions:

RQ1. What is the role of human factor-related mistakes and errors in logistics industry?

RQ2. What are the causes for human-factor related mistakes in container shipping and freight forwarding?

The answer to the first question will be revealed with the help of literature background and earlier available theoretical knowledge.

The second question will be answered by the literature review, the empirical part and with the help of quantitative survey of the personnel involved into logistics industry, as well as finalized with statistical analysis. Afterwards, the managerial recommendations are presented together with the key results.

1.3. Thesis structure

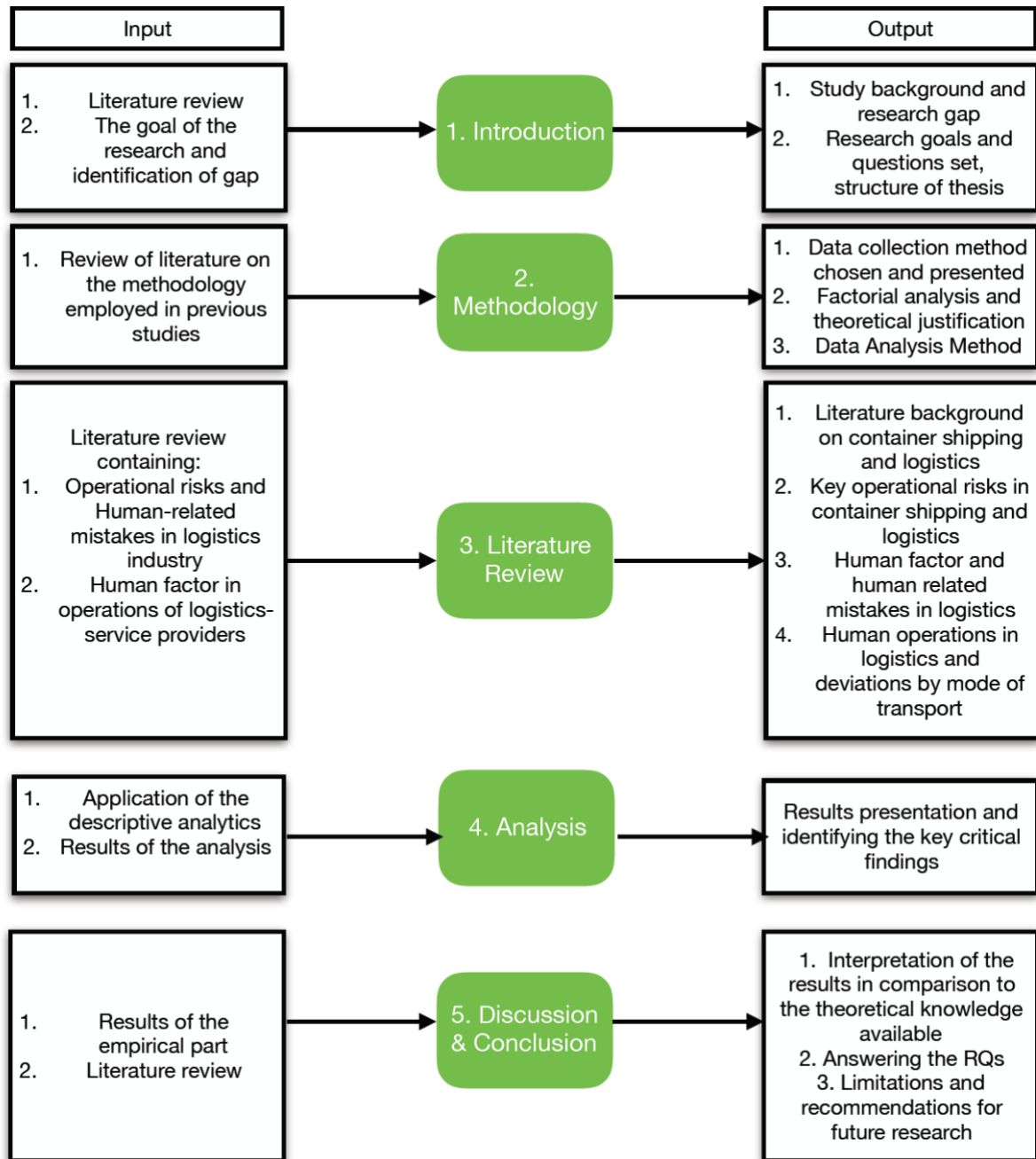| Input		Output
1. Literature review 2. The goal of the research and identification of gap	**1. Introduction**	1. Study background and research gap 2. Research goals and questions set, structure of thesis
1. Review of literature on the methodology employed in previous studies	**2. Methodology**	1. Data collection method chosen and presented 2. Factorial analysis and theoretical justification 3. Data Analysis Method
Literature review containing: 1. Operational risks and Human-related mistakes in logistics industry 2. Human factor in operations of logistics-service providers	**3. Literature Review**	1. Literature background on container shipping and logistics 2. Key operational risks in container shipping and logistics 3. Human factor and human related mistakes in logistics 4. Human operations in logistics and deviations by mode of transport
1. Application of the descriptive analytics 2. Results of the analysis	**4. Analysis**	Results presentation and identifying the key critical findings
1. Results of the empirical part 2. Literature review	**5. Discussion & Conclusion**	1. Interpretation of the results in comparison to the theoretical knowledge available 2. Answering the RQs 3. Limitations and recommendations for future research

Figure 2: Thesis structure representation. Source: The Author

The figure above represents the organization of the thesis, which presented the structure as follows: Chapter 2 or the Methodology part will describe the data collection methods employed in the thesis, the factors under investigation and their theoretical justification, as well as brief sub-chapter on the data analysis techniques employed generally and in this thesis particularly. When it comes to the following section 3 or Literature review, firstly the background on the container shipping and logistics will be provided, thereafter the mistakes and errors in logistics, container shipping and freight forwarding will be discussed from

different points of view, especially from the view of existing operational risks. The critical human-related mistakes in all modes of transport will also be identified.

In Chapter 4, the analysis of the data with descriptive analytics will begin and the results of the descriptive analytics employed will be revealed. Consequently, the following chapter will contain the results of the study, which are going to be debated in comparison to previous literature available, and the relevance of the theoretecial knowledge together with the empirically collected and analysed data will be proven.

Finally, the conclusion chapter will be present, where the limitation and challenges of conducting research will be illustrated. Correspondingly, the managerial recommendations and the suggestions for further research will also be revealed.

2 METHODOLOGY

In this part of the thesis, the methodological design is discussed. The choice of reserch method is justified together with the description of emplirical data collection technique and analysis are presented.

Quantitative research together with deductive approach is chosen as the primary analysis instrument, due to a continuously developing topic of human errors that has been familiar to many logistics industry related organizations around the globe. According to the previous literature available for this topic, which is going to be particularly described in Chapter 3, quite significant amount of the organisations face errors in cargo loading procedures, driver's errors, incorrect cargo handling in the ports, complications in the import procedure due to mistakes in the documentation, sometimes unprofessional forwarding service. Therefore, there is a missing perspective of errors in operational freight forwarding, container shipping lines, trucking companies caused by office clerks or contributors, responsible for the initial organization of the logistics activities.

Quantitative research method, meanwhile, is the empirical research instrument common for the social phenomenon or human struggling, which is helping in testing theories and

gathered and assessed quantitately variables. These variables are, thereafter, analysed with chosen data analysis methods to identify, whether the question of interest is proven with the analyzed theory (Cresswell, 1994; Yilmaz, 2013) Precisely, quantitative approach in researching helps to obtain a generalized set of findings, with deduction capture the relationship of the variables, predict the outcome of the studied phenomenon. (Yilmaz, 2013)

By the same token, another reason for choosing the quantitative research lies in the fact of simplicity of data collection process, since the numeric results can be easily subjected to "statistical treatment" of any mathematical models. (Yilmaz, 2013)

Due to the wide availability of the forwarding, shipping and trucking specialists around the world with the very different behavioural patterns, the quantitative research in this case is chosen to collect and quantify the data about the various work-related procedures of such employees, the personal habits, the time management practices, the errors' and their attitude to thereof, as well as motivation, which will help in identifying the common reasons for the human related mistakes in logistics. As a result, the following variables have been chosen for a study: Motivation, Time Management, Personal lifestyle, Work management and work lifestyle, Mistakes and errors.

The deductive approach is chosen on the grounds of starting from the available theoretecial knowledge observation and continuing the research with the emperical investigation of the causal relationships between the variables, measuring the concepts quantitatively, followed by the generalizations of the research findings. Even though the problem of human errors in container lines and logistics was firstly and foremostly observed by the author being in the industry, whilst later been proven with the existing literature, the deductive approach, which complies the theory as the first source of knowledge, is still employed and is justified with the Literature Review discussed later on in this thesis.

2.1. Data Collection

The data collection method in this research is consisting of a questionnaire. Therefore, the **sample** includes the specialists, working in the field of logistics, particularly in freight

forwarding business, trucking companies, shipping lines customer services, broker services, stevedoring. The age of the participants of the study is varying between 18-24 years old (10.81%), 25-34 years old (45.95%), 35-44 years old (18.92%), 45-54 years old (13.51%), as well as 55-64 years old (10.81%). All of the respondents are currently up to these days involved into daily logistics operations. In addition, the majority of the questionnaire participants have received higher educational level, including, but not limited to bachelor's and master's degrees. The sample complies logistics specialists, mostly from Finland (37.4%) and Russia (35.14 %), followed by specialists from Germany (5.41%), Brazil (5.41%), Vietnam (2.70%) and others (13.51 %), including representatives from Belarus, Norway and France.

Questionnaire refers to data collection method, which includes each person to react to a specifically priorly arranged quiz. Questionnaire is one of the most common techniques in gathering the data for the research, due to efficiency the method provides with, when all of the respondents are requested to answer same questions within large sample. (Miles & Gilbert, 2005) Questionnaire is used in this case study, enabling the collective examination of the participants working in logistics. The group of 33 individuals is adopted for studying RQ2.

Additionally, the research questions are aimed to be answered with the literature background and the key facts from thereof, as well as by empirical part of the thesis and empowering statistical methods, such as descriptive analytics.

Based on the gathered empirical data, statistical analytics will be taken in order to the determine patterns of collected data and drawing conclusions through the analysis. Data were analysed with employment of descriptive analytics, specifically mean statistics and the standard deviation. This approach has been chosen due to the more convenient way to collect the data from a larger sample, as well as usability in assessing the data empirically. Since the data was not altered during the process of analysis, except for the standardization of results into equally normalized numerical values, for the convenience of descriptive analytics method employed.

The variables mentioned above are to be analysed after the data collection is complete; the relationship between the views and opinions of a chosen sample are going to be statistically measured, which will help to identify the vital influencing variables and, possible most critical causes of the mistakes occurring in logistics. Since the causes of the errors generated

by the logistics related specialists are of particular interest in this research, the observational study method is chosen to observe and analyse the behavior of the logistics-related employees.

2.2. Factorial analysis

In the particular questionnaire used as a data collection technique in thesis, the individuals are going to answer the predetermined questions in order to test the following factors: motivation, personal life-style, work management & work life style, time management, as well as mistakes and errors or mainly, the causes & consequences and the personal attitude towards thereof.

All of the analysed influential factors are represented in the table below, together with the theoretical justification.

The survey's navigating questions will be based on the proven theoretical knowledge available, as well as part of the questions will be adapted from the author's knowledge and the real-life cases of the surrounding logistics specialists, in order to deepen the knowledge of specifics in the studied field. The aimed data collection method also includes the questionnaire as the source for obtaining more research-focused data.

Table 1 Theoretical Justification for Factors under research

Factors	Theoretical justification
Motivation	Deci et al. (1989).Self-determination in a work organization, Hansen & Levin (2016) The effect of apathetic motivation on employees' intentions to use social media for businesses, Mamycheva et al.(2016) Instrumentation Organizational and Economic Support of Labor Motivation of Employees, Bhatti & Haider (2015) The Impact of Employees' Motivation on Performance, Amabile (1993) *Motivational synergy:* toward new conceptualisations of intrinsic and extrinsic motivation in the workplace, Sheikhtaheri et al. (2018) Physicians' Perspectives on Causes of Health Care Errors and Preventive Strategies: A Study in a Developing Country, Hanaysha & Majid (2018) Employee Motivation and its Role in Improving the Productivity and Organizational Commitment at Higher Education Institutions, Campbell (1997) *Mission statements*, Mullane (2002) The mission statement is a strategic tool: when used properly, Phanuel Kofi Darbi (2012) Of Mission and Vision Statements and Their Potential Impact on Employee Behaviour and Attitudes:, Van den Steen (2001) Organizational Beliefs and Managerial Vision, Bart et al. (2001) A model of the impact of mission statements on firm performance, Malik et al. (2014) Rewards and employee creative performance: Moderating effects of creative self-efficacy, reward importance, and locus of control, Olido & Bilbert (2015) The Importance of Self Efficacy and Employee Competences in Employee Performance, Herbers (2012) The Virtues of Self-Importance, Aguinis & Kraiger (2009) Benefits of Training and Development for Individuals and Teams, Dysvik & Kuvaas (2008) The relationship between perceived training opportunities, work motivation and employee outcomes, Nerstad et al. (2018) Perceived motivational climate, goal orientation profiles, and work performance., Tansky & Cohen (2001) The relationship between organizational support, employee development, and organizational commitment, Latham (2004) The motivational benefits of goal-setting;

Personal lifestyle	Halpern, M. (2001). Impact of smoking status on workplace absenteeism and productivity, Fapohunda, T. (2014). An Exploration of the Effects of Work Life Balance on Productivity, Reynolds, J. (2004). When Too Much Is Not Enough: Actual and Preferred Work Hours in the United States and Abroad, Swanson et al. (2010). Sleep disorders and work performance: findings from the 2008 National Sleep Foundation Sleep in America poll
Time Management	Amponsah-Tawiah, K. (2018). Time management: Presenteeism versus management-by-objectives, Reynolds, J. (2004). When Too Much Is Not Enough: Actual and Preferred Work Hours in the United States and Abroad, Shih, S. (2017). Factors Related to Taiwanese Adolescents' Academic Procrastination, Larco, J. (2018). Scheduling the scheduling task: A time-management perspective on scheduling, Ahmad et al. (2012). The Relationship between Time Management and Job Performance in Event Management, Macan, T. (1996). Time-Management Training: Effects on Time Behaviors, Attitudes, and Job Performance, Jackson et al. (1983). Preventing employee burnout, Orpen, C. (1994). The Effect of Time-Management Training on Employee Attitudes and Behavior, Jex, S. and Elacqua, T. (1999). Time management as a moderator of relations between stressors and employee strain;
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Variable: *Motivation*

To begin with, the empirical investigation of the association among motivation and the productiveness, has been widely studied previously (e.g., Deci et al., 1989; Hansen & Levin, 2016; Mamycheva et al., 2016) The studies of motivation tend to focus on the inspiration of the human being by the specific subject. Such inspiration is converted into the overall organization's productivity, which at the same time endorses the competitive advantage of the corporate institution. (Bhatti & Haider, 2015) That is why organizations put maximum of effort into keeping employees as much motivated as possible, in order to keep the employee's performance on high level continuously. Motivated employees tend to become,

over time of organizational investment into each and every employee, much more enthusiastic for achieving the desired, by organization, achievements. (Bhatti & Haider, 2016; Amabile, 1993)

Otherwise, the unmotivated employees contribute much less to the job operations, tend to avoid the working place as much as possible, as well as perform low quality work. (Amabile, 1993) A good example to show, how practical the study of linkage between the employees' motivation and the errors occurrence is, may be found in the field of medicine & healthcare.

Even though the key causes to the dramatic medical errors are fatigue due to extremely long working shifts, insufficient budget, lack of monitoring and inappropriate education, the physicians have acknowledged the high efficiency of the managerial strategy, represented by motivating personnel to constantly study and upgrading the existing knowledge. (Sheikhtaheri *et al.*, 2018).

The less the physicists are motivated for studying and upgrading the medical competences, as an example, the more errors they cause with time, due to lack of appropriate and in time education. In addition, Hanaysha & Majid (2018) have suggested that creation of sufficient motivational incentives is among the most resource efficient ways to reach the organizational objectives, whilst keeping the employees constantly productive.

Belief in the organization or in other words, a concept of an employee sharing the corporate mission and vision, was studied by several authors as well. In fact, mission and vision tend to help in constructing a shared sense of objective for employees, together with serving as a pipeline, through which the employees' focus is collaborated. (Campbell, 1997; Mullane, 2002; Phanuel Kofi Darbi, 2012; Van den Steen, 2001)

In fact, Mullane (2002) claims that the mission's effectiveness as sort of behavioral guidance for the employees is linked to the way the employees collaborate in creating the value of obligation in persuing objectives. Similarly, Bart et al. (2001) has proven that in case of existence of a mission, it may in a positive way, influence the employees' behavior, when the organization has presented commitment and has arranged the supporting internal environment. Such positive behavior of the employees had the direct effect on the financial result of the whole company.

In the opposite way, without the clearly defined mission & vision and/or established internal policies supporting the belief in the organization, positive behavior of employees may diminish or may never reach the necessary for the corporate's prosperity level.

On the other hand, self-efficacy of an employee or self-confidence that an individual has the capacity to accomplish a certain assignment and being professional enough "to meet the situational demand", tend to stimulate employees to engage into the tasks, whenever employees have the confidence of being able to perform the task well & creatively. (Malik et al., 2014) Similarly, the research of Olido & Bilbert (2015) has shown that there is a positive relationship of the individuals' self-efficacy and the level of accomplishment same individual has as an employee.

Their regression analysis of a study of more than 103 respondents has indicated that both self-efficacy and personal characteristics can be important variables in predicting the employee's performance. In addition, Herbers (2012) has pointed out in the *Investment Advisor* that by coaching the employees and nourishing their desires to make the most of the goals set, in their own way instead of controlling each step, is a secret to corporation's success.

Growth possibilities for an employee, or in other words, development potential is identified as also an effective solution for enhancing employees' performance. (Aguinis & Kraiger, 2009) Development possibilities are usually vital for the employees, since the employees, when given a chance to evolve professionally, as a result, are given new skills, potential knowledge, as well as professional growth, which provides with the option of rising up the career ladder. In turn, employees perform better at the job and pursue, generally, more stability in the organization. (Dysvik & Kuvaas, 2008; Nerstad *et al*., 2018; Tansky& Cohen, 2001)

Moreover, the person's perception of the provided benefits and opportunities may increase the work performance in this regard, as well as endorse the employee's belief that the employability and contribution of this particular person is vital for organization. That is the reason why the employees start working harder and achieving far greater results. The employee is less looking for job alternatives and the employees' turnover is decreased across the organization. (Nerstad *et al*., 2018)

In addition, Latham (2004) has highlighted the importance of the goal-setting and its motivational benefits. He presented the idea of causal mechanisms and its effectiveness in four general steps. First of all, whenever a person is committed to a certain goal, the attention is very narrowly driven towards the target related actions and tends to be diverted from the irrelevant for target achieving activities. Secondly, having the goal itself motivates and gives energy to most of the people, especially pursuing challenging targets. Challenges force people to go for an extra mile and, generally, try harder, comparing to pursuing an easy-achievable goal, regardless of cognitive or physical resources required in achieving the target.

