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Mitigate cost volatility from suppliers in international new build power plant projects

Wärtsilä Solutions & Services Sales Support

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Thesis for a Bachelor of Engineering degree

Degree Programme in Industrial Management and Engineering

Vasa 2023

DEGREE THESIS

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Degree Programme and place of study:	Industrial Management and Engineering, Vasa
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Title: Mitigate cost volatility from suppliers in international new build power plant projects

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Date: 7 May 2023 Number of pages: 41 Appendices: 1

Abstract

The thesis was commissioned by the Engine Power Plant Sales Support department within Wärtsilä, Energy Business. This thesis is about two newly implemented mitigation strategies, forward pricing, and index-based pricing, because of the recent geopolitical crisis. Recommendations as of today is that either one of these must be used when offering.

The purpose was to evaluate the implementation process of these two mitigation strategies to find potential flaws and areas of improvement. This was done by gathering feedback from relevant employees involved in sales projects using these strategies.

The information was gathered through a questionnaire, which collected both quantitative and qualitative data. Additionally, the author studied Wärtsilä's internal material, books, and articles.

The results of the analysis are presented through a combination of charts and written summaries, which highlight the key patterns identified in the data.

Language: English
Key Words: Index-based pricing, forward pricing, volatile market

EXAMENSARBETE

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Titel: Minska kostnadsvariationer från leverantörer i internationella nybyggnadsprojekt för kraftverk

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Datum: 7 Maj 2023 Sidantal 41 Bilagor 1

Abstrakt

Detta examensarbete gjordes på uppdrag av avdelningen Engine Power Plant Sales Support inom Wärtsilä Energy Business. Avhandlingen behandlar två nyligen implementerade strategier för att minska risk, nämligen forward pricing och indexed-based pricing, vilka har införts på grund av nyligen inträffade geopolitiska kriser. För närvarande rekommenderas att en av dessa strategier används vid erbjudanden.

Syftet med avhandlingen var att utvärdera implementeringsprocessen för dessa två strategier för att hitta eventuella brister och förbättringsområden. Detta gjordes genom att samla in feedback från relevanta anställda som var involverade i försäljningsprojekt som använder dessa strategier.

Data samlades in genom en enkät som innehöll både kvantitativ och kvalitativ information. Dessutom undersökte författaren Wärtsiläs interna material, böcker och artiklar.

Resultaten av analysen presenteras genom en kombination av diagram och skriftliga sammanfattningar. Dessa sammanfattningar framhäver de viktigaste mönstren som identifierats i datan.

Språk: Engelska
Nyckelord: Index-based pricing, Forward pricing, Volatil marknad

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Abbreviations

AFEU	**Africa and Europe**
AMER	**North and South America**
APEX	**Sales Tool**
BDM	**Business Development Manager**
BOP	**Balance of Plant**
CCI	**Construction Cost Index**
CPI	**Consumer Price Index**
EEQ	**Engineering Equipment Delivery**
EPC	**Engineering, Procurement and Construction**
NTP	**Notice to Proceed**
OECD	**Organisation for Economic Co-operation and Development**
PO	**Purchase Order**
PPI	**Product Price Index**
PPI-I	**Producer Price Index by Industry**
IPP	**Independent Power Producers**

1 Introduction

This thesis was written on behalf of Wärtsilä Finland Oy. In this chapter, the following are introduced: background, purpose, confidentiality, research questions and disposition. The background section provides relevant information, followed by the purpose of the thesis work. The confidentiality section contains information regarding limitations and restrictions of the thesis work. The research question section provides the specific questions the thesis work aims to address. Finally, the disposition section explains the overall structure of the thesis work. This should give the reader a better insight into the composition of the work.

1.1 Background

Cost volatilities has been a problem for many supply chains in recent years, particularly after the Covid-19 pandemic. This has caused several companies to rethink, Wärtsilä, a company operating in the energy and marine market, has also faced those challenges, and has developed solutions to mitigate risk from suppliers. One of these solutions has been the introduction of forward pricing and index-based pricing. These models help mitigate the price volatilities in the current challenging market. Index-based pricing uses indexes to refresh and regularly update prices, while forward pricing estimates future costs. By implementing these mitigation strategies, Wärtsilä can provide more stable prices to its customers.

At the beginning of the research, the author was introduced to the two new pricing models index-based pricing or forward pricing. These pricing models will be investigated in greater detail in later chapters of the thesis, specifically Chapter 3. To gather feedback on these new pricing models, a questionnaire will be sent to employees with experience. This information will be then further analysed and drawn conclusions on, which will be crucial in making sure the implementation is heading the right direction.

1.2 Purpose

The purpose of this thesis is to evaluate the implementation of new pricing models, which will provide insight into areas of improvements for the pricing models, such as identifying potential flaws and suggesting solutions. This will then help the company to better understand its new pricing models and improve their implementation in the future.

1.3 Confidentiality

This thesis contains sensitive information and is therefore confidential. A confidentiality agreement has been signed between the author and the case company, outlining the specific information covered. As a result, certain enclosures and names will be excluded from the official version of the thesis to protect the confidential information.

1.4 Research Questions

In order to achieve the goal of the research, a couple of questions need to be answered.

- What are the key advantages and disadvantages of using forward pricing and index-based pricing?
- What challenges or limitations were encountered using forward pricing and index-based pricing, and how could these be further improved?

1.5 Disposition

This thesis work will be divided into seven chapters, each of that focuses on a specific subject. The first chapter introduces the thesis, including background information, purpose, research questions, disposition, and confidentiality of the work. The second chapter describes the organizational structure of Wärtsilä, and its department of Engine Power Plant Sales Support. The theoretical background part of the thesis is handled in the third chapter, while the fourth chapter covers the methods used to get the results. The fifth part contains an analysis and comparison of the cases. The sixth part presents the results of the thesis work, discussed the findings from previous chapters. Finally, chapter seven provides an overview of the thesis work and its method, presents conclusions based on the results and gives recommendations for future research.

2 Wärtsilä

Wärtsilä is a Finnish corporation that was established in 1834 in Finland, more exactly in Tohmajärvi. It started as a small sawmill and has since changed its business model several times since, responding to the market needs along the way. Today, the company can call themselves a global leader in innovative technologies for the energy and marine markets, with one of its goals to provide sustainable solutions to tackle environmental problems. Wärtsilä offer services such as renewable energy solutions and energy storage systems. Over the years, the company has grown significantly with approximately 17 000 employees working in 68 countries around the world.

2.1 Wärtsilä Energy

Energy solutions are all about helping their customers towards achieving decarbonisation and transitioning to 100% renewable energy sources. As part of this goal, Wärtsilä is developing future-fuel engines, running on fuels such as ammonia or hydrogen. The energy business offers lifecycle services that are designed to improve efficiency, reliability of the plants.

The total operating capacity of engine power plants globally is 76,5 GW, which can run on liquid fuels and gas. Wärtsilä's portfolio includes solutions for peaking, baseload, and balancing intermittent renewable energy. A total of 180 countries have had installed power plants by Wärtsilä.