Thirdly, Latham (2004) suggests that complex goals bring persistence, since by constantly trying hard to achieve the sophisticated targets, the effort is being constantly prolonged; fixed deadlines push for a more rapid pace of work for employees. Last, but not least, any goals bring as much as motivating people in order to pursue theereof, using knowledge already obtained or by gaining knowledge necessary to be applied.

Variable: *Personal lifestyle*

The variable of personal lifestyle refers to the daily activities and the habits of the employees that may influence directly the job performance of the employees. As an example, the study conducted by Halpern *et al*., 2001 has been aimed in evaluating the smoking effect on the individuals on the productivity at work with prospective cohort study.

As a result, Halpern et al., 2001 have found out that currently smoking individuals experience significantly much more absenteeism at work, comparing to the employees that have never smoked before, with an intermediate result for the former smokers. It has been noted also that with the former smokers experiencing cessation, absenteeism has declined significantly over the years, whilst productivity has a tendency of general growth by 4.5%. With this being noted, the employers experience not only the usual direct medical costs associated with the constant smoking employee's possible decreasing health, but also the indirect costs related to the absence of the employee at work shown in less time of the employee spending whilst performing the daily working tasks. (Halpern et al., 2001)

In addition, according to Fopohunda's resesrch (2014), the personal lifestyle is directly representing balanced or non-balanced work lfe harmony, which is largely affecting the employees' productivity, general work performance and the work-related gratification. The central focus of the worklife balance or the personal lifestyle rotates around the conception of time.

Whenever the employees do not have the possibility to balance out the time spent at work together with the time spent on hobbies, families, individual outside of work plans, such tendency might result into worsening health indicators (both mental and physical), endangered safety and boostened stress. (Fopohunda, 2014; Reynolds, 2004).

A good example of the lack of sufficient work-life balance is related to chronic sleep deprivation, which is a tragedy of commons for many industries. According to the study of Swanson et al., (2010) sleep disorders are directly associatied with the unfavorable work performances among the American employees, including, but not limited to increased absenteeism and job-related occasional accidents.

Among the consequences of the sleep disorders might be insomnia, obstructive sleep apnea, shift work-related sleep ataxia. When it comes to insomnia, caused by sleep disorders, the reducd productivity or presenteeism and absenteeism are the most commonly addressed linked to individuals with insomnia. As an example, given by Swanson et al., (2010), the professional accidents have happened much more often within the French employees, defined by experiencing partially insomnia, compared to the individuals with a good rate of sleep.

In addition, the pressures of the various demanding tasks at work, which automatically manifest into longer hours and overworking, later on result into increased tiredness and decreased quality of the managed tasks by the employee. In that sense, the working obligations push the individuals to choose between the career accomplishments and balancing roles. (Fopohunda, 2014)

Variable: *Time Management*

Amponsah-Tawiah et al. (2019) stated that management of time is one of the most vital resource for both the companies seeking for the business development and constant improvement, as well as the individuals that are looking for ways to spend time.

According to Reynolds (2008), the time management is the state of achievement, when with the goals set, the prioritization of future work is arranged on the basis of the striving of people to goals and the achievement of thereof. The key idea of time management lies in that, whenever there are a lot of tasks to undertake, individuals seem to not have sufficient time available for the individual plans of desire.

Time Management, however, tends to help in identifying and prioritizing the needs and wants as per the importance measurement and required resources to process thereof. The process of time management, however, brings order into the actions, boosting the productiveness of the individual both during the working process and the individual goals' fullfilment. (Reynolds, 2008) Moreover, motivation together with performance are showing impressive results, when there is a particular goal set, which is challenging and adequate enough. (Amponsah-Tawiah et al., 2019; Locke and Latham, 2006) Therefore, the less individuals are able to focus on time management both in work and daily life, the more decreasing the overall working productivity will be.

Macan T.H. (1996) has earlier attempted to capture the influence of time management trainings arranged for the employees on the employee's feelings and overall job performance, however, contrary to author's expectations, the paprticipants of the research did not report back then their increased engagement into the more frequent time-management behaviors immediately after taking the training on time management. However, the respondents have claimed, after four to five months after the training, they perceived more control in time.

This may be explained from the human perspective of the self-comparison and benchmarking of the behaviors against the other co-workers. This may be proven by the study of Maslach (1982) in comparative knowledge, which, according to the study, affects the negative perceptions and self over judgement, together with the other burnout associated issues. In addition, the respondents that have been engaged into the training have claimed after few months that with the enhanced control of time, they have experienced that less stress enhanced job satisfaction. (Macan T.H., 1996)

Equally important, the study of Ahmad N.L. (2012) related to connectivity of time management and job performance in Malaysia, has proven that, with the tight time frames involved in the

daily activities of Event Management and the constant deadlines to be met, the job performance of employees in the companies were generally much more influenced by the time management and scheduling in successful accomplishments of assignments at work.

Variable: *Work Management and Work life-style*

Work Management and Work life-style in this thesis complies a variable, including but not limited to such sub-factors as Communication at work, Guidelines and Training, Corporate Profit Analysis by the employee, Physical & Mental Environment at work, Problems and challenges, Competition and teamwork, attitude of supervisors etc. The full representation of the sub-factors can be seen in the Figure 7, Analysis Section of the thesis accordingly.

To begin with, the previous research has investigated the connectivity of training possibilities and productivity of the employees, which has led to the following outcome: investing into training possibilities of the employees by enhancing their problem-solving skills, teamwork and relationships with the co-workers, as well as advanced decision-making tends to result into the beneficial results for the organizations. Since the prosperous future of any organization depends on the human skills and human resources (HR) as such, the level of the HRs knowledge, skills and experience is fundamental for any firm.

The necessary trainings do not only improve the Human Resources generally, but also gives an opportunity to learn deeply, and sometimes virtually, from a different perspective about the performed objectives and increase competences of thereof, which may not certainly lead to negative outcome. (Bartel, 1994; Colomba & Stanca, 2014; Russel et al., 1985; Singh & Mohanty, 2012) Professionalism in logistics, meanwhile, is appreciated as much as in any other industry.

In addition to the above, the productivity of the employees and their performance indicators may get influenced by the external working atmosphere and the level of comfort at the regular working place. One of the examples of the comfort conditions for the employees is Indoor Environment Quality (IEQ). The IEQ of office, once fresh and pleasant, is having the direct influence on the life quality of the employees, as well as the productivity and life satisfaction of office workers. Comfort of the employees has been also identified in the other relative studies as the satisfactory condition or a feeling of mind and physics of an individual via cognitive process, which includes, but not limited to indoor comfortable

temperature, pleasant humidity, individuals' metabolism rate. At the same time, with employment of PMV parametric analysis, it has been found out in the study of Kosonen (2004) that for the tasks requiring cognitive functions, such as analytical mindset employment or thinking, the performance level of the employees has decreased by at least 30%, when the room temperature has reached over 27 celcius or higher, with the normal room temperature is being 21 celcius.

Regarding the typing tasks, performance has also decreased by 30% in the conditions of higher than average temperatures. These statistics tend to be even more actual in the current European situation of highly increased heatwave due to Global warming, which leads European countries, such as France, Germany, Croatia, Belgium to extreme temperatures that the local citizens are not used to work and live in. (The Guiardian, 2019) Relative humidity, as per Kosonen (2004) also tends to affect the productivity. Higher than 65% humidity is considered harmful for the thermal comfort of the human beings due to worsening of the quality of the indoor air, therefore, harmful for the productivity of employees. (Kosonen, 2004)

Below is represented the figure which shows the adjustments or changes that arise, when the indoor temperature is fluctuating from 25 celcius degrees and 50% humidity indicator. The optimal productivity is present, once the temperature is equaling 24 degrees, afterwards the productivity loss of 15% occurs with the 0-1.5 tempereature increase, dependant on the relative humidity. The effect of humidity is increasing together with the higher than neutral 25 celcius degress temperature, hence once the humidity is increasing greater than 50%, the productivity starts decreasing. (Hopley & Mattison, 2013; Kosonen, 2004;)
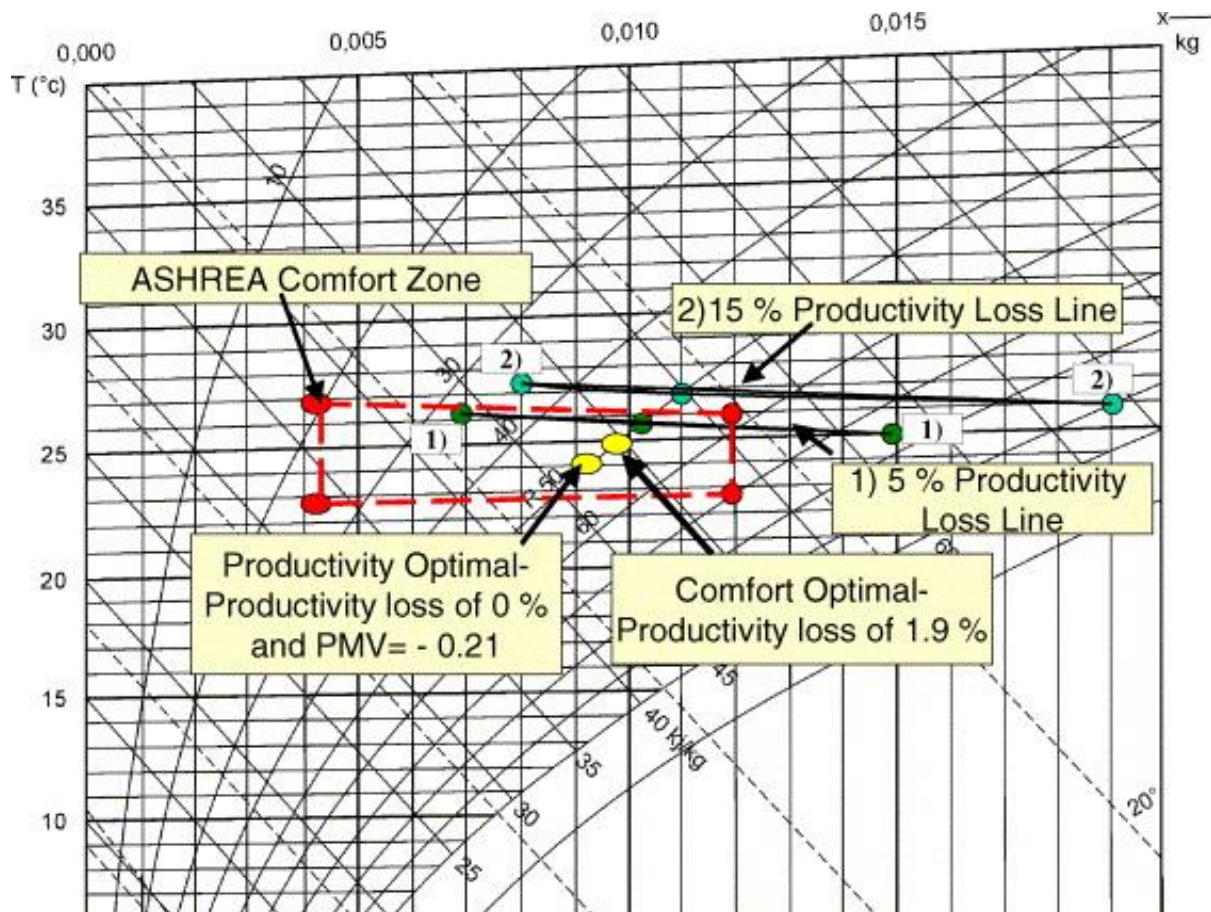
Figure 2 Illustration of the comfort conditions loss, comparison to ASHREA representation (Source: Kosonen, 2004)

By the same token, the study of Hopley & Mattison (2013) helped to investigate the effect of the physical positioning and keeping the strange postures for long, as working day, which usually develops into the following consequences: fatigue of the muscles and the overall irritation of the cognitive process together with the decreased work performance. Even though initially the research of Hopley & Mattison (2013) has been aiming for studying the relationships of time, awkward postures of the individuals, as well as cognitive utilization of the visual and audile functions with the measured individuals' reaction, only the decreased performance (represented into the increased amount of errors and reading speed) has shown the significant relation to the motion and the incorrect postures of the human beings. Irregardless of the other measured variables as time or modality on heart rate variability, perceived discomfort or electromyography.

In addition, the work performance and errors' occurrence have been viewed from another perspective, precisely through the lens of influence of work ethics. (Shah & Lacaze, 2018) In case the ethical behavior is endured in the organizations, the work ethics may bring continuous benefits in enhancing the employees' loyalty to the organization, as well as reduced labour transitioning. In case the organization fails to perceive the adequate

commonly undisputable moral standards in the organizations, the overall reputation of the company will likely be devastated, the employees will be less willing to stay innovative and employed for long in the company, as well as the employees' daily tasks will be less particularly goal-oriented and more random (Christian et al., 2013; Schwepker *et al.*, 1997; Tu & Lu., 2013; Valentine et al., 2006).

Especially with the nowadays highly internationalized organsations, with the moral principles formed by various cultures, including but not limited to Islamic shaped business and individual behaviors spread in one-fourth of the global population based on the specific religious dynamics, it is vital for the conflicts not to arise in the diversity of the individuals' cultures, religion views and mindsets. As an example, the study of Shah & Lacaze (2018) has shown that work ethics, precisely islamic work ethics tested in this study, influence directly the employees' performance level and general work-life fulfillment, once implemented. However, in case there is a high level of cognitive dissonance, the particular work ethics setting may not bring the expected positive outcome. (Shah & Lacaze, 2018)

When it comes to daily work organization and logistics in particular, stress is coming along with almost every single task that involves arrangements of the complex project cargo transportation and/or urgent critical general shipments. Following the transactional theory of stress, presented by LePine & Zhang (2016), stress may have as negative as also positive effect on the individual depending on, what is believed to be at stake of performing the actions with an element of stress. It means that, if an individual tends to believe the performed actions are in one way or another possibly influencing the personal development and growth or general's individual's state, an employee might take it as a cause for depression and threat or as an opportunity and positive challenge.

Another study performed by Wetzel *et al.* (2010) has proven that in the non-critical situation, surgeons tend to perform with a high productiveness rate in a "simulation" surgery. With the various assessed levels of stress, including the heart rate, heart rate variability, salivary cortisol, it has been found out that there is a positive relationship, in a critical situation, of the experience of the surgeons and their stress level, hence the more experienced clinicians are, the less stressed they get in the critical situations.

Variable: *Mistakes and Errors*

The study of Homsma *et al.* (2009) has stated that none of the mistakes are avoidable, bearing in mind the existing ways of human irrational decision-making and the highly dynamic habitat of the organizations and the external environments. Apart from learning, mistakes and various incidents may generally hardly lead to positive outcomes in production results, quality indicators, customer relationships, and because of the possible negative consequences, it is vital that employees can handle and learn from their mistakes. Previously, the study of Argyris (1992) mentioned in the research of Homsma et al (2009) suggested the idea of people being even much more enthusiastic in learning from the errors, once they feel that everything goes wrong. Going further, the more severe the mistakes are in its consequences, the higher is the chance that the individuals are willing to learn from thereof.

Cannon & Edmondson (2005) have identified the failure of the organization as a difference from the awaited results, which includes both the avoidable and the unavoiable errors, as well as potential negative experiments' results and risks consequences. Such failures may be technical or interpersonal. Technical errors may largely be defined as the error of the data systems, errors of the production technical unit, whilst interpersonal errors may be represented by a non-given feedback to one of the employees.

Cannon & Edmondson (2005) have also identified that, even though learning from the organizational' errors seems logical and obvious, very few companies do learn from their mistakes and failures, irregardless of the amount and the frequency of the investments into teaching organization and its employees of how to systematically learn from the mistakes occurred. They have argued that there is a interrelated process to constantly learn from the error, which includes the following steps to make the learning feasible: 1) identify the error, 2) analyze the failure, 3) confront the failure and arrange an experiement with representation of the error 4) repeat, if needed.

There have been several causes for the employees' errors noticed in various industries. One of such errors' reasons lies in fatigue, which itself is interconnected with many additional factors, such as long hours spent at work surrounded by the lack of rest, detrimentally competitive environment, absence of free time, and varies on the basis of the work type, the type of the employee, even the season or the time of the day. (Katic *et al.*, 2013) Fatigue is directly connected to a decrease of productivity, increase of the amount of errors and possible injuries. Meanwhile, the study of the Hunter (2014) claims that the fatigability may

also differ on the basis of sex-related physiology's and anatomy's specifics, however even with the higher intensity of the tasks, high level of focus and concentration or speed of reaction required, fatigability tends to be lower for women.

Another cause for the errors at work can be the interruptions the employees make in taking breaks, which compromises the productivity, time spent on working, efficiency of the employee, as well precision of the work in progress, which directly results into a higher failure possibility of the human. One of the substantial industries suffering from the interruptive work causing errors is healthcare. The study of Zide *et al.* (2017) has, through the presentation of the COR theory or theory of conservation of resources, shown that with a number of given cognitive functions with the overall goal to accustom, tolerate and overcome challenges, whenever a disruption occurs, one or several of the necessary cognitive functionality shuts off, which causes an employee to modify the actions performed earlier, attain carefulness and struggle. In return, such constant implications of intense struggle turn into a burnout for an employee or an emotional depression over time.

Another reason for possible mistakes' occurrence can be represented by multitasking. Multitasking, as per the study of Zide *et al.* (2017) is shown as under the light of an individual perceiving the sufficient capabilities to perform several tasks at the same time, which leads to cognitive overwhelm. Since an individual, in the process of multitasking, is spreading the efforts to many goals-perceiving situations, the primary tasks tend to suffer.

When it comes to suffering from errors industries, highly influenced by the employee's failures, the first industry coming to mind is healthcare. According to the study of Burk (2002), over 98 000 deaths cases in United Stated in the latest 90s have been caused by the medical errors, due to the lack of e-systems and computerized solutions for medical prescriptions at that time. Burk (2002) also claimed that the only possibility to increase the safety of the patients in United States was via the employers, and the way the employers are building up the daily routine for the physicians, by providing propper training, enhancing the purchasing's team centrlised choice over the medicin' suppliers, as well as automation of certain procedures, like prescription of the medicine for the pre-determined "clear to be defined" symptoms.

In addition, Prins et al. (2009) has investigated, with the help of the physicians and their self-assessment patient's treatment, that over 94% of the practicing physicians make one or

two mistakes without causing negative consequence for the patient during training. Over 56% of the physicians have claimed to cause the negative consequence by making an error. Generally, men have claimed to be making more judgement-related errors and daily mistakes than women, whilst the physicians accepting and experiencing burnout have had more errors of more severe result.

If in healthcare, in case of human-factor related errors, one of the negative consequences is the health of the patient itself, in logistics it may also be related to sufficient additional costs. According to the study of Schulz (1999), which has invested the overall supply chain of Miebach, one percent error increase in the order fulfillment phase adds accordingly 10% increase in the overall logistics cost. Fortunately, with the car manufacturing process, such strategies as ABC (Activity-Based Costing) or Kaizen principles are available up to this day to minimize the costs related to production and inbound/inhouse logistics.

2.3. Data Analysis

Data analysis, as per Sharma (2018) is represented by continuous action of finding answers to researchable questions via investigation and explanation of the collected data. Usually the following steps are involved in the analytic flow: the process of identifying the questions of interest, attempting to collect the necessary available data, making a decision on the appropriate methods for answering the researchable questions and application, as well as final evaluation and wrapping up the results of the analysis.

For the data analysis the most common method used in research is the statistical analysis, which depends on the following factors, such as: the type of the variables under the analysis-quantative or qualitative, the identification of the variables, whether the research undermines the explanatory or dependent variables. Apart from these, the number of the factors under study also has its influence, whether there are several variables or only one under focus and, last but not least, the type of the research performed- exploratory or affirmatory. (Sharma, 2018)

For this research, we have learned, the several quantitative variables/factors are chosen, the nature of which is explanatory variability, hence the statistical analysis is going to be

performed later, also due to an exploratory main goal of this research, the causes of the human-related errors performed by logistics coordinators.

Therefore, Hoare & Hoe (2012) have presented descriptive analytics as the "summary statistics" or the data given about the sample and its demographic related features, which can be assessed by repetition of arranged variables' examination, such as nationality, or by the average value, as well as the variance, in other words standard deviation, for continuous variables (continuous behavior of the sample such as education, working, age).

Since this research is focusing on such continuous and changing over time conditions of the employees, such as personal lifestyle or working conditions and work lifestyle, the descriptive analytics' mean and standard deviation of the factors are particularly useful, since with the mean value we may find out the most common, average sub-factor influencing the working condition of the employee, and with employment of standard deviation, we may found out the significance of the mean value for the whole sample.

By the same token, anoher common data analysis technique is represented by regression analysis, which is observing the connection of tested independent and dependent variables. (Jihye, 2015) This method is also not employed in this research due to unknown dependency or even relation of the so-called variables or factors with the outcome in the first place.

Another most commonly used data analysis technique is Correlation Coefficient, which is similar to Regression Analysis, however, identifies relation of two random variables. (Asuero et al., 2006) Due to purpose of the research being the investigation of the cause and effect of the potential factors identified previously and its relevance to the errors in logistics the correlation analysis would not help particularly in answering the Research questions, as the correlation between the variables would bring more additional sub-factors and mislead the author from the main research goal.

Other common statistical tests presented by Hoare & Hoe (2012) have been One sample t-test and Paired t-test, as an example, which compare the population's means, in the first case, with the estimated value or a hypothesis, and in the second case, compares two means and measures the difference between several observations. Since in this research, there has been no particular hypothesis but an observation of the human behavior and the consequences, and the survey is running only once with the unique individuals. The one

sample t-test and paired t-test are denied in its convincing contribution to the researchable questions, unless the objectives of the study are amended.

3. Literature Review

During this part of the thesis, the freight forwarding and container shipping industries are represented from the general point of view, as well as Operational risks in Logistics, Human-related mistakes and human errors in road transportation, rail transportation, container and project shipping, as well as the common human mistakes in air freight.

3.1. Logistics and container shipping background

Container shipping contributes majorly to the massive growth of shipping industry. In fact, globalization of the global economy, as well as significant changes in manufacturing and distribution processes have become possible due to an improvement in container shipping development. Containerization has transformed the way the cargo is transported around the globe without majorly damaging the quality of distribution and accelerating freight costs, which has led to the increased demand for container shipping. (Notteboom, 2006; Song & Dong, 2011) Additionally, the easiness of exchanging the containers for combining the transportation modes allows the fast door-to-door small batches deliveries around the globe (Fremont, 2009).

Precisely, the reasons for the increased containerization may lay in the overall improved efficiency of the ports handling and the reduced transportation costs, which have resulted from the increased size of container vessels. (Fremont, 2009). Starting from 1960s, when the first marine containers have been introduced to the international trading, liner shipping has started booming in its popularity. The intermodality of transport, land and sea integration, as well as complex supply chains have become possible ever since (Lau *et al.*, 2017).

Therefore, supply chain management involves numerous of networks that complicate the smooth movement of cargo, including, but not limited to the shippers, maritime or inland

logistics operators, freight forwarders, and logistics socialists- all very active on managing the cargo flow (Heaver et al, 2001).

It may be taken for granted that all participants have different goals and objectives. A good example could be the division of the roles of vessel, container and freight logistics. Vessel logistics is mainly interested in maximization of the vessel's utility, whilst container logistics is managing the stock of containers and allocating them. Freight logistics, meanwhile, is mainly targeting management of goods flow throughout supply chain, including the transport provisioning (Fremont, 2009). It has to be mentioned that great geographical separation is not making the network functioning any easier, which raises the problem of global logistics hub allocation.

The logistics hubs are the structures of the major flows' concentration, within which the logistics operators collaborate to provide high-maintenance service. The logistics hubs are the linking transshipment points of goods flow in logistics network. The hubs are substantially important for the supply chain, since hubs affect the overall value in logistics service provisioning. The services provided within frames of hubs are not only storing, but also ordering, collection and unbundling of the cargo (Huber et al., 2015; Vieira & Luna, 2016).

The characteristics of hubs, therefore, depend on the types and classes and can be based on either the functional (single shipping or multimodal freight forwarding) or spatial level analysis (micro, meso, macro). Likewise, there is also a significant difference of hubs that maintain the division of the transport logistics hubs and its operations, and distribution-oriented logistics hubs. This means: the distribution logistics hubs are central or regional hubs that are able to store the cargo for an extensive period of time, while the transport logistics hubs are the ones that do not have the storage function or only a few temporary cargo buffers to prevent the out-of-stock situation. (Huber et al., 2015) The typical example of a transport logistics hub is an airport, where all the cargo is stagnant for only a while.

Choosing the effective logistics hub is one of the substantial decisions made in the logistics and shipping industries and is part of so-called management of logistics infrastructure. Since movement of big quantities of all levels products shall be done at a lowest possible cost and highest customer influence to ensure the product's market competitiveness, it is of great necessity to have a concentrated rail, road, port or airport flow with "high levels of planning

repetition" and good level of operational efficiency. (Bolumole et al., 2015; Villiers et al., 2013)

This provides the freight forwarders and shipping lines with consistent operation structure, whilst gives an opportunity to stay financially reasonable when planning the overall freight costs for the geographically dispersed locations.

Additionally, managing the hubs to hubs logistics allows the transport service providers to operate the economies of scale and take advantage of the efficient loading and unloading containers operations within one centralized hub. Shipping lines also benefit from using the hubs, as it allows to issue a Bill of Lading and state the inland port as a destination point to discard the responsibility for the cargo from the shipping lines. (Villiers et al., 2013)

Container managers not only benefit from the hubs, but also manage the concentrated turnover of containers within the targeted area and reduce the overall number of containers needed around the world by employing the empty ones for export and seamlessly manage the turnover of containers in stock. (Villiers et al., 2013)

Additionally, hubs are also necessary when employing the multimodal logistics or different modes of transport during the same delivery progress. Combining transportation modes in the logistics processes has been widely spread in the world of international shipment starting from 1990s due to its efficiency and reduced transport costs. Also, when compared to the unimodal transportation, the cost savings of intermodal transport may be as much as 20% and the environmental impact can be reduced up to 57% in regard to CO2 emissions. (Agamez-Arias & Moyano-Fuentes, 2017)

Precisely, intermodal transportation has been highly supported by the European Commission due to the opportunity of energy consumption reduction together with a far more rationalized usage of the existing global infrastructures offered by advantages of large capacities of sea and rail, as well as benefiting from highly flexible road transporting. (Lopez- Navarro, 2014)

Intermodal transportation, in its essence, represents a system of grouping the cargo and the most efficient combination of one or more transport modes chosen to use from point of origin to destination. There are only few types of such systems- multimodal and intermodal, where multimodal transportation considers combined transport under a single contract with

the same provider, whilst multimodal system encourages the usage of multiple modes with distinct providers. The ways of combining transport, therefore, largely depend on the geographical distribution of the point of discharge and the point of origin, as well as the infrastructure of the countries considered and the supposing time and length of the planned journey. (Agamez-Arias & Moyano-Fuentes, 2017)

A good and one of the most common examples of intermodal transportation could be the opportunity for the shipper to carry the cargo in a container via sea vessel and then reach the destination point by road via truck trailer. Another example, which is used less frequently due to a cost disadvantage is to organize a container portion of a truck trailer to be carried by air instead. What is noticeable is that almost every single freight carrier and terminal operator are involved in intermodal transportation either as a transportation service provider or as a part of the intermodal transportation network. The reason for that is customized transportation offered on the market (Crainic & Kim, 2007).

As per Ballou (2004) there are only several possibilities for intermodal transportation already identified: "1) rail-truck, 2) rail-water, 3) rail-air, 4) rail-pipeline, 5) truck-air, 6) truck-water, 7) truck-pipeline, 8) water- pipeline, 9) water-air, 10) air-pipeline".
Therefore, even though some of these modes are not practiced completely, they still have gained considerable social acceptance. The most commonly used ways of transportation are still rail-truck and truck-water that are normally used for the moderate level goods. At the same time, truck-air and rail-sea are less frequently used, regardless of being quite convenient for certain types of cargo (Ballou, 2004).

3.2. Operational risks in Container shipping and logistics

World supply chains (SCs) are threatened to numerous exposures because of scope and structure of logistics chains, where companies shall learn how to confront the constant changes within great geographical distances, national regulations and customs formalities, difficulties in planning business-related events and inspection mechanisms. Various external events such as constantly changing exchange rates, macroeconomic risks, environmental requirements, as well as diverse cultural standards dictate a great exposure of cargo to risks. As an example, with the raising number of logistics companies together with external environmental uncertainty, the manufacturing companies are building far

greater safety stock than needed in producing to avoid the untimely supplies of the ordered material (Veselko, 2009).

The more excessive goods are produced, to the greater extent the supply chain costs are raised, including the warehousing handling services and additional transportation surcharges.

Due to the fact of risk management being a large phenomenon in the global corporations, the way the company is facing risks varies, and is individual on multiple dimensions, that can be categorized into strategic, operational, financial or credit risks, as well as market risks described previously in the introductory part (Crouhy et al., 2005).

Meanwhile, another research suggested that uncertainty concept in SCs may consist of several following divisions: value related exposures, information transferring risks and relationship uncertainties, and jeopardy in export-based activities or foreign political and general influencing atmosphere. (Kwak et al., 2018).

Precisely, the information transferring risks and relationship-based uncertainties may even result into a certain loop of exposures, which if being identified early, can help in strengthening the interactions and logistics processes (Kwak et al., 2018). A different approach in research has led to the conclusion that the focus of the corporations shall also include, but not be limited to such sub-categories of business risks as: operational risks of daily activities, compliance or people related risks; information risks related to technological, performance measurement or information access risks; and finance risks related to trading, pricing, interest rate risk etc. (Moeller, 2007)

Operations exposures in logistics, meanwhile, tend to be key inwardly-manageable risk of logistics providers. Logistics operations risks are usually divided into the two-possible harm comings from uncertainties of outsourcing the business activities to a third-party and management of internal logistics processes. (Qureshi *et al*., 2008).

Therefore, the most common operation fields of logistics to be threatened by risks are in acquisition, actual transportation of cargo and handling, as well as transferring of the information along the supply chain. (Zhang & Yuan, 2010). The primary resources, nevertheless, are there to ensure the smooth logistics processes and ease the cargo transportation along the supply chain, such as:

1) the resources to accustom the quality information flows to trigger the changes in the logistics processes along with the continuous changes in the knowledge,

2) The opportune logistics infrastructure required to maintain the effective and efficient supply chain activities (quality roads, safe wagons, appropriate equipment for loading/unloading activities),

3) Qualified employees to accordingly organize, implement, monitor and perform all types of supportive activities for high performance logistics services and systems; (Lockamy, A., 2017)

Precisely, the operational risk is identified by other authors as a risk, which failure of management is caused by failing *internal processes* or *human resources mistakes*, *systems failures* and various challenging *external events* (Jarrow, 2008). Operational risk at the stage of service providing has, therefore, lacked the devoted attention, even though the disruption of business operations due to late realization of some of the process's risks, is threatening the organizations' operations and has a strong influence for the companies' strategic objectives (Jallow, 2007).

Consequently, risk caused by people is normally associated with the internal human resources and their operations. The failures of humans are defined by the errors in processes, unorganized working conditions, as well as blanks in personnel's qualification and education. The additional factors to human risks, according to the theoretical resources, are related to lack of training, inappropriate guidance or wrong work tasks division. The dishonesty and apathy can also be as the contributing factors to the human operational risks (Jarrow, 2008). To be precise, if dividing the human risks into categories:

1) 43% result from the deficient proceeding of the documents,

2) 18% is because of incompetence and untrained personnel,

3) 16% is because of the failure in following the procedure and rules,

4) 10% is due to poor planning, followed by 6% of miscommunication,

5) 3% because of inefficient supervision,

6) 2% due to various policy problems,

7) 2% etc. (Gordon, 1998)

In fact, there are only two angles the human-related mistakes can be demonstrated from-systematic and individual, where individual focuses on the personal' failures caused by natural absentmindedness and inattention, and conscious weaknesses, whilst systematic

aspect is concentrating on the situation of the concentrated employees trying their best in avoiding mistakes. In the system approach, human errors are considered as consequences, not the causes, resulted after the traps in the organizational processes. (Reason, 2000)

An example of such an organizational trap could be the outdated software used for processing the documents and inputting information into the corporate system, which if slow and user-unfriendly, would create the barriers for the smooth operations.

Process risks, at the same time, are the risks that are very hard to eliminate completely due to the complexity and constant changeability of environment and their reliance on the human resources' activities. Process risks, first and foremost, negatively affect any goals' accomplishment from the financial, timeframe and final results' value view. Minimizing such operational risks may usually be executed in corporations by automation and standardizing activities (i.e. involvement of Information Systems), which eliminates the human factor to a certain degree (Pika et al., 2016). The process risks are involved into all corporate levels, including the transactions processing in products, services, as well as imperfection in controlling the processes (Jarrow, 2008). Sometimes it is possible to avoid such risks by employing outsourcing and distributing the non-core activities to the subcontractors, such as accounting or technical support within the 3PL providers.

System and technology risks, which undermine the nowadays cyber insecurity, as well as viruses that can have a major impact for the whole organization's workflow are also considered to be challenging (Fheili, 2011).

As an example, the FBI has rated the cyberattacks to be one of the top three threat to United States security, apart from the nuclear rivalry and the weapons of mass destruction. Due to the massive dependence of corporations on the Internet and other means of technology in order to sell products and complete the transactions at the highest speed and the major efficiency, companies strive to make the operations as paperless, branchless and electronically manageable as possible. Whenever the company becomes a part of information business, the costs for maintaining data security against the technology breaches, cracks and hacker attacks raise drastically. In fact, protecting its cybersecurity also means securing the corporate reputation. (Ludwig E., 2011)

In logistics and container shipping, moreover, as well as generally in supply chain activities, corporations are trying their best to decrease an effect of such unforeseen external events, also as terrorist attacks, the natural disasters, various types of diseases on the performance

of the supply chains. Apart from such destructive external events that would have an obvious influence on the supply chains, there are some further external risk factors that have been noticed in supply chains, such as: country risk, possible industrial fluctuations or business risks, economic, logistics-related, and, last but not least, bribery and associated crimes To be precise, country risk refers to a risk related to all the financial and sovereign issues in transnational operations abroad processed in an uncertain environment. Closely related are the business climate risks, which are considered to be the noneconomic and financial risk factors occurring due to the government instability, the military security as well as internal/external conflicts, the level of bureaucracy, altering GDP level, exchange rate instability together with export levels etc. (Lockamy A., 2017).

In addition, the commercial uncertainty is the macroeconomic situation, where the corporation is willing to operate in, or as in our case, in which country the shipment is organized or operated within (Lockamy A., 2017). As an example, shipments to Brazil require very precise and accurate documents with all the information provided exactly as in the invoices and in accordance with Brazilian regulations. At the same time, the HS codes specified for all the possible cargo transported around the globe, are different, NCM codes in Brazil. Without double classifying the HS codes valid around the globe into the NCM codes in Brazil- it will be impossible to import any cargo, since the import taxes and tariffs are specifically identified and are already bearing the Brazilian fiscal policy (Duran, 2018).

The commercial risk is also representing credit risk and the influence thereof on the global financial market. Logistics risks, meanwhile, are associated with how well the country is able to fulfill the transportation, distribution, packaging, warehousing and handling, as well as reverse logistics of the goods within the supply chain (Salanta & Popa., 2015).

Infrastructure of a country plays a vital role in logistics sector. Corruption risks, therefore, comply the risks associated with the pressure for the political institutions in the sovereign nations and the way the economic stability is performed in the country. (Lockamy A., 2017).

Freight forwarding, especially, is vulnerable to corruption risks when attempting to smuggle goods through borders due to a very close connection with customs officers, who are poorly paid in the majority of the developing countries like China, Brazil or Russia (Burnson P., 2018).

The "faster" customs clearance or a smooth processing of the documents; bribery simply seems like an operational cost for many of the logistics operators, especially in Africa (Manners-Bell., 2018). Sometimes in case of a simple human-factor mistake in logistics may cause the so called "blind eye" of a customs officer, consequence of which is avoidance of demurrage costs or the additional paperwork necessary to release the cargo from the border or a port of a foreign country.