2.2 Wärtsilä Engine Power Plant Sales Support

Wärtsilä sales support consists of three teams divided into different regions, Asia, Africa & Europe, and America, which are responsible for the proposal work in power plant projects. Working closely with sales and technical teams, they gain a better understanding of client requirements and turn them into proposals. (Wärtsilä, 2023)

2.3 Project Scopes

There are primarily two types of projects when dealing with projects within the energy solution. That is to say, Engineering, Procurement and Construction (EPC) and Engineering Equipment delivery projects (EEQ). Additionally, there are Basic EEQ and Process EPC projects, not needed to get more into detail of them.

Figure 1; defines all the scopes in more detail.

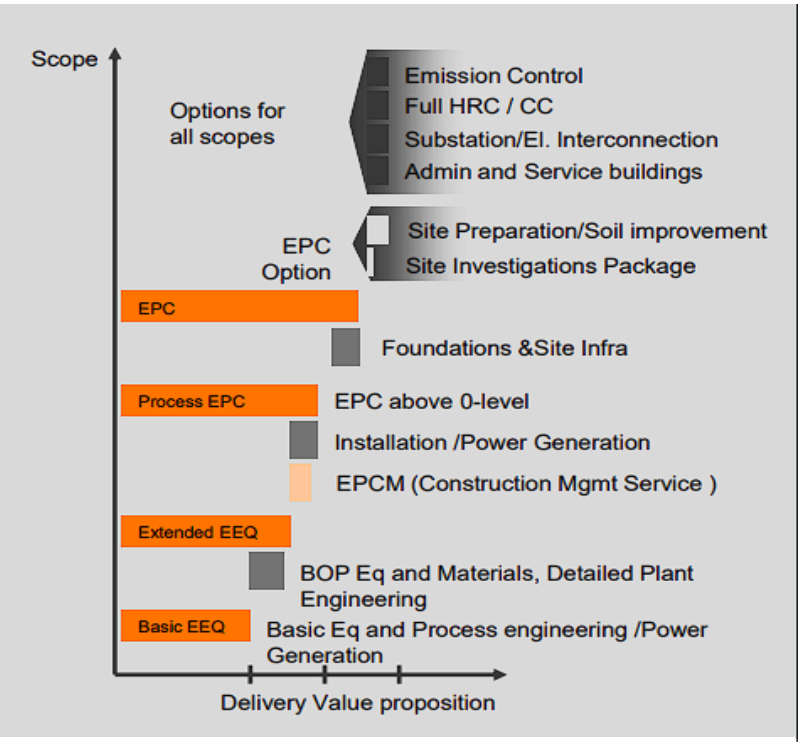


Figure 1. Energy Business Project Scopes (Wärtsilä, 2023)

Meaning when involved in EEQ projects, Wärtsilä's responsibilities are limited concerning the installation equipment that they provide and issues within their scope of supply for the project. Meanwhile, in EPC projects they have full responsibility of the entire project, such as engineering and construction, from design to commissioning and lastly handing over the project. These scopes help to ensure clearer understanding of all parties' roles and responsibilities in each project. This study includes both EEQ and EPC projects. (Wärtsilä, 2023)

2.4 Project Time schedule

All the project scopes have different time schedules, which affects the timing of price adjustments when using index-based pricing, which is explained in the theory part. The offer validity is max one month and the date of price adjustments are two months after the Notice to Proceed (NTP) for a EEQ project and four months after the NTP for an EPC project. Figure 2 shows an example of a Basic EQQ projects time schedule and adjustments. (Wärtsilä, 2023). Overall, it is important to approach the adjustment timings based on project scope and the time schedule.

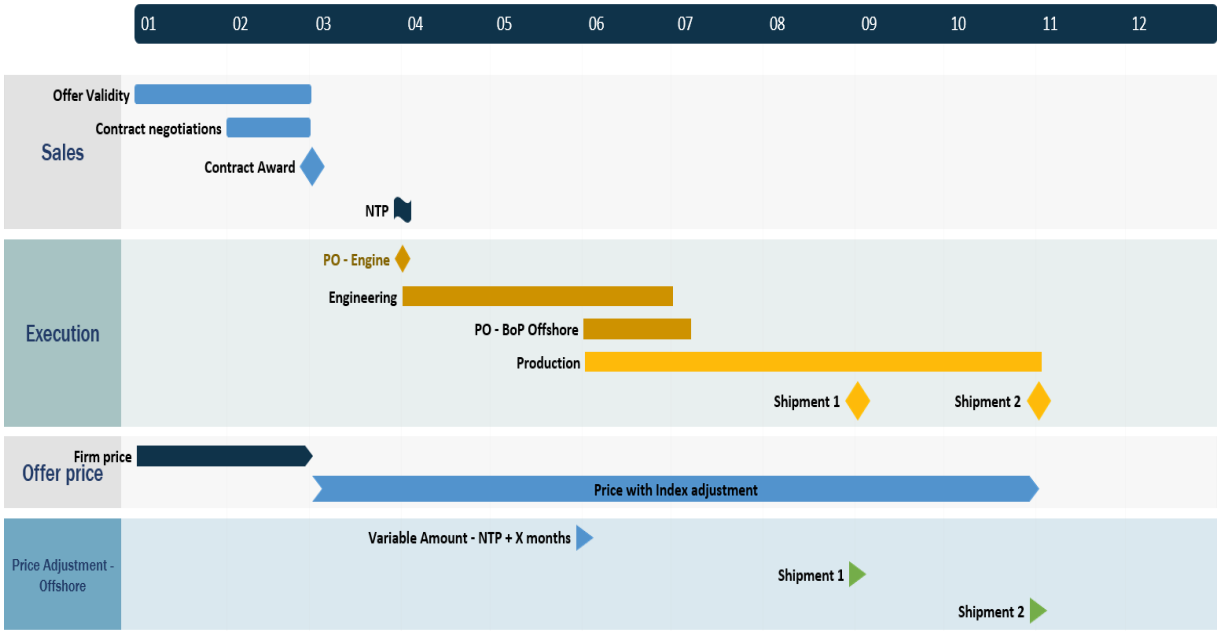
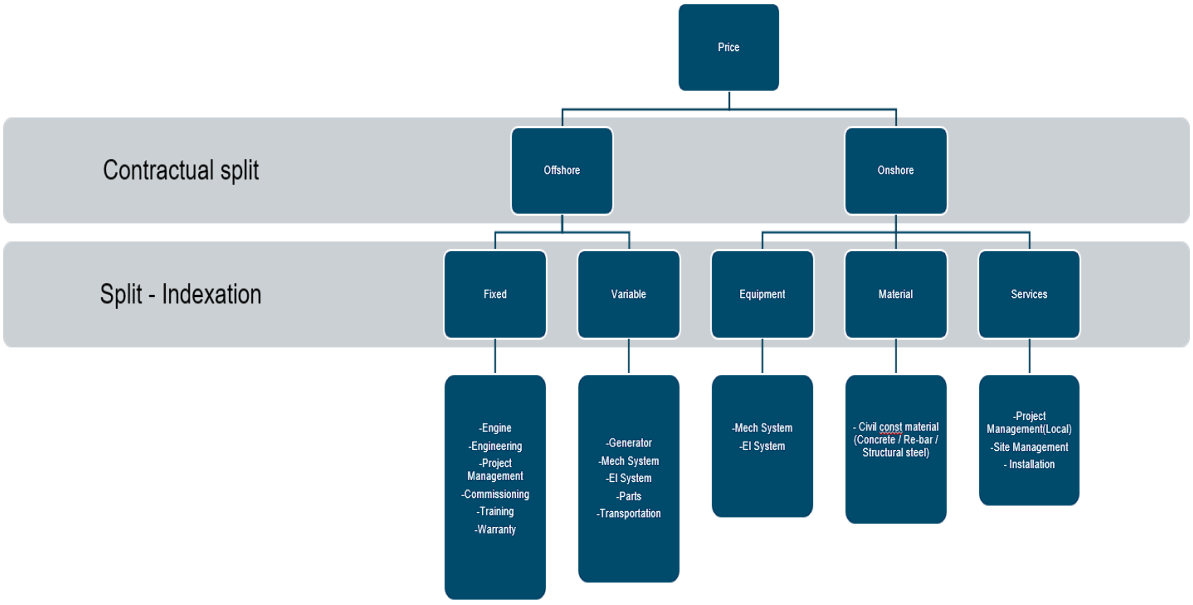


Figure 2. Example of a Basic EEQ projects time schedule (Wärtsilä, 2023)

2.5 Contractual split

A contract can be divided into two parts, first based on geographical location called offshore and onshore. Then, the two parts can be divided into sub-parts, such as equipment and service. This allows Wärtsilä to simple and clearly document each indexed part of the contract. A visual example of a split contract that includes the standard and more specific indexes for each part, can be seen in Figure 3. The indexes will be discussed more in detail in the theory part of the work. (Wärtsilä, 2023)



Indexed	✘	✓	✓	✓	✓
"Standard" Index		PPI	PPI	CCI / PPI-I	CPI
		European PPI	Local PPI	Local CCI / PPI-I	Local CPI

Figure 3. Contractual Split of Index-based pricing (Wärtsilä, 2023)

In sum, the sub chapters Project scope, Project time schedules and Contractual split helps the reader to easily understand what will follow next in the theoretical part of the work.

3 Theory

The theory chapter will serve as a foundation for the theoretical part of the thesis, focused on the new engine power plant pricing models that were implemented due to market volatility. This chapter will cover fundamental information on index-based pricing, key indexes, forward pricing, and volatile markets. Also, general information on the industry and standard examples of price splits and project schedules will be discussed.

3.1 Volatile market

(epcm, n.d.) defines a volatile market as a degree of variation and not the level of prices. A company operating in the power plant sector is characterized by fluctuations in the prices of raw materials like steel, along with prices of electronic components such as generators, and other equipment used. As quoted by (Wu & Ma, 2021), "*The imbalance between energy supply and demand has led to fluctuations in energy prices, exposing the energy sector to increasing risks of instability".* These prices can fluctuate due to changes in supply and demand for the material and components, and other factors such as transportation costs.

The recent geopolitical risks, such as the COVID-19 pandemic and the ongoing war between Russia and Ukraine, have led to supply chain disruptions, rising commodity prices and political sanctions. The most affected raw materials due to the uncertainty or potential unavailability of supply from Russia and Ukraine are pig iron, semifinished iron, and anthracite coal, primarily impacting the steel industry. The volatile market is not a surprise considering the continuous commodity challenges, raw material shortage and transportation disruptions. (BCG, 2022)

The study by (Reason, 2021) also highlights the significant impact of the Covid-19 pandemic on the supply chain and the importance of containerization in facilitating global trade. The analysis of container movement statistics shows characteristics of the global container shortage, including trade imbalances, dynamic operations, uncertainty, and lack of visibility and collaboration. The results show that the pandemic led to a supply chain disruption and capacity imbalance, causing high freight rates, contract term difficulties, and spare part shortages, resulting in a negative impact on profitability and sustainability.

Supply chain disruptions and challenges in the production of inputs like semiconductors, can affect prices across the economy, which leads to the creation of macroeconomic consequences. Inflation reaching its highest level in thirty years highlights the importance of measures needed to be taken to minimize its impact. (Leibovici & Dunn, 2021)

3.1.1 Risk Mitigation strategies

According to (Sodhi & Tang, 2012, pp. 51-54), a risk mitigation strategy is used to reduce likelihood or the impact of risk incidents if they occur. Three general risk mitigation strategy approaches, which are useful for mitigating risks in the supply chain are shown below:

1. Alignment of supply chain partners incentives to reduce behavioural risk within the supply chain.

2. Flexibility to reduce both demand, supply, and process risks.

3. Building redundancy

Wärtsilä's response to price fluctuations is the implementation of the following two risk mitigation strategies, index-based pricing, and forward pricing, both approaches could be seen as a form of "Flexibility". The two strategies each have advantages and disadvantages. Index-based pricing is more cost competitive since it is based on actual increases, while forward pricing will most likely be less cost competitive and have a higher cost, since it is based on estimates. Index-based pricing has a lot more discussions with the customers and more work during the execution of the project, while forward pricing on the other hand is more straightforward with its fixed price and therefore easier to sell to the customer. (Wärtsilä, 2023)

3.2 Index based pricing.

Per (Monitor Deloitte, 2016), index-based pricing is defined as the use of a market or commodity index (or a combination of indexes) to calculate and regularly update the prices. This can be crucial in volatile markets, as it enables buyers and sellers to enter long-term contracts that help the supplier to protect its margin. Also, meeting customer demands and hedging against risks is the use of index pricing a powerful tool.

Index price formulas can vary depending on the product's major costs. It has to be led and managed by the right teams to avoid unnecessary indexes that fail to accurately represent the complete product package. Figure 4 shows an example of how a simple pricing model using indexes can look like, assisting the reader to get a better understanding.

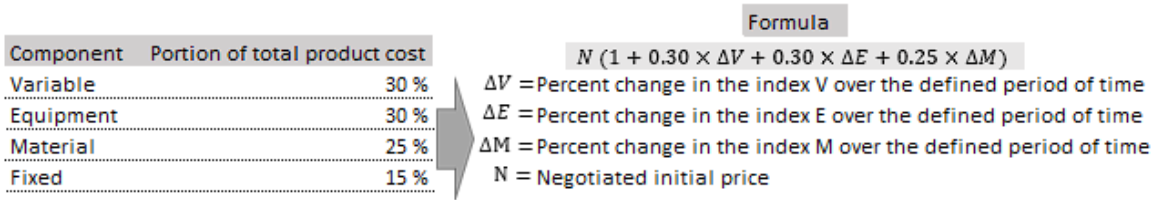


Figure 4. Simplified index-based pricing model

The approach of implementing indexes should be done on the equipment or system level, instead of the material or item level. It is used on the equipment level as the price of materials can fluctuate frequently, making it difficult to use an index as a reference point. However, prices are typically more expensive on the equipment level and less volatile thus making the index-based pricing approach more practical. (Monitor Deloitte, 2016)

Index-based pricing has two alternatives, shared cost risk indexation and all cost risk indexation. All cost indexation is fully variable pricing, meaning that the whole contractual split is indexed. In shared cost indexation, a portion of the price is fixed and is linked to items such as engine and training, while the other portion is variable and based on parts such as generators, civil and installation. The fixed portion of the total price is agreed on and set in advance and doesn't change over time, while the variable portion changes based on market conditions of the tied indexes. However, if the index decreases in value during the defined period of time and is below at the end of the period, then the price will not be lowered and will remain the same. Additionally, in both cases, transport cost adjustments are applied on a pro-rata basis. (Wärtsilä, 2023)

3.2.1 Briefly about key indexes

This subchapter will go deeper into the key indices used in the new pricing model. Note that the indexes presented below are all referenced to local ones, as shown in Figure 3. Additionally, the indexes presented are not in a particular order.