With the ongoing competition between the globally spread firms providing the logistics services, there are considerable challenges existing in developing and providing high quality offerings to the global business customers. The difficulty is not only in providing the transport or managing the routing for the widely dispersed locations, but also in the border crossing procedures, longer lead times, raising transportation costs which complicate the flawless service offerings. At the same time, strong bond with a customer and the customer customization are both required (Mentzer et al., 2004). Since whenever there are human interactions in business, especially cross-border business, we start focusing on the service and the logistics coordinating service quality.

Logistics service quality (LSQ) is mainly focused on the physical service distribution and concentrates on the results of the service provider's performance, which comply availability, timeliness and condition of the service-provisioning. (Kilibarda & Andrejic, 2012; Thai, 2013).

Whereas customers' loyalty, as preserving the continuous presence at the target market, is recognized as a substantial challenge for the operational department (Kilibarda & Andrejic, 2012). Consequently, winning the loyalty of customers is possible by leveraging the firm's logistics service capabilities and providing the constantly better logistics services. The most common vitally important components of the LSQ are on time delivery, timeliness quality, the quality of the processed orders, personal contact quality, order handling as well as the condition of the order and the convenience associated with process of the order handling (Thai, 2013). To be concrete, the example is shown based on the project cargo below.

Under project cargo or project shipping is determined planning of logistics for various types of cargo, including the industrially needed parts of enormous critical dimensions, extreme weight and complexity, for which the specific approach in handling and forwarding is required in different ports and locations all over the globe. The most common project cargo

may include the crushers for mining industry, the gigantic submarines, filters for the paper and pulp mills, as well as various frames and boilers for factories of different types. Depending on criticality of the cargo (the cost and difficulty of replacement), the certain conditions must be ensured. The reason thereof lies in the large costs involved in the project cargo with the sufficient costs for damages if any occur, where generalizations are extremely hard to make, and the time frames are essential to consider. (Allianz, 2018; Andersson *et al*, 2011; Fagerholt et al., 2013).

Sometimes in more financially difficult times the freight forwarders and carriers are under a lot of pressure to reduce the shipment costs to attract the clients and stay on the market, for which aims the use of unsuitable outdated vessels, poor security and caring of the cargo is met more and more often in the world of logistics. Therefore, the poorly trained crew and not properly planned shipment can all result into goods damage, as represented in the *Figure 3* below or even a complete loss, as it happens often with the not properly fixed on board containers. Heavy oil & gas machinery and other industry specialized equipment especially require the shipper's instructions for the safe carriage of the cargo. Standard handling instructions indicating the gravity points on the cargo or its packing, volume of packing required for the security of the cargo and else must be given by all stakeholders well in advance (Allianz, 2018).

Also, due to the major shift in global sourcing, as when the materials and goods are fabricated genuinely not only in United States as previously peaked in the 80s-90s, but also in Asia Pacific and Eastern Europe, the need for flexibility in sourcing internationally and globally to various parts of the world has increased (Baily & Bosworth, 2014; Hickey, 2004).

The trend of building factories everywhere has turned into less factories and active sourcing and delivery to various parts of the world. Such a combination usually leads shippers to demand the precise and on-time information. The logistics challenge in the case of export, is to make sure that on behalf of the customer, the goods are received in the right condition, as well as being documented properly by the fitting transport to the precise destination point (Hickey, 2004).

It is necessary to mention that because of uniqueness of the project cargo in its types and dimensions, the sub processes are to be managed effectively and in time to make sure that

each shipment is going to reach the end-customer promptly, especially when multiple elements are to be brought somewhere as a single lot. As an example, if considering the stowing in the port and the additional costs occurring with it, it is of great necessity to make sure the cargo will be on the planned vessel to avoid the extra costs in the port. In addition, the most suitable cargo vessel has to be chosen before arranging the shipment, especially if the cargo is going to be combined with other deliveries, which usually influences the schedule of delivery and other transportation related processes. The cargo combinations are, therefore, usually used in order to split the transportation costs in case the other cargo of a different shipper can be delivered via the same route and is more or less the same of a cargo type (Andersson *et al*, 2011; Fagerholt et al., 2013).

Figure 3 Damage to Project cargo during transportation. Source: Allianz

There are various challenges occurring in the operational processes starting from handling the cargo, stowing, inventory handling, changing weather conditions, to the documentation required and the import/export customs formalities when managing the out-of-gauge cargo. Selecting the best route is one of the first challenges to occur since with the extremely specific dimensions or weights, the special permits for, as an example, rail or road transportation are required to arrange a delivery over the territory of one or another country (Nord & Hovey, 2018).

The cost for the permits and the freight offered will vary based on the route selected. Therefore, the weight and dimensions of the cargo significantly complicate the routing and scheduling, especially when the cargo has to be synchronized with other shipments originating in different countries. (Allianz, 2018; Andersson *et al*, 2011).

There are different risks involved in the heavyweight and oversized cargo loads, which have different areas of influence and can be classified thereof by: technical, economic, social and political risks. All of the risks areas and influential factors can be clearly or abstractly identified, where the factors are generally quantifiable, but not necessarily manageable or controlled. The technical risk is determined by the loading processes and risk associated with the vehicle selection, selected technologies for loading, the length of route, cargo parameters or the storage of the oversized cargo. The safety of transportation as well as the probability of accidents are also taken into technical risks' affecting factors. Therefore, human factor is directly affecting the probability of the technical errors, hence human factor is also influencing the technical risks in the project cargo (Palšaitis & Petraška, 2012).

The economic risk is connected to the role of banks aassociated with the usual newest technology and industrial development the heavyweight and oversized loads bring to the industry, and their high invoiced value. The procurement of new technological solutions, as well as stability of the interest rates and inflation, availability of investments for the developing industry projects determine the level of development thereof and, moreover, boost the out-of-gauge transportation. The other significant influencing issues belong to labour availability and cost, competitive conditions and access to resources for such cargo transportation on the market (Palšaitis & Petraška, 2012).

The social risk, meanwhile, represents the acceptance of the society for the out-of-gauge cargo transportation through the territory of the sovereign country. Since the transportation of the oversized goods impose certain restrictions and might influence negatively lives of the society by several inconveniences related to noise, closing of the roads, the social risk is related to having the qualified human resources, fulfilling expectations of the society members. In such matters the social risks may threaten the possibility of the transportation of such out-of-gauge items as whole (Palšaitis & Petraška, 2012).

Alongside the social risk comes the political risk of political attitudes to the oversized loads, which could stimulate or deny the process of such transportations. Mostly the decision-making regulation, the tariffs imposed for the exported/imported cargo as well as routing coordination and permission receiving procedures are directly influencing the transportation modes' choice, the routing and the overall possibilities for the transit of project cargo. Meanwhile, the perception of the government in regard to its economic development needs

can also be attributed to the political risk, as if the economic benefit of the transit of the heavy weighted and oversized loads is not clearly realized, the cargo will be refused in transit (Palšaitis & Petraška, 2012).

As a result, there have been numerous of risks identified in logistics, however, very little research has been dedicated to how various uncertainties influencing the transport operations within supply chains. The logistics-focused uncertainty model, which has evolved from the simple manufacturing centered uncertainty circle and Source-Make-Deliver (SCOR) models presented in academia, includes in total five sources of uncertainties affecting the logistics operations. The evolutional model has identified the following uncertainty influencers:

- *Shipper* and any uncertainty that is originally directly from the sender of products and has an impact on the transport performance. The given examples are related to the raw materials sourcing, the process of the manufacturing as well as dispatching,
- *Consignee* and risks initiated by thereof, including, but not limited to forecasting, ordering of the goods, delivery restrictions imposed by the customer,
- *Carrier* and the deviations originated from the carrier that have an influence on the delivery process, including but not limited to scarce transport and human resources or a mistake of the carrier,
- *Information technology* and failures of the comminucation channels,
- *Risks caused by external events,* or disruptions occurred externally of the logistics processes, which are not controlled, as lack of human resources and striking of the labour, fluctuating exchange rates and gas prices*; (Sanchez-Rodrigues et al., 2010).*

3.3. Human factor and human factor related mistakes in logistics

Since the major influencers of uncertainty in logistics industry defined in the previous chapter, are usually represented by humans, the human factor immediately comes in the picture.

Human factors can be presented as environmentally related, organizational and wrok conditions-related factors, as well as individual characteristics that have an overall

domination over the working behavior, which also affects the individuals' health. Such aspects as the work-related goals, human-being and the company must be considered in the same context, due to human factors complying the tasks the employees asked to do, the personality of the individual and where the individual is working (HSE, 2005).

It has also been noted by D'Aleo and Sergi (2016) that, globally speaking, human factor guides improvement of Logistics Performance Index when compared with infrastructure and the institutions, since the logistics performance is directly influenced by humans' productivity, utilization of the human resources and the effectiveness thereof.

Moreover, logistics performance has been acknowledged, as higher in the countries, where the social development standards are better. Apparently, such fundamental human values as education, high living standards and the life expectancy have a vital role in forming the country's logistics performance indicator. Whilst on the contrary, in the former communist countries, such as Slovakia, Estonia, Hungary and Poland and the newest European countries: Bulgaria, Romania and Croatia etc., where the social development level is low, the logistics performance indicator is much lower, hence, generally, the overall logistics performance is much worse (Bizoi A. *et al*., 2015).

In fact, the input of the individuals plays one of the major roles in order-related processes, which also controls such essential drivers to the logistics operations as effectiveness and efficiency (Grosse et al., 2015).

To be more specific, the organizational aspect influencing human factor (HF) applies to essential conditions supplied by corporation in order to ensure the safest working habitat for the employees. Included are inside hierarchy communication, the company's deviations in keeping daily working records, instructions of employment of outer employees, as well as how well the instructions of job performance are given to the employees. In order to sum up, such variables as contracting, training, communication techniques and reporting are all influencing the behavior of a human at work (González Dan et al., 2018).

Meanwhile, the job description aspect is, basically, in providing for its workers the situation, where the assignments are fairly divided between the employees and the efficiency of the employees is possible in such conditions. In other words, job characteristics/description factor complies the noise, the quality of air, the protection equipment in case the job is

related to physical work, such as ear plugs, helmets or safety showers, labels. In general, the job characteristics factor includes, but is not limited to working equipment provisioning, fair duties assignment between the workers and the comfortable safe environment, the provided by the organization. (González Dan et al., 2018)

Therefore, the individual's features as an additional influential factor complies the employee's personalities, mindset, talents and proficiencies, personal customs and manners, as well as predetermination for the job that could also be the potential strengths or weaknesses of the employees and are all depending on the task the employer is performing. The combination of the above or even only the component of the personnel's features may result in professional human errors. The occurrence is, therefore, influenced by two parameters: the skills of the employees and the knowledge thereof, as well as the personal behavior of each employee (González Dan et al., 2018).

3.4. Human processed operations in logistics and deviations

All transportation systems are a subject to human mistakes, including all rail operations, road transportation, air freight or shipping that can be minor disrupting the operations or up to majorly extreme as causing death of innocent people. The researchers investigating the human mistakes is generally because of people making mistakes in daily routines, in any other way to explain the presence of the human errors would be complicated (Dhillon, 2010). The chronics of the human errors (HR) and mistakes basically starts from the first implemented studies during the end of the 90s to find out the most effective way to produce and design shovels. Therefore, the human factors have been introduced as the new field of study only by the end of 40s. (Felice & Petrillo, 2011).

Railway logistics errors

The railway transportation is up to these days rather significant mean of transport globally, since by railway the cargo of millions of dollars and euros and passengers are delivered around the globe from point A to point B (Dhillon, 2010).

Nowadays, sufficient funds are raised in order to continuously maintain the railways, where the majority raisen up to 90% of the accidents are resulting from the errors of the human type. Therefore, the phenomenon of human error in railway logistics can be explained as more general: a) natural result from discontinuity between human capabilities and the demands of the system; and more concrete b) unsafe behavior of the employees on the basis of intrinsic characteristics of the humans and inadequate structural conditions or instruction techniques (Bevilacqua & Ciarapica, 2018; Felice & Petrillo, 2011).

It is vital to mention that efficacy of the process of rail logistics is largely influenced by rail standards and rules, the equipment and operated systems state, as well as the human resources. To be precise, when it comes to human factors, personnel is in charge of various assignment that are error-prone, most of which fall under the following categories: pass of the signal, speed governance and signaling (Dhillon, 2010).

Signal passing contributes majorly to the critical disasters of the safety kind (Kim, Baek & Yoon, 2010). Whenever trains are passing a signal displayed as a stop, the danger of an immediate conflict with another train or trains increases automatically, especially in the cases of a Signal Displayed at Danger (SPAD), which as an incident, occurs quite frequently even nowadays. (Dhillon, 2010).

The causes for the SPAD incidents in railway logistics occur due to a failure of the driver to see the signal due to poor visibility, poor brakes' effectiveness usually occurring in case of bad weather conditions, oversight or disregard to a signal, speeding of the driver, sleepy condition of the driver during the transportation, as well simple misunderstanding and misjudging of which train the signal is applied to. In the past, many accidents have also occurred due to the errors made by the signal personnel or dispatchers, however, fortunately, this is already almost fully eliminated with the application of the newest technical solutions (Dhillon, 2010).

Train speed regulation is one of the other most numerous causes for the accidents, as when the driver failures to reduce the speed of the train, which leads to an accident (Dhillon, 2010). Even though the technologies of railway infrastructure have advanced, allowing trains to travel at much higher and controlled speeds than approximately 30-40 years ago, still in some cases the system of automatic train controls, which triggers the alarm whenever the cab of a train is far exceeding the limits, fails. (Mann & Tangel, 2015; Zhou et al., 2018).

The likelihood of the occurring circumstances of over speeding depend on the three types of speed restrictions: permanent, temporary or emergency and conditional speed restrictions (Dhillon, 2010).

Since all of the operations described above are performed by humans, there has been previous research dedicated to the factors contributing to the unsafe actions in railways. The factors mostly lie within the workplace or organizational system as well as taking into consideration the following hazardous acts: errors in relation to the individual skills, subconscious mistakes and conscious violations, as well as intentional infraction. The skill-based errors are, generally, caused by repeating the already well-known routine operations, where the work is performed automatically and sometimes even subconsciously, even though still needs the supervision that ensures the actions are performed correctly (Read *et al*, 2012).

However, since the traditional idea of humans being able to automatically process the information via a bottom-up automatic mechanism of attention capturing has been challenged, the society still comrepehends the imperfection of the human processing capabilities. (Fougnie & Marois, 2006; Park, 1987; Read et al., 2012; Shafer et al., 2012).

Moreover, additional tasks performed out of the routine skill-based activities or various distractions interfering into the routine working activities, can induce errors, which may be in the form of slips of actions (Botvinick & Bylsma, 2005; Read *et al*, 2012). Work overload also increases the occurrence of the errors, since with the increased work tasks, the attention failures more frequently. The high workload, various distractions and associated time pressures will all be connected to the skill-based errors that influence major and minor accidents in rail logistics (Read *et al*, 2012).

Meanwhile, fatigue is considered as one of the most dangerous risk factors for the rail accidents. Examples can be seen in case of Spuyten Duyvil Derailment in New York in 2013, where the driver has fallen confused or hypnosed by the constant unchanged picture and concentrated on elsewhere, causing 4 fatalities and 61 injuries, or Hinton, Alberta train case, where the lack of alertness has been noticed as a cause for 23 deaths and 71 injuries (Optalert.com, 2018).

In addition, the human mistakes can also occur from a more conscious state, where there is a significant knowledge gap or no rules applicable, and the processing happens with more generic reasoning skills resulting in the negative outcome. The same negative outcome may come from the wrong rules or action plan applied to a certain situation. (Read *et al*, 2012).

Violations, on the contrary, are different from the errors as they are intentional, which can be predicted by behavior of individuals, whose senses and actions are fully controlled (Read *et al*, 2012). Violations can also be divided based on the outcome and the initial intentionality, as in case of a robbery, the act is intended and so is the negative outcome. With the same bad outcome, but no rational intention, the other acts are called erroneous or unintentional violations (Lawton, 1998).

In the context of rail logistics, violations are vital in accidents to staff, e.g. personal injuries and fatalities. Violations officially increase the likelihood and the amount of accidents. The reason lies in couple of factors: certain violations are creating a vulnerable working atmosphere, which is less forgiving to errors and is not ensuring anymore the safe working practice. The other reason for violations being so dangerous, is in misunderstanding the rule book or, new, unpredicted and unpracticed situations can cause a person or a driver in this case, make an error (Lawton, 1998; Read et al., 2012).

Human errors in shipping industry

Shipping industry is vital for the whole society, carrying 97% of the world's trade, whilst continuously expanding: as an example, 90% of the population of US is continuously served by domestic shipping and 80 % of the Americans are using the flagged vessels annually (Hetherington *et al*., 2006; Wang & Zhang, 2000). However, the industry remains marked as a highly-risky due to injury and fatality statistics and, among the most important issues to be improved in order to accomplish high standard shipping is in increasing the competence of the vessels' operating team. (Wang & Zhang, 2000).

Even though generally speaking, the shipping industry's safety has a satisfying record, maritime incidents tend to have a high chance for catastrophes; as an example, tankers carrying the Liquefied Natural Gas (LNG), have a chance to blow up the whole city if an accident occurs (Hetherington *et al*., 2006). Despite the safety in the shipping transportation

industry being taken to a whole new level by organization of the safety management system (SMS), which follows the standard international code of conduct for safe ship operations, introduced by International Maritime Organization (IMO), still there is known significant amount of shipping accidents occurring up to this day (Celik et al., 2010).

In fact, all the accidents in sea shall classify as either the operated vessel and mistake of thereof or, on the other hand, the true unprofessionalism of the crew. Mistakes and errors of the operated vessel can have the ground factors in flooding, groundings, various types of collisions, capsizing, fires and explosions (as in the case of secret submarine disaster of Kursk in 2005), vessel's damage and other casual deviations. At the same time the crew accidents are a result of the incorrect usage of the equipment for loading and fixing of the cargo, vulnerability of cargo, slips as well as falls on-and overboard of the cargo, during the hatching and winches operations all caused by untrained or incorrect actions of the shipping actors (Lu & Tsai, 2008).

Nowadays large amount of shipping lines uses modern ships, where many elements or systems are fully automated, influencing the overall performance of the vessel. Even though, fully automated systems shall not require significant human intervention, they still need at least a touch of human personnel in order to, as an example, change the routing or sometimes quickly act in response to some of the security systems of the existing ship systems (Wang & Zhang, 2000).

For some of the systems at the vessel, the direct human intervention is needed continuously for the operations of the systems and maintenance, if required. Therefore, bearing in mind the previously mentioned unstable reliability of humans, the past experiences in shipping industry show approximate result of around 80% incidents happening due to human error (Dhillon, 2012).