Producer Price Index

The Producer Price Index (PPI) is used to measure the average price changes over time for a list of inputs purchased by producers. Notice that eventual taxes or transport margins that the consumer must pay are excluded. PPI is frequently considered to be an advanced indicator of economic price fluctuations, used for deflation of GDP data and as a measure of inflation. (OECD Data, 2023)

European PPI (EU-27 PPI) is one of the two PPI indexes used in a project. This index, as defined by (OECD Data, 2023), is a PPI for the 27 countries that are currently members of the European Union. It is used as a PPI in the offshore variable part of a contract, as shown in Figure 3.

The other PPI index used in a typical project is the local PPI. This index refers to the PPI for a specific country or region in a project. It is used as a PPI in the onshore equipment part of a contract, also shown in Figure 3.

Consumer Price Index

According to (Selçuk, 2011) defines the Consumer Price Index (CPI) as a measure of average prices for a basket of goods regularly purchased by consumers. Also, generally used index to calculate the rate of inflation and determining general price changes over time.

The causality between the two indexes CPI and PPI has been studied numerous times, meaning the relationship between two variables where one causes an effect on the other. There are three different causalities, namely one way, two-way and no causality. One way refers to one variable influencing the other, two-way meaning that either can impact the other, and no causality means that there is no relationship between the two.

A study done by (Selçuk, 2011) investigated the causality between the two indexes, but for a selected EU countries with a low inflation level. The study provided some mixed results, few countries had a one-way causality from PPI to CPI, one country had a two-way, and

some had no causality at all. Overall, the information of knowing the causality between the two indexes can be useful for businesses to make decisions related on prices and inflation.

Construction Cost Index

The Construction Cost Index (CCI) describes the changes in prices of construction materials, such as labour costs, transport, machinery, and other costs that are used in construction. CCI isn't limited to these factors and may also include other factors that affect the construction costs, such as changes in market demand and supply conditions. (Statistics Sweden, 2023)

The information presented by Figure 1 in Project Scope chapter, shows that CCI is only used on an EPC level project. Since, there is no responsibility to be indexed by CCI on projects with a lower scope.

Producer Price Index by Industry

The Producer Price Index by Industry (PPI-I) functions as a more detailed measure of price changes for specific industries.

3.2.2 Transport indexes

The adjustments of transportation costs to the total price will be applied on a pro-rata basis, using the Fuel Bunkering Index and Drewry Index. The Bunkering index accounts for changes in fuel prices, while Drewry Index covers the other cost elements. These indexes are described in more detail below.

Drewry Multipurpose Charter Index

The Drewry Multipurpose Time Charter Index tracks one-year period charter rates across different vessel types and sizes and forecasts the market movement over the coming month, vessel types include breakbulk and project cargo ships (Drewry, 2022).

In Figure 5, the Drewry Multipurpose Time Charter Index is presented and its yearly developments, starting its decline approximately a year ago and as of today continuing, reaching $9950.

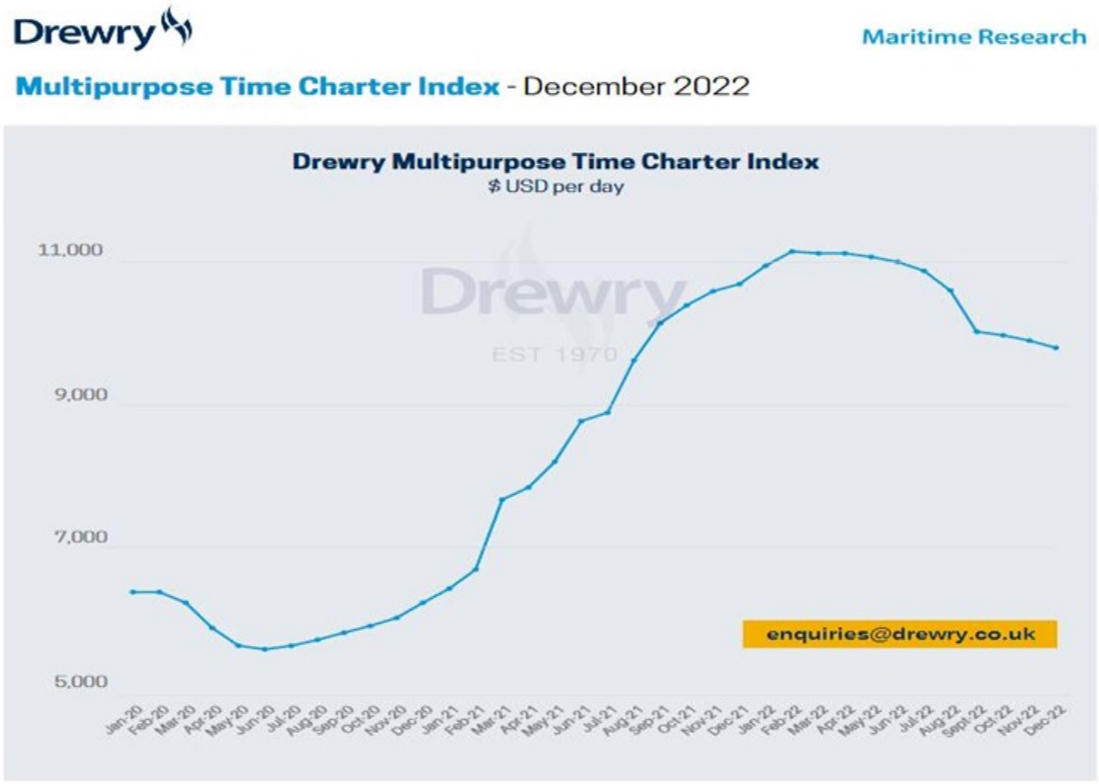


Figure 18. Development of the Drewry Multipurpose Charter Index (Drewry, 2022)

Fuel Bunkering Index

The Fuel Bunker Index gives an insight into the global marine fuels market, more specifically a measure of the cost of a particular port or region. The cost of fuel at different ports, as measured by the fuel bunkering index, can vary significantly. This is an important factor that ship operators must consider when planning their routes and purchasing fuel. (Ship & Bunker, 2023)

3.3 Forward pricing

In volatile market conditions, forward pricing represents a valuable mitigation strategy. This approach is based on estimating future cost fluctuations associated with a specific product. (Blocher & Chen, 2005, p. 151) defines cost estimation as the development of a relationship between a cost object and its drivers for the purpose of predicting future cost. This allows for lock in prices, providing a fixed price point for the customer. Wärtsilä tries to estimate the cost fluctuations for each line item separately. The illustration presented in Figure 6 demonstrates forward pricing implemented in the system. It is listed as a separate item, along with the percentage increase in cost associated with it. There is a six-month horizon on the default percentage costs, which is updated every month.

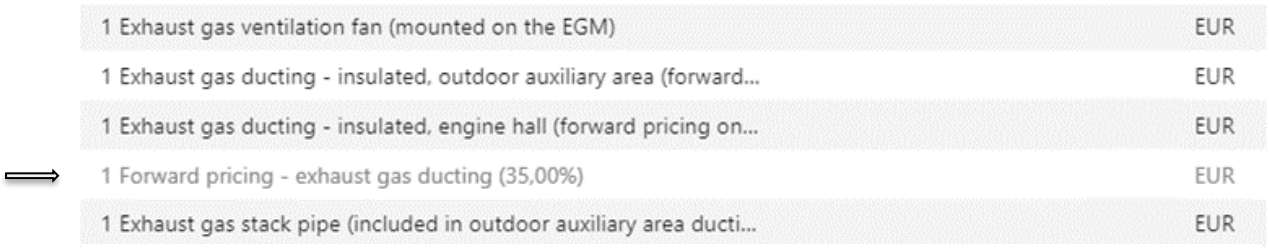


Figure 6. Standard example of forward pricing in APEX (Wärtsilä, 2023)

Additionally, not all items are subject to forward pricing because Wärtsilä already knows the actual costs of inhouse parts such as engines, project teams and services. Major items whose costs are unknown after one month are subject to forward pricing, such as generators, radiators, step-up transformers (if applicable) and major auxiliary units. Finally, two risk processes are performed, risk assessment process followed by a risk mitigation process, both of which occur in CRM (Customer Relationship Management).

Still, the primary strategy is to suggest index-based pricing to the customer. If the customers do not accept this method, forward pricing shall be used as an alternative approach. However, both strategies can be used at the same time, meaning that one part of the contract is index-based and the other forward-priced. (Wärtsilä, 2023)

4 Methodology

This section will present the methods used to collect and analyse data to answer the research questions of the thesis. Also, the actions used to acknowledge the best possible way to collect relevant information for this study. Overall, the aim is to give the reader an understanding of the research process.

4.1 Research methodology

The work started off with studying relevant material to gain a reasonable knowledge of the study subject. Next up, after gaining the knowledge needed through reviewing literature, was to choose what the best method was to collect all the relevant data. As the purpose of the thesis is to determine and investigate the implementation of the mitigation strategies, the amount of relevant people exceeded a handful. This gave questionnaire-based approach an edge over interviews because the main advantage for questionnaires is the possibility of generating and collecting a large amount of data. (Denscombe, 2010)

Discussions were held between the author and the supervisor on how to proceed with the data gathering, and since the two mitigation strategies are relatively new, there is a lot of information from various people to be considered. After the discussions, making a Microsoft Forms seemed the best possible solution going forward on gathering data. As mentioned earlier this would help in collecting a large amount of data and depending on the design different type of data can be collected. After deciding method, discussions between the author and supervisors were held on the design of the questions used in the survey. Resulting in a combination of closed-ended and open-ended questions, which collects both qualitative and quantitative type of data. Finally, these two research approaches will be discussed more into detailed in section 4.4 of the thesis.

The qualitative data collected by open-ended questions allowed participants to provide a detailed response that later can be analysed categorically to identify trends. While the closed-ended questions, such as rating scales collects quantitative data that can be analysed statistically to identify trends. Also, using different types of questions may increase the rates of participants completing it, since it makes the survey shorter and more convenient.

The form was sent out as a link to each department separately via email, to avoid participants thinking that the number of participants is so high that their responds won't matter. Well, after a week the author realised that a different way of approaching the participants had to be done, since the response rate of certain groups were too low. So, the author sent out individual reminders to each participant by teams, hoping to higher the rate of responses. Suddenly, several participants started responding to the survey, some were willing to chat regarding the subject giving even more valuable information.

4.2 Formulating the questionnaire

It is important to clearly define the purpose of the questionnaire and what information to be gathered from it. As previously stated, the implementation of the mitigation strategies hasn't been researched before, so formulating the questionnaire right is key to ensure relevant and useful answers.

There are few factors that help create a well-done questionnaire. Firstly, ensure that the questions are clear by avoiding complicated language. Then, considering the length of the questionnaire and keep it as short as possible, since it encourages the participants to complete it. Also, providing different types of questions to be able of collecting different types of data if needed. When the questionnaire is finally completed, running a test version with a group of choice can help identify any issues. The author took all these factors in consideration when the questionnaire was made.

According to (Saunders, 2007), there are different types of questionnaires, of which one is a so called self-administrated questionnaire. This came to be the type of questionnaire chosen, since it fits the entire research with being quick of reaching a large audience and easy to collect and analyse data. At this stage the main purpose of the questionnaire and its type was decided upon, the time for trying to figure out the questions is next.

As stated earlier, when phrasing questions few factors were taken into consideration. The phrasing was kept simple and clear, to be sure the questions are understood the same way by every respondent and questions asking for the same thing are avoided. Also, leading questions was avoided to make sure the respondent doesn't feel influenced towards a certain answer and the responses are kept non-biased. These were the key factors when the discussions about designing the questions were held between the author and its supervisors.

4.3 Questionnaire content

The questionnaire was divided into parts, where every part had its own focus of information gathering. This in combination with structuring the questions in a logical order makes sure that the topics of the questions are similar and avoids having to go back and forth between them.

The questionnaire started with the first part containing questions that focused on the respondents' experience with projects using the newly implemented mitigation strategies. This information was collected by close-ended questions asking the number of sales projects they were involved in using forward pricing and index-based pricing. Also, by asking an open-ended question regarding what the main reasons were behind choosing either one of the mitigation strategies for Wärtsilä and the customer. With this kind of information, the accuracy of latter responses by each respondent were sorted and highlighted, for example the respondents that ticked the box with high involvement in projects using these strategies should have more accurate information than the ones involved in only one project. Lastly, the ones with high involvement were contacted for further discussions if needed.

The second part focused on the respondent's opinions regarding the advantages and disadvantages of the mitigation strategies. Open-ended questions were phrased as follow: "What are the best features with Forward pricing?". To structure the questions, the best and worst features were divided into two separate questions, and the two strategies were also divided, resulted in a total of four questions. The aim was to collect as much information as possible while providing the respondents have enough space to express themselves. These responses were valuable to identify areas for improvement and understand the strengths of each strategy.

The third part used questions focused on challenges, lessons learned from the projects and suggestions on other possible solutions. By asking about lessons learned, the author expected to identify what had been working well in the past and what didn't. Additionally, suggestions of other possible mitigation strategies open new insight into potential solutions which were not explored before.