Other resource states that even up to 90 per cent of accidents are resulting from human error, from such seafarers as deck operators, crew, shore officers, captains and responsible engineers respectively (Lu & Tsai, 2008).

Furthermore, the effects the shipping accidents bring into the world largely vary between losses of life, comprehensive marine pollution, numerous damages to the vessel or the cargo on board and etc. If going into details, the human mistakes of technical and mechanical kind

as well as the environmental conditions, have a huge impact not only on the state of cargo safety and the crew, but also the environment (Celik et al., 2010).

In summary, unsafe operations of the crew, as well as the medical, psychological, workplace organization and the environmental conditions all influence the likelihood of the shipping accidents (Lu & Tsai, 2008).

Partly academia also states that the failing character of the shipping system lies in the poor social organization of the crew onboard, the economic pressure such as if the vessel is bound to arrive within a short timeframe, the industrial structure, the issue of insurance and the various challenges of the international regulation (Hetherington *et al.*, 2006).

In fact, the investigators of the shipping disasters, have stated that poor standards and lack of training for crews are key contributing factors to the marine accidents. Since nowadays shipping lines are globally based in opponents to the traditional interrelations between a national economy and a shipping organization, and are aimed at cost-efficient service provisioning, the attitude of ship owners changed towards vessels registration in the foreign countries, where the labor costs are cheaper. (Wang & Zhang, 2000).

Due to cheap labor cost in the less developed countries, the widespread employment of international crews of poor training and low education, has become standard practice and the tragedy of commons. (Wang & Zhang, 2000).

To be precise, these days it is possible to notice various human-related factors occurring in shipping that have a negative effect on the circumstance of the errors occurrance that can be named as poor state of the vessel, poor automation design, technically untrained personnel, ship system limited awareness, fatigue or constant tiredness of the crew, low knowledge of communication systems, incorrect policies and standard employed, dangerous environments and decision-making on the basis of insufficient information; all shown in the *figure 4* (Dhillon, 2010).
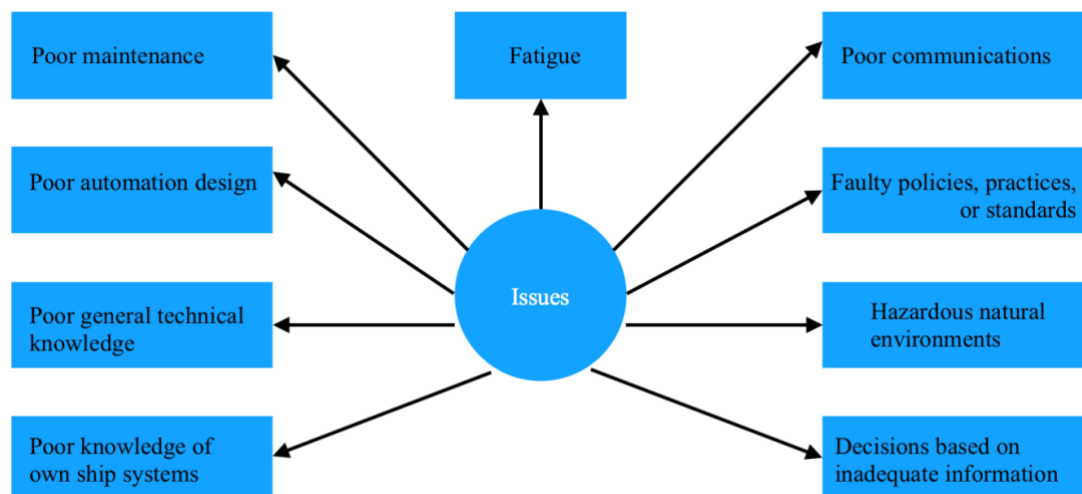
Figure 4: Significant human factors in the marine industry. Resource: Dhillon, 2010

Fatigue at sea has become much more important than ever before, since ship crews are getting smaller and the crew members are under the pressure of the schedules and the economy. (Lutzfort et al., 2010) Fatigue has been defined as most contributing to the human errors' appearance and the maritime disasters and various types of injuries. Also, since commonly in the case of transportation, heavy vessels are moving with a fast speed with a great momentum, the result can be lethal as well as destructive in case of fatigue, sleep disorders and sleep deprivation (Louie & Doolen, 2007)

The crew safety, the condition of the cargo and the vessel are all under the great risk for accidents and various types of injuries, each time whenever the maritime crew is under the fatigue. Such fatigue state, which influences performance due to diminished competence, also affects the information processing ability, which decreases the human ability to react to any unusual circumstance as well as any emergencies (Louie & Doolen, 2007).

In addition, taking into consideration the schedule of the mariners, which complies of up to twelve hours of work per day, for weeks or months consistently, and the tiredness that comes as a result of the tough environment the mariners are constantly in, such as:
- ✓ extreme temperatures,
- ✓ terrible for human health weather conditions, and
- ✓ permanent living in the confined spaces,

No wonder fatigue is a tragedy of commons. (Louie & Doolen, 2007).

The factors that have an impact on the fatigue can be classified as mental and physical fatigue; physical fatigue in such a case represents, basically, the sufficient lacking rest during, as an example, the navigation watch on the deck of the vessel, walking around the various locations of the vessel, climbing stairs between the decks and cargoes. At the same time, mental fatigue is identified as the willingly reduced psychological capacity from stressful work environment, the constant usage of complex equipment, lack of relatives and close people supporting, as well as demanding sea schedules that need to be kept up with (Louie & Doolen, 2007).

The issue of poor communication, meanwhile, is mainly concerning the level of communication and coordination between the master and the pilots, as according to statistics, approximately 70% of the majority of marine accidents have appeared when the State or federal pilot was giving instructions and directions on the vessel. Poor automation design is related to poor equipment engineering design, which can affect all shipboard automation, and is a critical issue of vessel and crew safety (Dhillon, 2010).

In addition, the faulty policies, practices, or procedures and standards are addressing a variety of issues that may also include such minor thing, as a non-available precisely written operational guideline on the board of the vessel that causes risk-taking, where needed and may cause the non-standard unprofessional behavior from port to port (Dhillon, 2010).

Another contributing issue to the human mistakes in marine industry complies the lack of education of the ship's systems. (Dhillon, 2010) Since the new complex automating systems are getting rapidly introduced on the vessels nowadays, it is very difficult to keep up with the newest technologies for a seafarer, especially if the design of the equipment is not standardized and differs from one vessel to another within the same operating company (Bielic *et al*., 2017).

Even though, usually the vessel owners and the Flag States are responsible to train the seafarers of how to use the automation systems, the familiarization process is very quick and sometimes unclear, since the manuals are extensive and often without the "full insight into the user requirements". (Bielic *et al*., 2017). Such factors contribute to the marine accidents, for which an example of oil/chemical tanker *Ovit* can be given (Bielic *et al*., 2017).

The case of *Ovit* represents unsafe actions of the deck officers, who have been familiarized with the ECDIS methods, but have failed at navigating, using such methods that, as a result, led the ship routed through hazardous and unchecked shallow waters of Dover Strait. All the alarms have been switched off, the vessel has been aground and damaged. Such a case could easily lead to a far more serious environmental disaster, knowing the substances the vessel was carrying (Bielic *et al.*, 2017; Gov.UK. 2015)

This case also contributes to the factor of poor general technical knowledge, which considers the lack of seafarers understanding of how automation of the vessel works or what shall be done in order for the automation equipment to work properly and effectively. (Dhillon, 2010)

Another two issues to be considered are the issue of poor maintenance, which is described by dangerous work environments and the state of crew fatigue in need to maintain the undone reparation works; and the issue of "decisions based on inadequate information" determined by the seafarers' navigation decision-making based on the inadequate or incomplete information, relying on memory or lacking critical thinking. (Dhillon, 2010)

Finally, the issue of hazardous natural environment is mainly focused around the winds, the currents and the fogs, which is vital to consider already during vessels' design phase in order to avoid the accidents bounded by the unpredictable natural environment. (Dhillon, 2010)

Meanwhile, the nowadays existing standards, such as Standards of Training, Certification and Watchkeeping for Seafarers (STCW 95) have strictly defined requirements for the education, as well as maritime training. (Wang & Zhang, 2000).

The theoretical standards are usually not enough in maritime logistics, so there are various methods of demonstration the minimum competence of the potential seafarers (in spite of the traditional examinations), which are classified as following STCW Code:

- Education of the ship systems and maintaining experience;
- Training with usage of simulator (including, but not limited to ARPA navigation simulator, route planning simulator, radio simulation and modelling of the ship);
- Experience of the service;

- Necessary education of equipment, such internal workshop of skills training and last, but not least,

- Practical training (including instructions training, drills and testing, practical demonstration and experience, as well specialist training and exercises). (Ghosh, 2017)

The effectiveness of the practicing the STCW 96 rules and standards has been proven by the ability of the potential seafarers to fracture the real-life situations against the financial costs, design of the tasks and orders for gaining the outmost of the learning effect (Ghosh, 2017).

Human errors in road transportation systems

Recently, the research has indicated that the errors made by the drivers contribute to almost 75% of the road transportation accidents. (Dhillon, 2010; Salmon et al., 2010; Stanton & Salmon; 2009) The human error itself is believed to reinforce in major factor into the occurrence of various incidents and accidents, regardless of these events happening in developing or developed parts of the world. As an example, human error is cited much more repeatedly than the errors of the mechanical kind in more than 5000 trucking connected deaths happening each year in United States, one of the most developed countries of the world. (Dhillon 2010)

It is significant to mention that there is a sufficient number of contributing factors to the road accidents, including, but not limited to: poor design of the vehicle, poor road conditions, as well as carelessness of the drivers. (Salmon et al., 2010)

Generally speaking, in the context of road transportation, human error has been previously attempted to investigate from the point of the origin and the frequency of the drivers' errors, the factors involved into the road traffic accidents, as well as different drivers' groups against the age parameter, as an example. (Salmon et al., 2010) For instance, it has been studied, based on the questionnaire of 1400 Swedish drivers of age 18 to 70, that the errors and violations tend to decrease with age with an increased experience. (Stanton & Salmon., 2009) On the other hand, it was also stated that, in the United States, the drivers of age 65

and older, tend to have an increased reaction time to traffic hazards, with declining perceptual, cognitive and visual abilities. (Cicchino & McCartt, 2015)

It has been attempted by Reason (1990) to classify also the different types of errors and the conditions influencing thereof. The driver errors have been classified as the *error of recognition*, *errors of decision-making* type, as well as *errors of performance*. Recognition errors mainly represent the lack of attention from the drivers, distraction, as well as so called "looked-but-failed-to-see errors", which in most cases have resulted into 56% of the investigated major trucking accidents. (Salmon et al., 2010)

The "looked-but-did-not-see error" is one of the errors, which is also related to other failure types, such as lack of attention and human misjudgments. The reasoning behind such errors can be found in three physiological phenomena. The first phenomenon is limited information processing capability (whenever the information is not fully processed due to the raised competition for attention in complex moments or scenes), followed by the selectivity of attention, where one visual scene is prioritized over the other. The last, but not least, psychological phenomenon occurs when the driver is having the illusory conjunctions and some hazards are obscured during the moment of driving. (Stanton & Salmon., 2009)

At the same time, *decision errors* have been represented by the misjudgment or inadequate unsuccessful assumptions, unprofessional vehicle maneuver, excessive speed, driving too near the other vehicles, as well as improper signaling. As an example, the most contributing to the road accident in UK types of maneuvers are going straight ahead, overtaking some vehicle, turning or waiting to turn in the right direction, as well as going ahead on a bend. (Stanton & Salmon., 2009) Meanwhile, *errors of performance* kind include, but are not limited to panic, overcompensation, freezing conditions, as well as defective directional control. (Salmon et al., 2010) The most common driver errors identified by Dhillon (2010) are shown in the figure below.
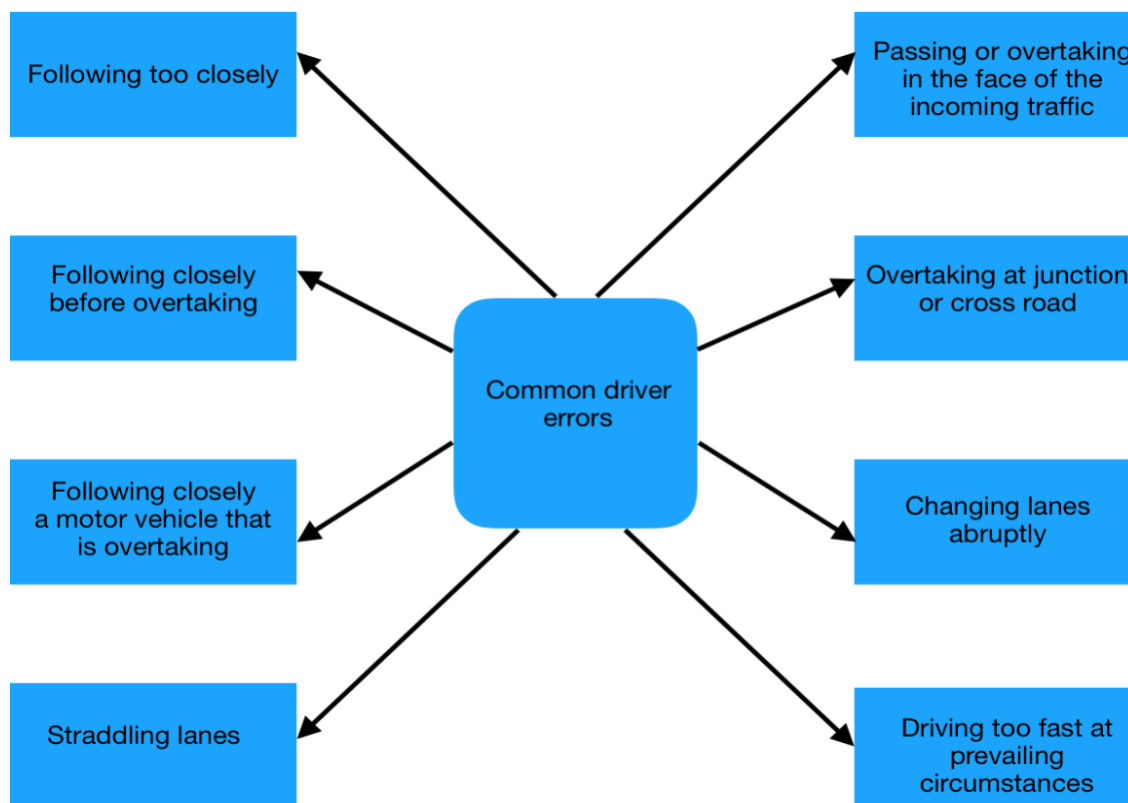
```
┌─────────────────────┐                              ┌─────────────────────┐
│ Following too closely│                              │ Passing or overtaking│
│                      │                              │  in the face of the  │
│                      │                              │   incoming traffic   │
└─────────────────────┘                              └─────────────────────┘

┌─────────────────────┐         ┌───────────────┐    ┌─────────────────────┐
│  Following closely   │         │ Common driver │    │ Overtaking at junction│
│  before overtaking   │         │     errors    │    │    or cross road     │
└─────────────────────┘         └───────────────┘    └─────────────────────┘

┌─────────────────────┐                              ┌─────────────────────┐
│  Following closely   │                              │   Changing lanes     │
│ a motor vehicle that │                              │     abruptly         │
│    is overtaking     │                              └─────────────────────┘
└─────────────────────┘

┌─────────────────────┐                              ┌─────────────────────┐
│  Straddling lanes    │                              │ Driving too fast at  │
│                      │                              │     prevailing       │
│                      │                              │   circumstances      │
└─────────────────────┘                              └─────────────────────┘
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Figure 5. Most common driver errors. Resource: Dhillon,2010

Mistakes and errors have been identified in several studies as if the original intentions of the driver were good, but the outcome has fallen short, as an example, whenever the driver is bearing the speed limits, but pressed the accelerator accidentally (*a slip*), or subconsciously forgetting about the speed limit (*a lapse*). These types of actions are unintentional cognitive failures resulted from the oblivious deviation of the actions of the driver from intention. (Reason, 1990; Rowe et al., 2015)

In order to be concrete, "*slips"* and "*lapses"* are most certainly resulting from either the poor attention, (as if the driver is not keeping the good attention to the transportation during the crucial times during on unfamiliar route) or excelling attention, as when the driver is over attentive to the performance on the road, at the wrong moments. (Stanton & Salmon., 2009)

On the other hand, a *mistake* of the road transportation actor would be specified by the driver, who with all the intention acts in a wrong way from the very beginning. An example would be, when a driver is planning to accelerate speed at the moment of when speed is supposed to be reduced. (Stanton & Salmon., 2009)

Whereas the intentional *violation* of the drivers, which has been proven by the study sampled by 520 drivers of the age 20-56, would contain a consciously intended *violation* of the speed limits and the accepted key principles of safe driving. (Rowe et al., 2015; Salmon et al., 2010)

The basic error types found by Reason (1990) are demonstrated below.

Table 2. The representation of the errors (adopted from Reason, 1990) Source: (Stanton & Salmon, 2009)

Basic Error Types	Error types examples
Slips (Attentional failures)	Misperception Action interruption Carelessness of action Reversal of action Disarrangement of action
Lapse (Memory fails)	Carelessness with planned action Losing place in action sequence Forgetting intended actions
Mistake (intention failure)	Misapplication of good application Application of poor procedure Poor decision making Failure to consider alternatives Overconfidence
Violations	Intentional violation Unintentional violation

Operational Influences on Commercial Driver Performance

According to the study of past experiences, the operational contributors are generally a sufficient factor influencing the performance of the drivers in regard to occurring human errors. To be specific, the drivers are usually working in an operational environment that includes, but is not limited to:

- ✓ Practices created by the company's management (as being on time with the schedule, selection, proper training, incentive for working in safe environment),
- ✓ Work requirements, as on-time customer delivery service,
- ✓ Governmental regulations and various penalties for violations (as an example, driving of over 80 km/h is strongly prohibited as well as the axle weight shall be balanced in a truck),
- ✓ Labor policies; (Dhillon, 2010)

Another side of the operational conditions that influence the human error on the road, is tightly connected to the driver behavior and cognition states. (Westerman & Haigney, 2000) For instance, it has been proposed that emotional arousal is reducing a certain range of visual attentiveness each time when scanning a visual scene. In case of driving, the reduced scanning ability has a detrimental effect for the performance of the driver. However, in the continuous research made, it was found out that that applies only to the negative emotions, as when an individual is experiencing the positive emotional times, the drivers can possess a great range of memory, which helps in any performed task. (Briggs, Hole & Land, 2011)

Same goes for the stress and cognitive anxiety the driver might be experiencing, which result into less productive incoming sensory information and contributes to failures in spatial memory, hence reduced performance level. High anxiety also contributes to the possible visual tunneling of the drivers or in other words, when the visual attention is narrowed. These emotional states significantly affect the driving performance. (Briggs, Hole & Land, 2011)

Human errors in aviation

According to the International Air Transport Association (IATA), the aviation is preferable choice for over a billion and a half people for both personal and commercial purposes, as well as over 40% of world trade is accomplished with the help of aviation industry. More

than 28 million, direct or indirect, jobs were created for the arrangement of stabilized movement of cargo, as well as smooth flights for passengers. (Dhillon, 2010)

Starting with 1950s, when the concern over the reduction of the accident rate, has started to arise due to, continuously raising, 70% of aircraft accidents involving human error, there have been taken measures to mitigate the influential factors for the occurrence of the accidents. Today the accident rate for air both passengers and cargo transportation, has decreased down to one fatality per a million flights. However even though the overall accident rate has decreased drastically, the reduction of the human errors in aviation has not been as stable in comparison with the accident rate due to various environmental and mechanical factors. (Dhillon, 2010)

Human error remains up to today as the superior cause for the accidents in both civil and military aviation industry, even if taking into account the sufficient improvements in technological reliability and systems safety. (Erjavac *et al.*, 2018) It has been also recently realized that it seems to be a very challenging task to diminish the errors caused by humans completely in aviation, bearing in mind the complexity of the technical systems employed in the industry. Human error is also bound to the complex scenarios, in which errors occur, due to the increased stress-level decision-making, high workload, as well as poor communication and coordination within the crew. (Kontogiannis & Malakis, 2009)

Therefore, the key studied aviation errors are devoted to the organizational factors and its links to the occasion of high-risk systems accidents, precisely, pilot errors. As per the study, which has investigated the National Transportation Safety Board's databases and the airlines disasters occurring within the years of 1990-2000. Out of the 1322 accidents, around 60 were related to human error of a pilot and several administrative-related factors. Such influential factors have been grouped under the following categories:

✓ Insufficient fatalities, (including, but not limited to the improper lighting, lack of safety conditions and unstable environment for piloting);

✓ Inadequate guidelines and procedures (including, but not limited to, conflicting policies, poorly explained procedures, neglect of operations);

✓ Insufficient supervision: as failures to give the necessary working instructions, disregard as well as leadership to flight operations;

✓ False documentation involved, represented by record keeping during the flights, signoffs or checklists;

✓ Unfulfilled standards or requirements with unclear objectives and differences to the general policy;

✓ Threats and management pressures, as threatening of pilots with payment issues and the intimidation of the job;

✓ Poor training opportunities;

✓ Incomplete or improper timing information distribution, including the weather reports, pilot logbooks and various operational updates;

✓ Poor inspection of the operational issues, organizational environment and quality;

✓ Poor and slow verification process of the well-defined standards of the operations, regulation and reporting process;

The contribution these organizational causes have made to the 60 accidents analyzed is represented as follows: 1.5% of insufficient resources and equipment, 21% of improper standards for operations, 10% of insufficient supervisioning over the operations, 4% of false documents and reports, 12% of unfulfilled requirements with unclear objectives, 6% of the threats and management pressures, 18% of poor training opportunities, 12% of incomplete or improper timing information distribution, 13% of poor inspection of the operational issues, and 3% of poor and slow verification process of the operational standards. Meanwhile, it is important to note that solely 2 categories have contributed with 39% value to the accidents, as the improper procedures and/or directives and poor inspection of the operational issues, management of the organized environment and quality. (Dhillon, 2010)

Factors contributing to flight crew decision errors

Through the decades, selection process of the employees in aviation, especially pilots, has focused on the individuals with high and even exceptional capabilities. Even more, for completing the flights and the core mission, the flying skills are simply not enough. Hence, the Crew Resource Management (CRM) has designed the tests to measure individuals' ability to problem solving, decision making, as well as testing an ability to act under increased pressure levels. (Kharoufah *et al.*, 2018)

Another study has suggested highlighting the critical situations' orientation of the crew during the selection processes. It has been pointed out that the significance of the flight crew

to react in the correct way within the short time period, even a millisecond, is sufficient for the safety of the crew and the passengers. Such situational awareness includes 5 vital individual skills, demonstrated by:

✓ Space orientation skillsof the individiald meaning being able to utilize the airline equipment both from the systematic and visual points of view. This ability is vital for navigational purposes;

✓ Attention as in the sufficient attention to the significant details in the demanding scene. It also includes distributing the right attention with the other competing information and demanding tasks;

✓ Memory, including the working memory storing and the long-term memory. Individuals need situational awareness, based on extracting the right information from the working memory and comparing thereof to the targeted result, to comprehend and predetermine the fortcoming events and potential scenarios. While the long-term memory is stored, the significant details are kept in the working memory, whilst reducing the load and pressure thereof;

✓ Perception, is also an ability to perceive the information within a short time period, process it, be aware of the significant details to make the decisions;

✓ Cognitive function is the capability of a potential crew member to deal with the high level of workload, extreme environment during the flight and the pressure. (Endsley & Bolstad, 1994)

Such individual skills and capabilities need to be checked in advance to test the possibilities of individuals to stay focused during the extreme situations and ensure the readiness to integrate rational decision-making for any type of challenges. (Kharoufah *et al.*, 2018)

4. ANALYSIS

To begin the Analysis chapter with, all of the questions of the survey aimed for analyzing the causes of the errors of the freight forwarders and employees working for container shipping lines have been formulated in a categorical closed-ended way, represented by, mostly, the multiple-choice questions. The full representation of the questionnaire may be found in Appendix 1.

As a result, all respondents have been given five options to choose from to identify, what is "most likely" down to "least likely" to their habits, daily activities in the personal life,

work handling and work-related challenges, self-organization at work, as well as personal and working time management, mistakes and errors.

Overall, there have been chosen several factors for statistical analysis: Motivation, Personal life-style, Time Management, Work Management and lifestyle, as well as Mistakes and Errors. The breakdown of the groups of factors, the belonging sub-factors, as well as the example of the questions raised in the questionnaire has been represented below. The full representation of the questions used as a data collection source is enclosed in the Appendix 2.

Table 3.Breakdown of the research factors and questionnaire basis;

Group of factors	Factors	Questionnaire example
Mistakes & Errors	Consequences of mistakes errors in logistics, causes of the errors, attitude of my organisation towards failure, personal attitude & level of mistakes	I agree that the mistakes I sometimes make can lead to a circle of errors for other logistics chain actors;
Motivation	Belief in the organisation, level of responsibility, realisation of self-importance, self-confidence, productivity, growth possibilities, targets setting, work stimulation	My work is not challenging my abilities;
Personal life-style	Family stability & number of children, alcohol consumption, profit & salary analysis, smoking/non-smoking habits, dieting, sport activities, social life, home situation, suffering	I am considering being physically active & getting exercise as the most important factor in my life-style;
Time Management	Fatigue, time spent on working, overworking and attitude, routine	I am being under pressure to get things done in a hurry;
Work Management and Work life-style	Communication at work, guidelines and training, corporate profit analysis, physical & mental environment at work, problems & challenges, ethical issues, competition & teamwork, devoted attention, attitude of supervisors, feeling of appreciation, responsibility for others, communication activity, reliability of completed tasks, stress at work, distraction	I tend to pay less devoted attention to the tasks that have been forwarded to me by my colleague, in case he/she has to be off these days;

The results have been "standardized" and turned from verbal expressions into an equal numbering scale, from one to five. This has been done, in order to compute the results of the survey, using the descriptive analytics. In this case, we have employed the Standard Deviation function to find out, how variable the answers of the respondents are against the "mean" or how clustered are the scores distributed from the mean value.

The sample is consisting of 33 respondents. The age of the respondents has varied between 18 to 24 years old (10,81%) 25 to 34 years old (45,95%), 35 to 44 years old (18,92%), 45 to 54 years old (13,51%) as well as 55 to 64 years old (10,81%).

For more visuality, the graphical representation of the age difference is represented by a pie chart below.
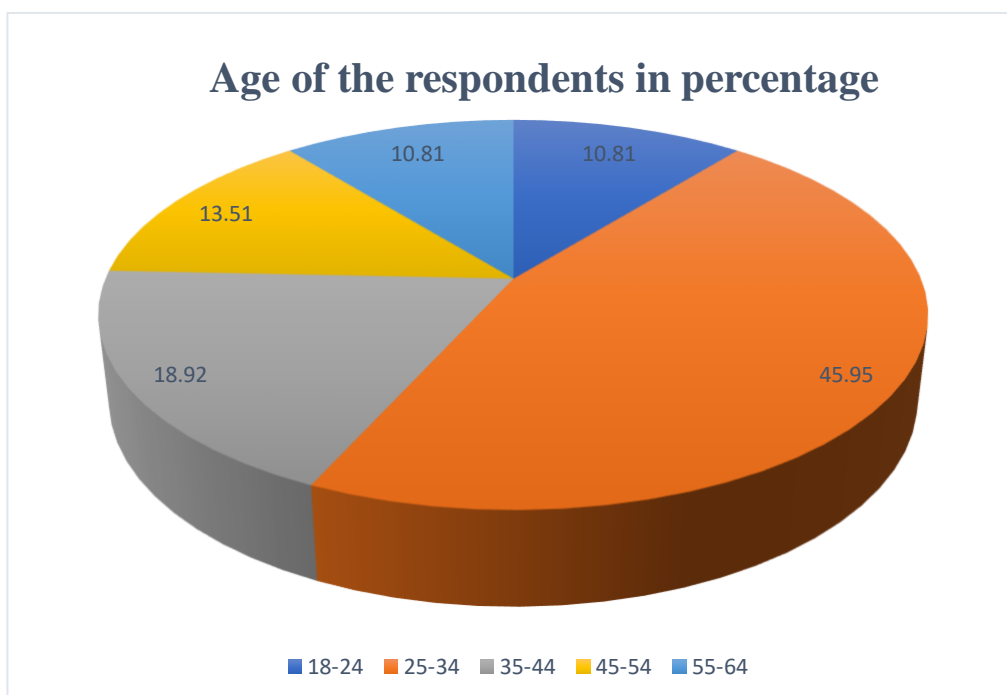
Figure 6 Represented age of the respondents in percentage

Majority of the surveyed persons have achieved the higher education level, including Bachelor's degree and, in some cases, Master's degree. The majority of the respondents have been from Finland (38%), Russia (35%) and others from Brazil, Vietnam, Germany, France, Belarus and Norway. All of the surveyed professionals are involved into logistics industry by being a freight forwarder, logistics specialist, port operator or container/shipping line customer service, broker.

The summary of the factors analyzed together with the total result of the overall mean value, as well as the standard deviation' per factor result is represented in the table below. Factorial analysis' clarification will be presented thereafter.

Table 4. Factor Analysis: Mean Value and Standard Deviation

Factors analysed	Total Mean value (Scale 1-5)	Standard Deviation per factor (lower standard deviation <1, higher standard deviation >1)
Mistakes & Errors	3.269	0.9345
Motivation	3.339	0.9605
Personal life-style	2.953	1.1811
Time Management	3.163	1.0487
Work Management and Work life-style	3.293	0.9549

Motivation

The first factor analyzed that has shown a rather high "mean" value is corresponding to the professional's referred likeliness for the Motivational components suggested, including, but not limited to target-setting, career possibilities, personal development, office conditions, skills obtainment, overall productiveness.

The overall mean value of Motivational factor for the whole sample has averaged to 3.339, which has shown that the majority feels that there is a low chance for them, as employees, to be promoted from the current job, as well as that there is a lack of some of the skills vital for performing the job well enough. It was also found that a significant number of respondents are finding their work routine, whilst there was also a sufficient number of respondents, who were sometimes lacking interest in executing their work. The overall

standard deviation for the factor has shown the result of 0.9605, which has been the second least variable standard deviation of the whole study of the sample.

The lowest standard deviation of the Motivation factor has determined as 0,2185 and has shown that the most of the surveyed (mean value 3.394) are aware of work progressing their career. Whilst the highest standard deviation (st.dev. 0.9828) or the highest variability in the answers has been noticed in the level of expertise being reflected in the level of the salary, with the overall mean value resulting to 3.182.

The highest mean value of the Motivation factor is 4.424 referring to high degree of seriousness, with which the respondents are taking their work. The standard deviation has been also relatively low for this question, resulting in 0.6139.

Work management and work lifestyle

The following factor that has been indicated with the second overall best or highest mean value (3.293) and overall standard deviation 0.9549, has referred to the Work Management and work lifestyle factor, which has been suggested for analysis in order to evaluate: 1)if there is any freedom in organization at work for respondents, 2) if standards and procedures are well notified inside the organization, as well as, 3) what is the level of competition, 4) how is the working environment generally and 5) what are the personal work-related issues noticed by the employees themselves.

The highest mean value for the Work Management and work lifestyle has been identified for the question about the submission of the department's work and the trust that the superiors may, for sure, have in thereof, which has reached its peak of mean (4.333) and third least variable result in standard deviation (0.6455).

Meanwhile, the least variable standard deviation has been also noticed to be related to Work management and work lifestyle factor. With the result of standard deviation being 0.4962 and the mean value being of 4.606, the majority of respondents have proven that there is a must in every individual taking responsibility for any actions performed at work. In addition, it is vital to notice that with the mean value of equaling to 4.000 or higher, the respondents have claimed that there is a free possibility to organize their own work, there

is a need of groupwork and requirement of helping the work colleagues, as well as there is a need to be creative in day-to-day problem-solving.

In addition, there have been several questions that have been identified with a "negative" mean value, which are important to mention in this analysis. The logistics professionals have claimed to not experience a stress-free pace of working (mean 2.455, st. dev. 0.9712), the employees tend to have complex problems to get absorbed in (mean 2.424, st. dev. 1.0906). Even though, the mean shows really accurate the negative experiences at work, the standard deviation tends to be rather high, which means an increased variety of answers and diversified working climates for different employees. Therefore, the highest standard deviation per factor has shown the result of 1.2568 and has referred to an ability of working unsupervised for an individual.