The fourth part was mainly focused on the general customer experience, such as receptiveness level and overall impact, while also gathering information regarding the sales training provided for the two strategies. In this chapter, a closed-ended model was used, and respondents were able to choose from multiple answers and express their thoughts on the

training provided with a scale of one to ten. By asking customer related questions, the aim was to determine how the strategies have been perceived by the customer.

The last question of the questionnaire let the respondent add anything they feel like hasn't been touched or any experience that they believe could be relevant. By ending a questionnaire with an open-ended question, the respondents get the opportunity of elaborating their previous closed-ended responses. Also, including an open-ended question in the ending shows a willingness to hear the respondent's thoughts.

Overall, the goal of these questions was to gather comprehensive feedback on the current mitigation strategies and use that information to improve future approaches.

4.4 Research approach

Research methods can have different research approaches. The alternatives are either to use a qualitative approach, quantitative approach, or a so-called mixed methods approach, which is a combination of the two approaches. So, the quantitative approach is about analysing a large set of numerical material and understanding the relationships behind the numbers. While a qualitative approach focuses on obtaining certain information from someone that is involved in what the researcher is investigating, mostly through discussions, such as interviews or questionnaires.

As stated earlier, a mixed based approach was used to create the questionnaire, as the author found both qualitative and quantitative approaches as suitable. The benefits of using a mixed method, such as obtaining more complete data and increased flexibility, outweigh the disadvantages, such as a more complex survey and risk for bias. Also, the questionnaire design gives the possibility of both categorical and statistical analysis. (Holme, 1997)

4.5 Information and data processing

The data stored on the platform is analysed by the various tools that Forms has to offer, such as summary statistics and charts. This helps the author to choose the right format to analyse the collected data, before exporting it to a spreadsheet. Another benefit of using Forms is it being a Microsoft product, which is integrated with other products, such as Excel enabling further data analysis.

When Excel was chosen as the platform to further analyse the data, the next step was to find the appropriate analysis solutions based on the stored data. Following some experimentation with different solutions, the author created different columns to list the challenges, their source, and suggested improvements. After reading through all of the open-ended responses, the author took notes of common patterns, such as positive or negative responses, as well as responses related specific aspect. Then the responses were analysed and grouped according to similar patterns, which allowed the author to determine frequency of each pattern. By counting the responses with similar patterns, the author was able to identify possible correlations between different patterns.

5 Results

This chapter will present the results of the research. Firstly, a general overview of the data sample will be presented, then more detail analysis will be presented that focuses on the research objectives.

5.1 Sample description

The participants enrolled in the study were selectively chosen by the author and its supervisor from the case company´s sales department based on their job responsibilities related to the use of newly introduced pricing models. A total of 63 participants, were selected, all of whom work in different regions. Of these, 25 are from the MEA (Middle East and Asia), 19 from AFEU (Africa and Europe) and 19 from AMER (North and South America). Participants held various positions, including Proposal Engineer, Senior Proposal Engineer, Proposal Manager, BDM (Business Development Manager) and Senior BDM. Those responsible for proposals typically work with forms to ensure the client´s needs are met, while the BDMs focus on negotiating and discussing with company clients to understand their needs and gather feedback to improve customer satisfaction. As this is the first feedback gotten from employees it is crucial to receive information globally, considering these pricing models have been implemented across all regions.

5.2 Response rate

The response rate is discussed more in detail in this sub-chapter to provide insight into the reliability of the data collected. Response rate is calculated by dividing the number of questionnaires returned by the number sent, then multiplied by 100. As stated earlier, the questionnaire was distributed to a total of 63 participants, out of whom 16 responded to it. This gives a response rate of 25,4%, which can be considered as low. One factor that may have affected the low response rate is the timing of the questionnaire sent. The questionnaire was sent on a Friday, with the following week being “Sportlov”, a week that employees usually take some days off in. Another factor that might be affecting the low response rate is the current state of the market. When the pricing strategies were first implemented, the market went through a period of high volatility, but now it is gradually going back to normal. This change in the market might cause some employees to question the use of forward pricing and index-based pricing.

5.3 Background questions

As explained earlier, the first theme of the questionnaire was to get a better understanding of participant experiences between index-based pricing and forward pricing. The first one asked for the number of sales projects involved using forward pricing, in which the outcome is presented in Figure 7.

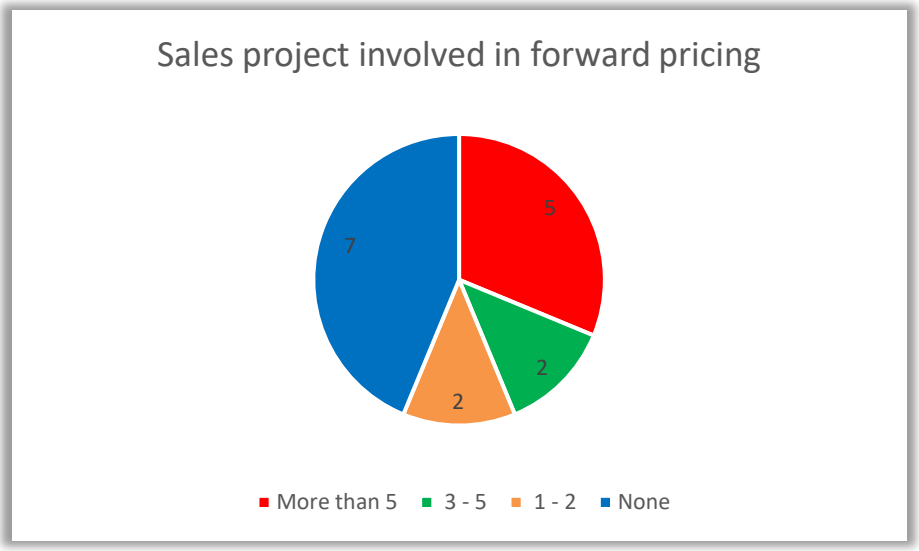


Figure 35. Respondents' involvement in forward pricing.

The results presented in Figure 7 show slightly more than half of the participants have been involved in projects using forward pricing. This should be considered when reading through responses to questions that ask for detailed information regarding forward pricing. Surprisingly, seven participants were not involved in such projects, which the author did not expect. As it is a must to either use forward pricing or index-based pricing when offering. Although almost half of the participants haven't used forward pricing, their responses still matter, as they should know the principles of forward pricing and should have attended meetings held regarding the pricing strategies.

In the same part, the participants were asked to fill in the amount of involvement in sales projects using index-based pricing, which is shown below in Figure 8.

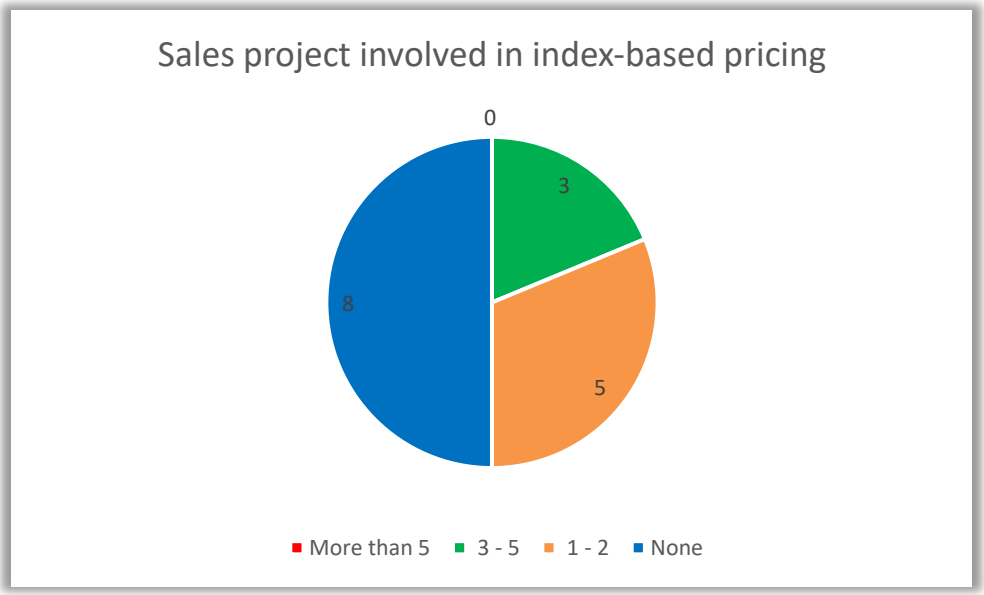


Figure 8. Respondents' involvement in index-based pricing.

The chart in Figure 8 shows that exactly half of the participants have been involved in projects using index-based pricing, while the other half were not involved. It is also noticeable that none of the participants have been involved in more than five projects using index-based pricing, which is less compared to forward pricing. This could be due to the fact that customers seem to be hesitant in accepting projects using index-based pricing.

Another feedback collected from the questionnaire is regarding the effectiveness of training on index-based pricing and forward pricing provided to the sales department, which is presented in Figure 9 and 10. Overall the feedback received can be considered as neutral, since the average rating is a little bit above 6. The one similarity the author noticed quickly is that the participants rated the training on the two pricing strategies almost identically. Meaning that the training provided might was provided as one or they felt that the training did not differ much between the two. However, the low ratings received means that there is room for improvements to the training, making sure the knowledge is on top from the beginning.

6.06
Average Rating

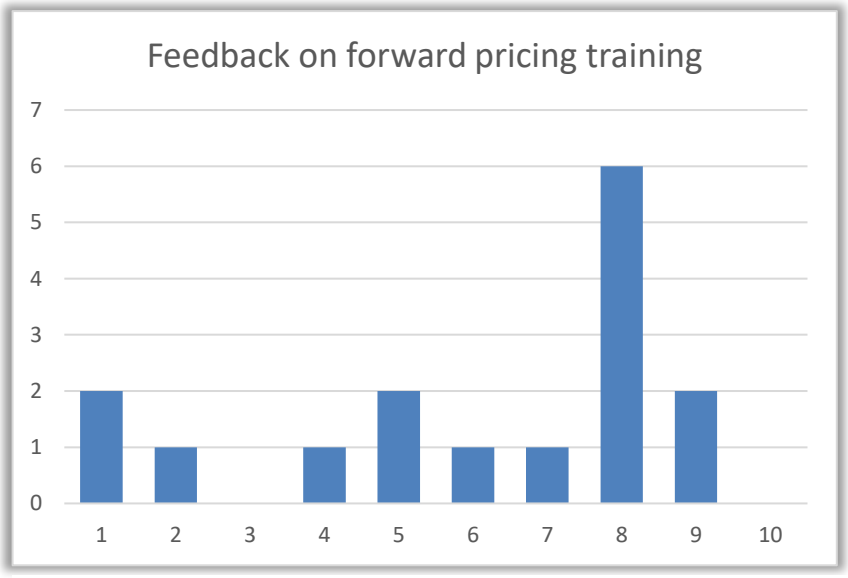


Figure 44. Respondents' feedback on the training provided for forward pricing.

6.25
Average Rating

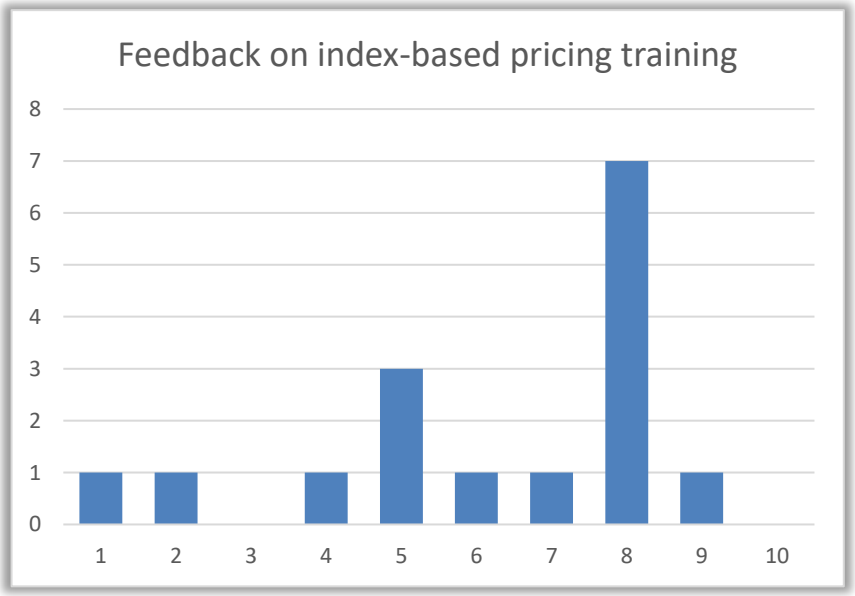


Figure 10. Respondents' feedback on the training provided for index-based pricing.

5.4 Strengths and Weaknesses

The next part of the questionnaire was to describe the best and worst features of forward pricing. Upon further analysis, a main advantage that was noticed is that forward pricing provides a fixed price for a longer period, increasing customer satisfaction. Additionally, many respondents noted that forward pricing provides a clear picture of the upon-agreed contract, which helps for example the budget planning.

The worst features of forward pricing have been analysed, and again many patterns could be identified. One highly mentioned was the difficulty in predicting cost changes, as forward pricing relies on estimates it can be challenging to predict accurately. Resulting in pricing uncertainty and unnecessarily high prices, potentially leading to losing deals to the competition. Another subject that was mentioned was that it could be challenging to keep track of offer prices, especially in long-duration projects.

Overall, a balanced view of the benefits and drawbacks on forward pricing are provided by the two paragraphs. Below the selected responses presented by the author to give a clearer picture of the participants thoughts on forward pricing.

Proposal Manager from AFEU "*Chance that we cost price uncertainties twice or several times (several people along the chain include an extra buffer in the costing, and then we ad risk); - depends on "hunches and estimations" in the costing, so does not improve clarity and transparency: if it was a clear price increase, the actual APEX cost would just be increased, - I expect people are quick to increase a cost, but slow to decrease a cost It's not bad to price conservatively, but this has the possibility that we are going to price ourselves out of the market well after the market disturbance has passed*".