Mistakes & Errors factor

When it comes to the third highest overall mean value per factor (3.269) and rather lowest variability of answers (0.9345), the factor Mistakes & Errors comes into picture. The highest mean value for the whole factor's survey questions has come to one regarding the, confirmed by the surveyed employees, fact that errors in logistics are costly and challenging to fix, if occurred. The standard deviation for this question has been second lowest per the factor and has amounted to 0,7687, which signals about a very concentrated view on this regard. When it comes to diversity of answers, it has been noticed that out of 17 questions asked, the standard deviation has been lower 1 for 11 out of 17 questions, which means that the respondents have mostly been on the same level of agreement for 65% of the whole factor related questions.

The lowest mean value (2.182) for the Mistakes & errors factor, has been related to overall disagreement of individuals forgetting to fix their own errors at work. However, the standard deviation has shown a rather high result of 1.0141, which shows rather honest attitude of respondents, some of which accept the possibility of forgetting about the mistakes they make.

The highest standard deviation (1.1307) or the highest variability has been related to the question of making mistakes due to lack of motivation. The average being 2.818 genuinely shows a general disagreement with the statement.

The lowest standard deviation (0.6784) has been related to question and agreement of the individuals that their mistakes can lead to a circle of errors for other logistics chain actors. The mean value has been 4.091. With the same mean value, 4.091, the respondents have identified that the errors in logistics' related documentation can be caused by the less devoted attention. Interestingly, with a rather high mean value being over 3.5, the respondents have confirmed that the causes of their mistakes can be tiredness, manual work at the computer, stress. The standard deviation has shown a result of being below or equaling one, which means that the causes of mistakes are the tragedy of commons.

Time Management

The fourth highest mean value (3.1625) is dedicated to the Time Management factor, with the overall standard deviation being 1.0487.

Therefore, the highest mean value (4.091) of all the questions belonging to the same factor matches with the least standard deviation (0.7230), which belongs to the majority of respondents identifying the constant hurry, in which the individuals are permanently working.

In addition, the lowest mean value (1.939) and the second lowest standard deviation (0.8269) show that the big majority confirms that there is a need to do many things at the same during their work. Whilst, the second lowest mean values (2.515-2.576) show that according to the individuals' opinion, they are not working short hours and are not able to forget about work, once they are done with thereof.

Personal life-style

The last but not least, mean of 2.953 has been connected to Personal life-style factor, with the lowest standard deviation of 1.1811. The highest mean value (4.273) of all the surveyed questions belonging to this factor has shown that all the individuals have friends to spend time with, after the work is done. The standard deviation was also within a lower rage and is identified 0.8394. The majority of individuals tend to be very social and vote for enjoying meting new friends and acquaintances with the mean 3,939 and the standard deviation being 0.7475, which happens to be also the lowest standard deviation per factor.

As it was also primarily awaited, the standard deviation results have been rather high from the majority of questions, due to the fact that the humans are very different in their habits, family situations and preferences over the activities during their free time. Therefore, a rather "high" mean of 4.061 has shown that the individuals seem to be majorly non-smoking, however the standard deviation result of being over 1.4 has proven that there is still diversity in regard to preference of this habit.

Therefore, the lowest mean value (1.515) of the whole factor analysis is devoted to having a smoke after each finalized task, which obviously tends to be the lowest, due to the results of the previously analyzed question of smoking generally. The same low result of 1.727 average goes to the majority not being interested in yoga.

Overall, taking the results into consideration, the majority of the individuals tend to have a rather healthy style of living, which is shown with the negative answers of the employees to the attempts of consuming less alcohol or preference of alcohol during the evenings, constant diets, lack of sleep, identified problems at home or children causing high stress after work, regardless of the number of children excessing one.

Taking into account the mean of 3.606, the standard deviation result of 1.324, a sufficient number of people feels that in doing sports they tend to forget about work and problems. In addition, the surveyed specialists, have indicated (Mean: 3.818) that they are able to separate their working life from their social and personal life.

The highest standard deviation of the whole factor has been 1.6583 and was bound to the question of the number of children, which has been the most varying answer for the whole factor related questions.

Overall, speaking of the general results of the variability of the answers, the standard deviation has shown a rather "high" result for the majority of questions, which, in this case, is above 1 for 86 questions surveyed, against 60 with a "low" standard deviation or the low variability in the answers. The most common low standard deviation questions have been related to the Work management and work lifestyle factor (31), as well as Mistakes and Errors factor (12), followed by Motivation, Time Management and Personal lifestyle.

The least variable answers are related to accepting the responsibility for individuals' own decisions, considering themselves being productive, superiors being pleased with the work done, achieving successfully targets, taking work seriously by the individuals. The individuals have also pointed out with a low variability having an enormous volume of work with a mean value over 3.5.

The most variable answers or the answers showing the high standard deviation, for all the factors, have been linked to Personal life-style and, in particularly, number of children, smoking habit, drinking situation, sport activities, dieting.

When it comes to highest mean values analysis for all the factors, there have 55 answers that have shown the overall value higher than 3.5, 28 of which have belonged to Work management and work lifestyle factor. The top five anwers with the highest mean value have been directly linked to responsibility for own decisions, taking work seriously, submission of work superiors can and do trust, having friends to spend time after work, as well as requirement to help other co-workers during the working day.

In addition, the respondents have been asked several questions about their sufferings, if any. According to the results, almost 70% suffer from headaches, over 57% of the respondents keep suffering from backaches, followed by 45% suffering from neckaches, sleeplessness-34%, anxiety- 25%, both irritability and stomach disorder- 22%, inability to concentrate-20%, as well as smaller percent suffering from chest pain and indigestion or nausea. Only 8-9% does not suffer from any of the above.
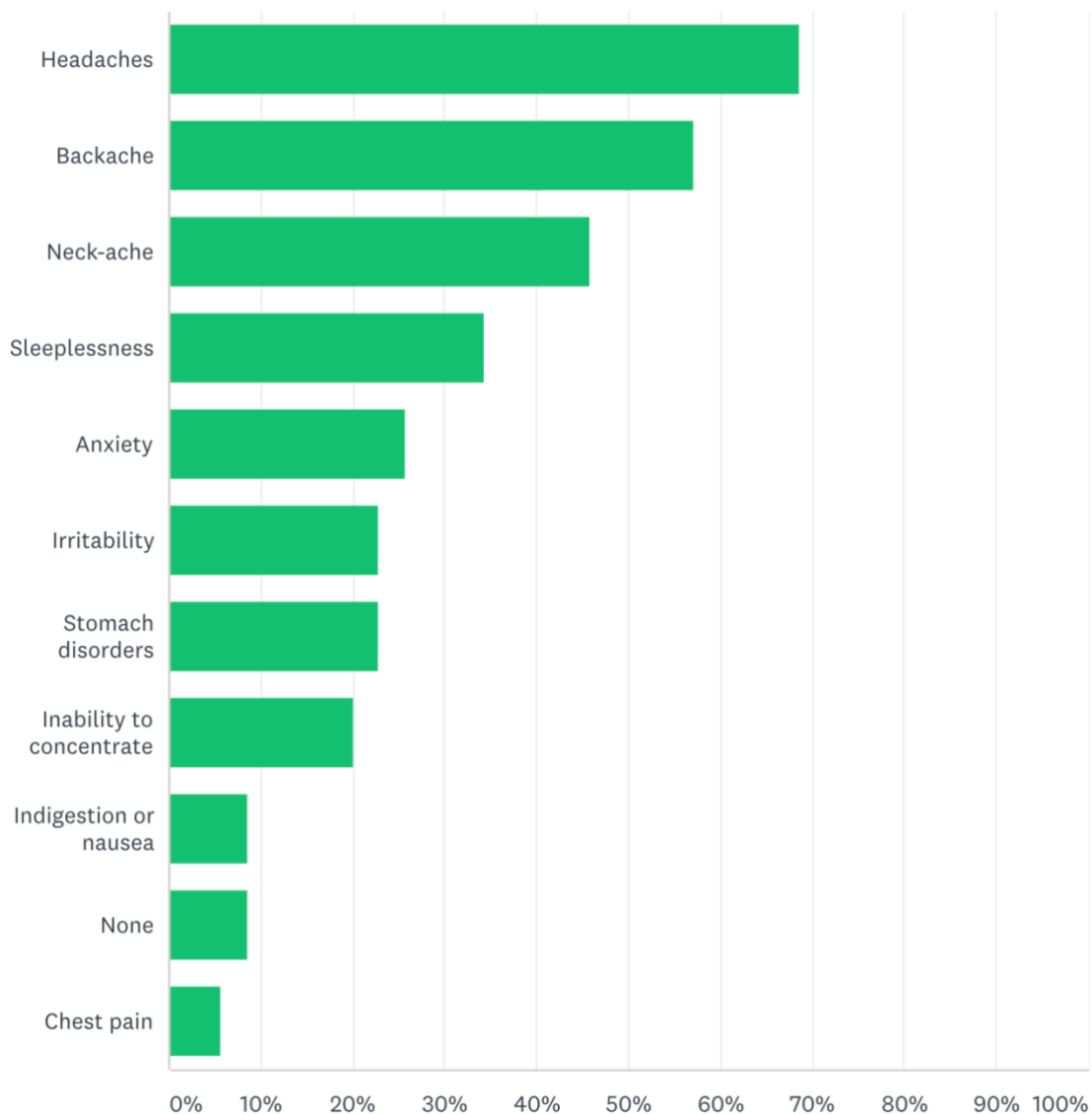
Figure 7 Experience of sufferings of the respondents. Questtionaire results of the Author

The respondents have also identified that the most bothering working conditions have been noise (38%), poor ventilation at the working place (35%), as well overcrowdings (21%), excessive heat (24%), poor maintenance as of t he building and premises (17%), dust (14%), poor lightning (11%). Meanwhile, the 21% percent of all respondents are not suffering from any working conditions related' issues.
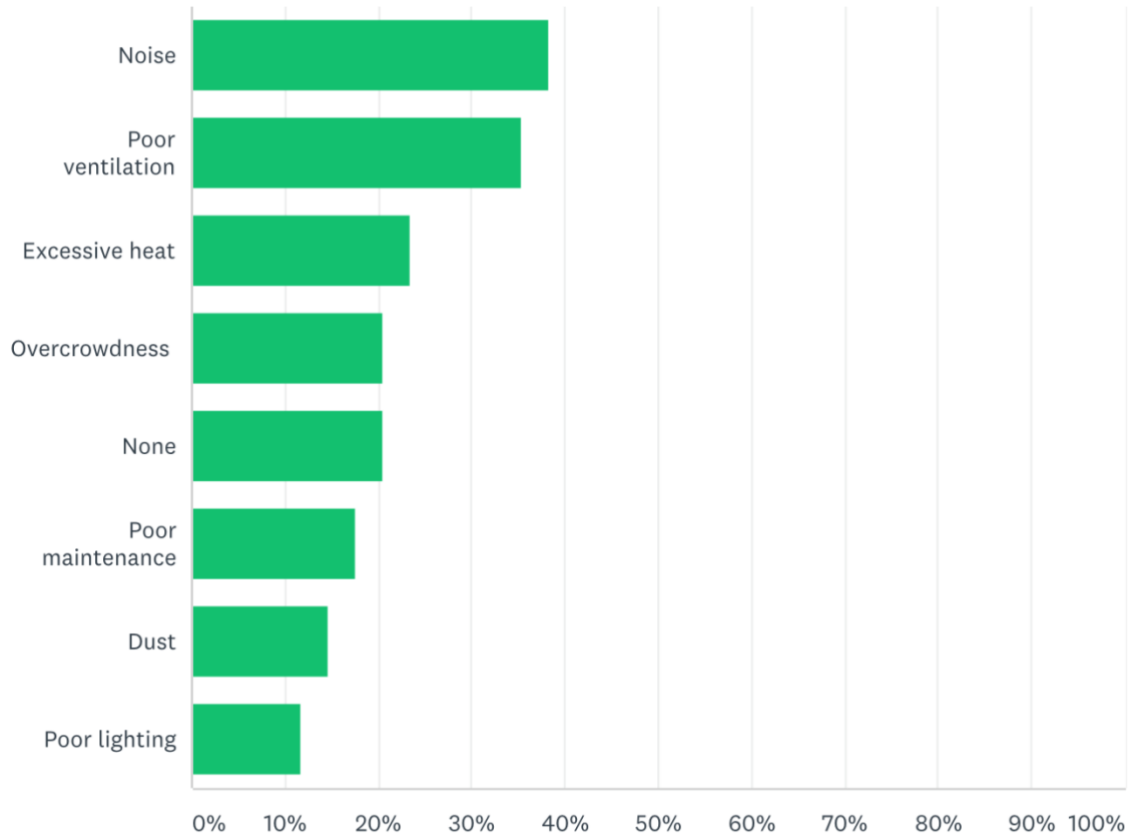
Figure 8 Working conditions' related issues. Quesstionnaire results of the Author

In addition to the individuals' sufferings, the respondents have been asked to identify, if there are any working relationships' problems (Figure 12).
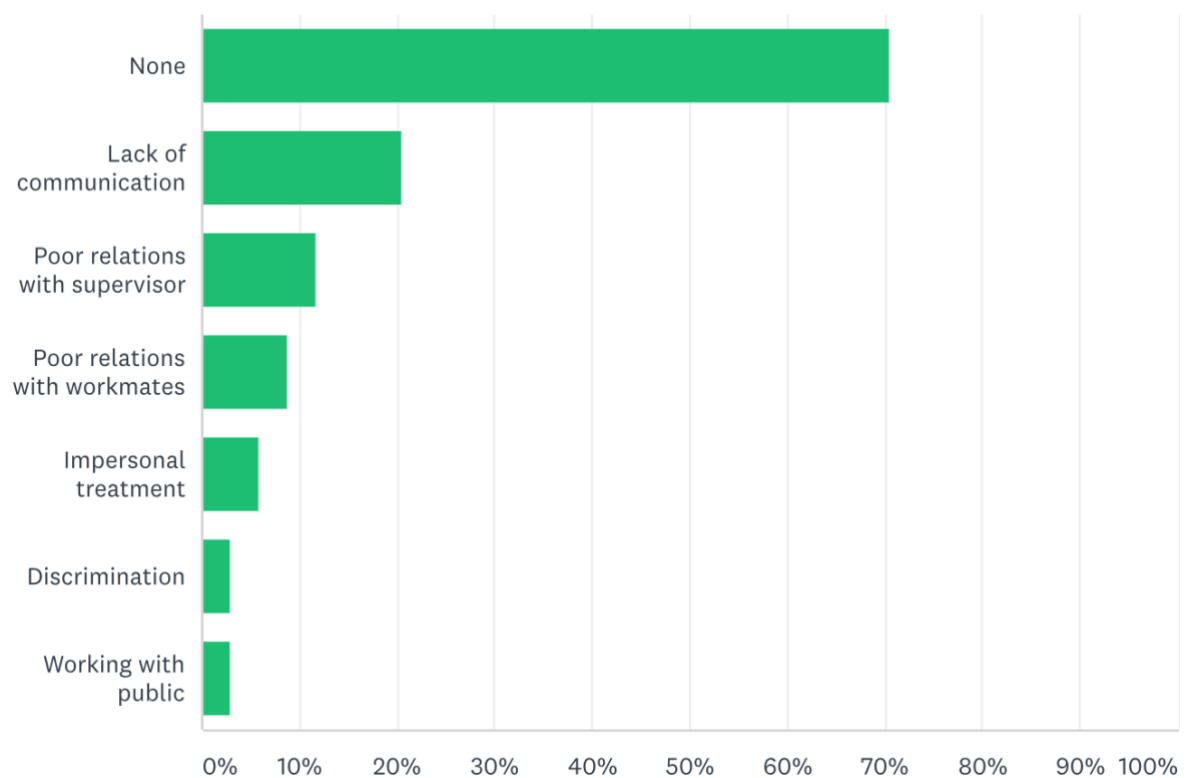

Figure 9 Working relationships problems. Quesstionnaire results of the Author

In this case, the majority (24 individuals or 71%) has identified that they do not have any working relationships' problems, whilst 21% of professionals are suffering from lack of communication, 11% of specialists are suffering from the poor relationships with the supervisor or supervisors, approximately 9% is suffering from the poor relationships with the colleagues. Moreover, one person is suffering from discrimination at work, as well as only one person is suffering from working with public. Finally, 2.58% is suffering from impersonal treatment at work.

Therefore, with the questionnaire results in mind and taking into consideration the author's personal experience in the same field of freight forwarding, it has been also additionally found out that the answers of the majority of the respondents are biased. As a result of personal communication with the same respondents, the vast majority of the employees are complaining about the colleagues going for vacation and the increased volume of work, the errors of the colleagues and sometimes even discrimination. That leads to a logical conclusion that people, by their human nature, fail to acknowledge their own errors probabilities and try their best to present themselves in a better light, without revealing too much in a survey deployed.

5. Discussion and Conclusion

Overall, an aim of the research was in addressing most critical human-factor related errors in logistics industry by reflecting various transportation modes' human errors and the causes of thereof, including the road transportation and the drivers' mistakes, shipping and the crew's limited training possibilities, rail transportation and the fatigue related mistakes, as well as air freight and the pilot's reactive behavior in the complex scenarious.

The goal was to fill in the missing perspective of the human error and the human factor-related mistakes in freight forwarding and container shipping and investigate the potential errors of logistics coordinators as the key contributors of the operational ineffecincy.

Answering the RQ1 "*What is the role of human factor-related mistakes and errors in logistics industry?*", with the help of the literature review and the empirical parts of this thesis, the human-factor related mistakes have been proven to directly influence the decreasing operational performance of any organization serving the logistics-related purposes, since until now all the operative employees in not only the organizing the transportation, but also performing actors (drivers, pilots, rail drivers, as well as captains and the crew) are carrying out and involved into manual, not majorly automated daily routine actions, which always leave a room for human factors and human-factor related mistakes.

Through the lens of discovering the possible operational risks in logistics, it has been confirmed by the surveyed logistics specialists that there is dramatical effect of the possible manual computing error in documentation preparation, made by the freight forwarder/operation employee, on the overall logistics operations. That means that by human's manually inputting information into either well-working system or a software, noticed being slow and poorly performing, the mistakes in the documentation coming along might cause dramatic additional costs. As a vivid life-example, a mistake in the Bill of Lading might lead to a customer not being able to receive the assigned goods after the cargo arrival to the port, failure to hold onto deadlines in manufacturing or the import clearance might get much more complicated, costly and time-consuming, since the cargo will be under the temporary storage in the port area, airport terminal, temporary warehouse until the documents are corrected.

Usually together with the storage costs also comes along the demurrage cost for the usage of the additional transport-related equipment, such as containers, flat racks, trucks or even cranes employed in handling operations on the loading and unloading of the cargo.

The causes of errors in this study have been categorized on the basis of the most utilized transport modes. The first transportation mode that has been analysed with the help of the literature available, was railway logistics. In Railway Logistics chapter, it was found that the major generator or influencing factor of the human-related mistakes in the railway logistics is the gap between the natural human capabilities and the railway systems demands or, in other words, the gap between the slow human reaction and behavior towards the routine general processes and regulations such as signal passing, speeding regulation, rail traffic rules.

However, the major theoretical source for this mode of transport was dated 2010, which calls for the example of the nowadays, already in use, fully automated trains in most condensed parts of Parisian subway, where previously the daily accidents peaked at least one per day, when the trains were directed by the humans. To be precise, there are nowadays no accidents with the employed intelligent Artificial Intelligence noticed ever since, whilst a bonus of 30% operational cost saving has been reached. (Weedon, 2019)

In different scenarios, either emergency, permanent or temporary conditions, the reasons of human error may generally vary. When it comes to such common error as mistake in signal passing, the weather conditions and the human's visibility and concentration will be the potential causes for the risk. Meanwhile, when it comes to typical routine-based daily performed actions, the most dangerous causes for the human error are fatigue of the driver, sleepy conditions as well as work overload, which are generally more of a mistake of organizational type, which is allowing the drivers not to have any rest during the long working shifts, not having employed enough of drivers to substitute each other, as well as having unbalanced night shifts, which the drivers are constantly in.

When it comes to the RQ2 "*What are the causes for human-factor related mistakes in container shipping and freight forwarding?*" and the causes for human-factor related mistakes in container shipping, all the errors can be basically be blamed on either the condition of the operated vessel and the failure related to thereof, as it has happened with the famous Kursk submarine (Global Media, 2008) and the major systematic failure in a form of explosion, or technical/mechanical errors of the crew or the captain.

However, if going into deeper root of both of the classifications for the shipping errors, behind we may find the key reasoning in the workplace organization failure, both for mental and physical conditions of the crew. In essence, due to harsh economic competition on the logistics and shipping markets, the crew's organization is one of the factors simply suffering from the major savings, resulting from the constant competition between the vessel owners and the freight forwarders, demanding the cost-efficient logistics services. Nowadays, therefore, the vessel owners, in order to balance out the operational costs and utilize the existing resources, both the operating vessels and the human resources, tend to agree for the lowest market's prices to serve the logistics purposes.

As a result of such economic pressure, the neglected standards and lack of training of the crew remain to be the most significant cause of the shipping errors. In addition, the vessel owners, in order to reach the cost-efficient policy, invest into registration of the vessels in the foreign countries, where the labour force and education standards are much more of low-cost than in the more developed countries. The poor knowledge of the vessels and the fast education of the crew, fatigue of the crew due to the tiring schedule of the mariners, terrible for human health conditions and permanent living in the confronted spaces- all majorly influence the amount and the severity of the errors in shipping and forwarding.

Therefore, as an outcome of the conducted study, the freight forwarders and other logistics-related specialists tend to be also largely affected by the motivational factor in a long-term perspective. Since without any motivation, humans by nature, even subconsciously, start trying less to go for an extra mile in performing their job, or even do not care enough to follow all the standard procedures. Such interrelated issues as an absence of promotion or salary rise, lack of skills and deffeciency of desire for obtainment of the required skills or education contribute largely to an objective loss of attention towards the daily activities, hence more mistakes are to be made.

Another major contributor to human-factor related errors in logistics is presented by stress, which the office clerks, organizing the logistics operations, are extensively reporting about during the empirical part of the study. Even though the actual actors, such as drivers, shipping crew, crane operators, are the ones influencing most of the routine of the cargo loadings, transportation and driving, transshipments and customs clearance; the freight forwarders and the carrier's representatives are responsible for the whole set of operations and organization of thereof, which tends to be even more stressful due to a high level, extensive responsibility and the drastical economic value involved.

Another sub-reasoning of the stress being one of the key argument for increased amount of mistakes, lies in the fact that, due to a variety of the operations involved in multimodal and intermodal transportation, with different time-zones, various influencers, the initial plan of the logistics activity may never work the way an individual forwarder has planned it to, which causes even more rapidness in finding alternatives and higher chance for an error to occur. As per the results of the empirical pert of the thesis, the hurry with which the forwarders and the carriers are constantly planning the logistics and implementing thereof,

as per the confession of the logistics specialists, also largely contributes to the failures being conducted.

Another justification for the human error controversy is related to the circularity of errors in logistics. Since logistics, by definition, means coordination of the separate activities in arrangement, managing the stable, frequent and effective flow of cargo from finalized manufacturing until delivery to the end customer (Wood, 2019), any deviation caused by one of the actors in the large logistics network, influences immediately directly the logistics service level of another party and the operations' flow.

In such case, as an example, the loss of attention of one of the engineers preparing the transport drawing with the sufficient lashing points for the boiler, harms the smooth loading procedure of the boiler onto the vessel, delays the vessel and might even lead to possible injuries and fatalities, in case the crane will be lifting the heavy out-of-gauge boiler incorrectly under the wrong angle.

During the process of implementing the descriptive analytics in this study, it has been also found out by measuring the respondents' deviation level and the mean, that manual computerized work and tiredness lead to slips (attentional failures). Theory, previously mentioned in this study, has confirmed that even the posture of the individual and the level of comfort in the office (air conditioning, noise, humidity) lead to overall individuals' satisfaction level and more or less precision in attentiveness towards the implemented tasks. With this being noted, some of the organizations tend to forget about high maintenance of the spaces the employees are working in. Especially in the less-developed countries, like Bangladesh, the working conditions are described as unacceptable with the individuals working longer than the standard 40-hours in the neglected conditions (Robertson et al., 2016).

When it comes to mental and physical individuals' specific potential causes for the errors, the tragedy of commons is complied of headaches, backaches and neck pains due to imperfection of the non-active working lifestyle, as well as noise and the poor air conditioning systems.

As regarding to the potential opportunities for mitigation of the human-factor related mistakes, it is important to point out that even though in this research' methodology only

descriptive analytics technique has been utilized to be able to comprehend the quantified collected business data of logistics errors, descriptive analytics made it possible to evaluate the most contributing causes of the errors, after which the Personal Lifestyle factor has been denied in its significance.

The following step for the corporations could be utilization of predictive analytics, in order to, with the already collected typically observed causes of the human errors, predict the consequence of the error and mitigate it already at the phase of just occurance of the influential human factor, such as constant fatigue of an employee, irresponsibility in certain procedures, failure to follow the rules. The only key issue is that the organization is collecting enough data and comprehends the technical steps involved for the predictive analytics to remain as a possibility. Continuous, periodical fulfillment of the data in that case is a must. Therefore, for the organizations, predictive analytics also means continuous investments (as in collecting the unaltered researchable factor-based data of the same and added respondents), which over time will prove in its efficiency. After a while, the organizations will be more precise in choosing the employees for the particular roles with the required characteristics, whilst for some of the manually performed actions the automation will be of choice.

Perhaps, the employment of Big Data Analaytics, particularly predictive analytics, will introduce a new profession to the field of logistics in the future as a Logistics Business Intelligence Manager, who will be acting as a control tower and constantly monitoring the errors, but also taking a more intelligent and objective statistics-based decisions.

As it has been mentioned during this research many times that in logistics industry still there are a lot of operations, including reporting, documentation arrangements, status tracking updates remaining to be manually operated daily tasks for the logistics specialists that could be fully automated. In case these manual tasks are identified over time by the Managers as the key cause for the errors, get more automated, the logistics specialists will focus more on the strategic actions, will have the possibility to be less in a hurry, focus on the smooth process organization rather than documentation-related details.

5.1. Limitations and future suggestions

This research is only taking a first step into the identification of all causes for the Human related mistakes of logistics coordinators. It is limited to a rather decent group of

respondents and only one-time resource gathering, which is obviously not enough for making any generalisations. In case the sample would be increased and more country-wise diverse, the research could have obtained more deep and precise results.

In addition, the research has not taken into scope the financial consequences and analysis of the errors in logistics due to scarce literature available on the presented topic.
Therefore, the primary chosen method for this research has been descriptive analytics as the first step of testing the critical causes of the human errors in logistics and investigating the matter further would require more sophisticated analytical methods.

In case the predictive analytics would be chosen, as the more advanced technique for predicting the errors, different methods of Big Data Analytics would be tested and compared, depending on the main focus of the researcher, such as data mining, machine learning, deep learning agorithms, or optimization techniques, as an example. At the same time, this is the future suggestion to continue the development of the topic of this study and investigate potential improvement technique for the logistics industry's efficiency.

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Appendices

Appendix No.1. Questionnaire

Introductory questions
- What is your nationality?
- What is the highest education you have received?
- Are you working in the field of logistics service/forwarding/cargo handling/customs brokerage?
- Please, specify your age
- Do you agree to take this assessment honestly and without any assistance from others?

How would you evaluate, on the rank from 1 to 10, where 10 is most likely and 1 is least likely the statements as below?

I feel the requirement to be in a hurry in the job;
I am in need to justify my working results in terms of corporate profits;
I am in need to justify my working results in terms of personal profits;
I confirm to be having little contact with my colleagues;
I confirm to have clear standard and procedures for doing tasks;
I agree that the mistakes I sometimes make can lead to a circle of errors for other logistics chain actors;

Competition is vital in organization;
I am not receiving any remuneration from the supervisors;
I am not feeling free to organize my own work;
I have a feeling of failing in working in coordination with the standards expected from me in my work;
I know the organization is managing things that are socially important;
The job is not providing good salary;

I have to be responsible for making my own decisions;
It is unlikely I will be promoted from my current position;
I am not given a chance to forget about work after the working hours;
Often, I am overworking by will and joy;
I am not being able to take time over the tasks;
I tend to overwork and do not feel any satisfaction from doing so;
I am having limited training opportunities;
The errors in documentation (B/L, Air Waybill, Rail Waybill etc.) can be caused by paying less devoted attention;
I sometimes see how my colleagues are making an error;

I am not being encouraged by the tasks in my daily work;
My job is not putting my capabilities for challenge;
I am not required to help my colleagues;
I am performing my job in constantly changeable unstructured conditions;
My mistakes sometimes lead to unpredictable events;
My colleagues are making sometimes a dramatic mistake due to amount of stress;

I am not having any competition in my every day routine activities at work;
I am confident that everyone would be knowing if I have done a project well;
I am working on a project/projects which is/are beneficial to society;
Sometimes the error possibly made in logistics can cost a fortune to fix;
I notice my colleagues making an error due to fatigue (tiredness);

I am in an unappealing working environment;
I am knowing that my work is progressing my career;
My work is extending beyond the official hours;
I am not having opportunities for personal growth in my job;
I am recently trying to consume less alcohol;
I notice the mistakes done in the documentation later than I should;
I notice my colleagues making an error due to work overload;

I am being under pressure to get things done in a hurry;
I am never having any complex problems to get absorbed in;
I am successfully achieving a target;
People at office rarely have time to chat with one another;
I am following the standard procedure in doing a task;
I am currently trying my best to reduce my weight;

I am feeling my self-esteem under threat when I do not perform my job well;
I feel there is a low ethical standard in the organization;
I am getting perks from the job that is worth a lot of money;
I tend not to make mistakes in the procedures I take full control of, but confirm that my tiredness can lead to a possible error;

I am not having secure position in the company;
I am having few possibilities for individual development;
I am working in an environment that is matching my status;
I tend to agree that manually inputting the information into computer may cause the incorrect data as a result;
I tend not to make mistakes in the procedures I take full control of, but confirm that my lack of motivation can lead to a possible error;

I have a stress-free pace of life at work;
I have never arrived with a hangover to work;
I am not having a lot of hobbies to focus on after work;
I am working in environment, where people tend to help each other out in managing work;
Sometimes it is not straightforward, how to start with the specific task;
Superiors are pleased with my work;
I am considering being physically active & getting exercise as the most important factor in my lifestyle;

There is a lot of pressure in each task that I manage;
The organization is having ideals to uphold;
I am knowing that I could be better paid in the other organization;
I am having enough of sport activities after work;
I am fond of yoga and do it regularly;
I enjoy having a glass of wine or two sometimes in the evenings;
I sometimes forget to fix my own errors at work;

I have to take work to home;
I am being able to learn from my colleagues in the organization;
I confirm that my position is in a low-rank;
I am being required to do several things at once;
I am able to accomplish the objectives before others in the company;
I am enjoying meeting new people & making friends, as well as taking part in social gatherings;
I tend to pay less attention to the tasks that have been forwarded to me by my colleague, in case she/he has to be off those days;

I am aware I will be considered as failure, in case I make mistakes;
In doing sports I am forgetting about work & problems at work;

There is a lack of direct connection between my salary and work experience;
I feel the need to learn a new skill;
I know if working hard, I can become the best within my department;
I am doing sports 2-3 times a week;
My colleague being off some days can cause a great portion of stress;

I am finding all my work routine;
I feel like a part of the group when engaged into the particular sport;
I am having time and possibilities for engagement into activities after my work;
I am having friends to spend time with;

I am well aware my company's activities are creating wealth;
I am being congratulated on the job well done;
I am a regular smoker and cannot perform my daily activities without a cigarette;
I feel my expertise recognized in my salary level;

I am confident that the organization is doing everything ethically correct.
I am constantly having enormous volumes of work to do;
I am conifident to state that I am working at a convenient location;
I am required to be creative during problem solving;
I am working without any supervision;
The job is getting majority of my energy;
Sometimes I lack interest in doing my work;
In case I am stressed, I tend to make more mistakes than I usually do;
I am able & eager to multitask;

I am working for a company, which is not paying bonuses;
I feel there is a focus on team work in my company;
I consider myself being productive;
I am constantly lacking sleep, which is felt during my work activity;
I am always provided with challenging targets;
My department has overall brought good revenue recently;

I am not having clearly defined job objectives;
I am able to divide my working life from my personal one;
Wine/beer or some other alcohol gives me an opportunity to relax from work;
I am constantly trying to be on a diet;
I do not have problems at home;

I confirm that I am not able to earn more by simply working harder;

I am seeing only few people during the whole working day;

It is rather noisy in the working environment, and I cannot concentrate;

I am nervous about big events;

I am aware of my department's financial figures;

I am not generously receiving the praise;

I tend to have a smoke after each finalized task;

I receive a lot of calls during the day, which sometimes results into the lack of my attention towards the task;

I am being able to do a job in my own way;

I am working reasonably shot hours;

I stand behind the quality of my work;

I take my work seriously;

I tend to be mostly happy and enjoying my job;

My department completes and/or submits work that the supervisors can trust;

My department completes work in a reasonable amount of time;

I have more than one child;

I tend to be distracted easily;

The results of the project may suffer due to the irresponsible attitude of the employees in my department;

My kids tend to make me tired after work;

My children have already grown up and do not require my attention anymore;

I feel the lack of training/knowledge sometimes influencing my work results;

Questions regarding stress and suffering. Tick if any.

Do you happen to suffer from such health issues?

- Migraines or headaches
- Unexpected worries or anxiety
- Chest ache
- Stomach upsets or indigestions, possible nausea
- Lack of sleep
- Unexpected irritation
- Back pains
- Neck related pains
- Stomach illnesses
- Concentration failure

Any conditions at work that might cause you troubles?

- Noize
- Not enough lighting
- Extreme warmness in the office
- Extreme coldness in the office
- Excess of the people around
- Lack of fresh air
- Dirt conditions
- Equipment of not enough maintenance

In regard to relationships at work, any noticed?

- Not satisfactory relationships with the supervisor/supervisors
- Not satisfactory relationships with the colleagues
- Possible act of discrimination
- Informal and unfriendly treatment
- Not satisfactory level of communication with the colleagues of higher status
- Unsatisfactory work within society

Appendix No.2. Factors and links to questionnaire

Factors and the questionnaire

Groups of Factors	Factors	Questions
Motivation	Belief in the organisation; Level of responsibility; Realisation of self-importance; Self-confidence; Productivity; Growth possibilities; Targets setting Work stimulation;	It is unlikely I will be promoted from my current position; I am not being encouraged by the tasks in my daily work; My job is not putting y capabilities for challenge; I am confident that everyone would be knowing if I have done a project well; I am working on a project/ projects which is/are beneficial to society; I am knowing that my work is progressing my career; I am having few possibilities for individual development; I am successfully achieving a target; I am feeling my self-esteem under threat when I do not perform my job well; I am working in an environment that is matching my status; I confirm that my position is in a low-rank;I am able to accomplish the objectives before others in the company;I feel the need to learn a new skill;I know if working hard, I can become the best within my department;I am finding all my work routine; I feel my expertise recognised in my salary level; Sometimes I lack interest in doing my work;I consider myself being productive; I am always provided with challenging targets; I confirm that I am not being able to earn more money by simply working harder;I am tend to be mostly happy and enjoying my job;I stand behind the quality of my work;I take my work seriously; I am having vaguely defined job objectives; I am having no power to influence the decisions;
Personal Life-style	Family stability & children amount; Alcohol consumption; Profit & salary analysis; Smoking/Non-smoking habits; Dieting; Sport Activities; Social life; Home situation; Suffering;	I am in need to justify my working results in terms of personal profits; The job is not providing good salary; I am recently trying to consume less alcohol; I am currently trying my best to reduce my weight; I am getting perks from the job that is worth a lot of money; I have never arrived with a hangover to work; I am having a lot of hobbies to focus on after work; I am considering being physically active & getting exercise as the most important factor in my lifestyle;I am having enough of sport activities after work; I am fond of yoga and do it regularly; I enjoy having a glass of wine or two sometimes in the evenings; I am enjoying meeting new people & making friends, as well as taking part in social gatherings;In doing sports I am forgetting about work & problems at work; There is a lack of direct connection between my salary and work experience; I am doing sports 2-3 times a week;I am feeling like a part of the group when engaged into the particular sport;I am having time and possibilities foe engagement into activities after my job;I am having friends to spend time with outside my job; I am a regular smoker and cannot perform my daily activities without a cigarette;I am lacking sleep, which is felt during my work activity;I am doing sports at least two times a week;I am being able to divide my working life from my personal one;Wine/beer or some other alcohol gives me an opportunity to relax from work;I am constantly trying to be on a diet;I do have problems at home;I am seeing only few people during a working day;I tend to have a smoke after each finalized task;I have more than one child;My kids tend to make me tired after work;My children have already grown up and do not require my attention anymore;Do you ever suffer from the following?(Headaches, Anxiety, Chest pain,Indigestion or nausea, Sleeplesness, Irritability, Backache, Neckache, Stomach disorders, Inability to concentrate)
Work management & work life-style	Communication at work; Guidelines & Training; Corporate Profit Analysis; Physical & Mental Environment at work; Problems & challenges; Ethical issues; Competition & teamwork; Devoted Attention; Attitude of supervisors; Feeling of appreciation; Self organisation at work; Responsibility for others; Commercial Activity; Health attitude from the organisation; Reliability of completed tasks; Stress at work; Distraction;	I am in need to justify my working results in terms of corporate profits; I confirm to be having little contact with my colleagues; I confirm to have clear standard and procedures for doing tasks; Competition is vital in organisation; I am not receiving any remuneration from the superiors; I am not feeling free to organise my own work; I have a feeling of failing in working in coordination with the standards expected from me in my work; I know the organisation is managing things that are socialy important; I have to be responsible for making my own decisions; I am having little training opportunities; I am not required to help my colleagues; I am performing my job in constantly changeable unstructured conditions; I am not having any competition in my every day routine activities at work; I am in an unappealing working environment; I am never having any complex problems to get absorbed in; People at office rarely have time to chat with one another; I am overloaded with work; I am aware of my department's financial figures; I am not generously receiving the praise; I am being able to do a job in my own way; I feel there is a low ethical standard in the organisation; I am not having secure position in the company; I have a stress-free pace of life at work; I am working in an environment, where people tend to help each other out in managing work; Sometimes it is not straightforward, how to start with the specific task; Superiors are pleased with my work; There is a lot of pressure in each task that I manage; The organisation is having ideals to uphold; I am being able to learn from my colleagues in the organisation; I tend to pay less attention to the tasks that have been forwarded to me by my colleague, in case she/he has to be off those days; I am meeting many people through work;I am being ignored when superiors pass by;My colleague being off some days can cause a great portion of stress;I am knowing the company's business activity is creating wealth; I am being congratulated on the job well done;I am confident that the organization is doing everything ethically correct;I am constantly having enormous volumes of work to do;I am confident to state that I am working at a convenient location; I feel there is a focus on team work in my company; I am required to be creative during problem-solving;I am working without any supervision;The job is getting majority of my energy;I am able & eager to multitask; I am working for a company which is not paying bonuses; My department has overall brought good revenue recently;It is rather noisy in the working environment; I am nervous about big events at work;I receive a lot of calls during the day, which sometimes results into the lack of my attention towards the task;My department completes and/or submits work that the supervisors can trust; My department completes work in a reasonable amount of time;I tend to be distracted easily;I tend to meet the deadlines; Do any of the following cause problems for you at work?(Noise, Poor lighting, Excessive heat, Excessive cold, Overcrowdness, Poor ventilation, Dust, Poor maintenance of equipment), In regard to working relationships, do any of the following cause you problems?(Poor relations with supervisor, Poor relations with workmates, Discrimination, Impersonal treatment, Lack of communication from management;Working with public)
Time management	Fatigue; Time spent on working; Overworking & attitude; Routine	I feel the requirement to be in a hurry in the job; I am not given a chance to forget about work after the working hours; Often I am overworking by my will & joy; I am not being able to take my time over the tasks; My work is extending beyond the official hours; I am being under pressure to get things done in a hurry; I am working reasonably short hours; I have to take work home; I am being required to do several things at once; I am setting my own time-scale for doing a job;Work commitments are limiting what I can do in my leisure time;
Mistakes & Errors	Consequences of mistakes; Errors in logistics; Causes of the errors; Attitude of my organisation towards failure; Personal attitude & level of mistakes;	I agree that the mistakes I sometimes make can lead to a circle of errors for other logistics chain actors; The errors in documentation (B/L, Air Waybill, Rail Waybill etc.) can be caused by paying less devoted attention; I sometimes see how my colleagues are making an error; My mistakes sometimes lead to unpredictable events; My colleagues are making sometimes a dramatic mistake due to amount of stress; Sometimes the error possibly made in logistics can cost a fortune to fix; I notice my colleagues making an error due to a fatigue (tiredness); I notice the mistakes done in the documentation later than I should; I notice my colleagues making an error due to work overload; I tend not to make mistakes in the procedures I take full control of, but confirm that my tiredness can lead to a possible error; I tend to agree that manually inputting the information into computer may cause the incorrect data as a result; I tend not to make mistakes in the procedures I take full control of, but confirm that my lack of motivation can lead to a possible error; I sometimes forget to fix my own errors at work; I am aware I will be considered as failure in case I make a mistake; In case I am stressed, I tend to make more mistakes than I usually do;I tend to make mistakes only when I am busy with assignments;