Proposal Manager from MEA *"The downside of forward-looking pricing is, keeping track of our offer price (cost and selling price), especially in a long duration project which are running for several months (or a year) before coming to a logical conclusion. we cannot decrease our selling price based on forward pricing (if the price is decreasing). As a prudent sales practice the selling price is always going up and not down during such a volatile market condition".*

Proposal Manager AMER *"Forward or fixed price will give clear picture of the agreed Contract price and milestones. the price tag is closed".*

The following paragraphs contain the collected information on the best and worst features with index-based pricing. Most of the responses touched on the subject of Index-based pricing being transparent. Few also mentioned the fact that index-based pricing ensures fair and competitive pricing, avoiding unrealistic over-pricing.

The worst features with index-based pricing are summarized in this paragraph. Most commonly mentioned drawback in the responses is the difficulty to get the customers to accept index-based pricing solutions. These responses suggest that customers may not fully understand or even trust index-based pricing, which results in hesitance of accepting it. Another factor might be the fact that the customers have no knowledge or familiarity on the specific indexes used. This is a highly addressed drawback, as the only way of coming around the challenge is through educating and convincing the customers on their benefits.

These two paragraphs together provide a good base on the responses collected from the participants and will be further discussed. Below is stated some responses received on this subject.

BDM from MEA "*Unlike forward pricing, which is somewhat internal, Indexation mechanism is more transparent. A pre agreed formula on price movement gives visibility to both the parties on the possible fund outflow based on market trends. However, one should be ready to accept price reduction if the indexation goes negative".*

Senior Proposal Manager from AMER *"The indexation methodology we propose is somewhat confusing and while conceptually understood, the mechanism and indexes seem to be hard for them to understand. Customers have no idea what Drewry or OECD index is and little to no idea what the PPI is".*

Proposal Manager from AFEU *"Possibly less likely to give unrealistic over-pricing, pricing ourselves out of the market. clear and transparent way of adjusting costing based on 3rd party information, so easier to sell to customer".*

5.5 Challenges and Improvements

The limitations and challenges encountered using forward pricing and index-based pricing was a hot topic, when compared to other questions in the questionnaire. Most of the participants encountered challenges using these pricing strategies, some of which talked about similar needed improvements. So, first the key patterns in the challenges of using forward pricing will be presented and afterwards those of index-based pricing.

Challenges encountered using forward pricing are related to volatility of the pricing mechanism and accuracy of the pricing information. As big sudden changes in the percentages added to the line items and not knowing when it is updated, even though it is updated on a monthly basis. This could lead to confusion and frustration, which could negatively affect employee morale.

Index-based pricing has some limitations and challenges as well, looking at the feedback gathered. The following challenges were mentioned, the timing of price increase, inappropriate local indexes and transport pricing being too complicated. This could be due to the extended waiting period for the final price, which may not be well received during a volatile market situation. Transport pricing seems to be difficult for customers to understand, as some perceive that they will be charge twice for the same service, which creates confusion and might even affect the customer trust negatively. Overall, the number of answers collected from this question was great, which helped identifying the key challenges and limitations.

Senior Proposal Engineers from MEA *"Forward pricing good, but big sudden changes in the % shows how uncertain this is to use."*.

Senior Proposal Engineers from MEA *"With forward pricing it is to know if APEX is up to date, had meetings with category manager to confirm"*.

Proposal Managers AFEU "*Missing info (any little thing leads to "ETO" designation), leading to many line items in a quotation that require manual override, additional input, and thus delays*. *Transport pricing was made unnecessarily complicated, and worse, with unclear/un-transparent input requirements, and also on a completely different way than the other cost (not an index cost factor, but an additional to be added price), so some would think that we were indexing that part twice"*.

Proposal Manager from AMER *"the timing of presenting the price increase is important, if it is in the final stage of EPC contracting, customers will not accept it"*.

The participants lessons learned from sales projects using either forward-pricing or index-based pricing has some valuable information. One lesson learned was that of focusing more on the discussions with the customer. It appears that if the market trends show that such mechanisms are proposed, there will be a natural acceptability among the customers. Also, to make sure that the customer is aware on the use of pricing mechanisms from the very beginning of the discussion, seem to be another important part. Overall, a question, which

collected a lot of valuable information that should be considered when involved in future projects.

This part summarizes the received responses to the question "What future improvements are needed to further enhance forward pricing and index-based pricing". Well, suggested improvements are brought up in earlier questions, such as the quick updating of APEX to keep the cost up to date. Also, more clarity and explanation on indexed-based pricing and to find the right pricing indexes, as some customers have difficulty understanding most of them. Then, the suggestion that several participants mentioned, using a mix of both forward pricing and index-based pricing. These answers suggest the retain use of index-based pricing in costing areas such as, transport and local costing, whilst forward pricing is used in costing areas that are not tied to any index. Furthermore, a suggestion was to first present index-based pricing, and if the customer is not comfortable with it an option for change order should be checked.

Proposal Manager from AFEU *"protect against a limited number of significant risks for example local currency risk, local inflation risk and volatile transport costing that we cannot handle easily without significant price increases via risk addition"*.

Proposal Manager from MEA "*If the Customer is not comfortable with Indexed-based pricing then trying to have an option of change order should be checked. This will keep the control in our hands, and we get to decide what additional cost we want to transfer to the customer"*.

Proposal Manager from MEA *"more clarity and explanation on indexation with information on items, it applies"*.

5.6 Additional insights

This paragraph provides a summary of the responses to the question "What feedback have you received from customers or other stakeholders about the new pricing models, and how has this feedback been incorporated into future projects?". Noticeable is the low number of actual responses on this question, there could be several reasons to that, for example could tiredness play a role or totally wrong group of people to ask it from. Still, some of the participants answered the question by expressing their thoughts on the whole subject. As it was mentioned that there is no feedback received on forward pricing from the customers, since it is kept inhouse and invisible to the customer, as explained in the Chapter 3.3. Then

thoughts about the current market situation were talked on, which is gradually going back to normalcy after a period of high volatility when the pricing models were first implemented. This will most likely push the expectations back towards fixed pricing with the standard variation clauses and split pricing models, such as index-based pricing might be a better compromise in big ticket projects.

Proposal Manager from AFEU *"Never discussed the forward pricing (I think this was kept inhouse: we don't explain how we price to our clients, anyway, so why explain if we do it slightly differently)".*

Proposal Manager from MEA *"As the post pandemic and geopolitical crisis is well known and well aware to all the stake holder and customers, most of them have accepted this way of pricing".*

The last question is an open-ended one with the purpose of collecting other insights or experiences that the participants think could be relevant. Two answers only that could be brought up, still no surprise considering the rate of answers in the previous question. It appears that not everyone received training on the two pricing models, which was surprising to the author as he thought everyone involved received training on both the pricing mechanism. However, this will have to be further analysed and then discussed in latter parts of the thesis. The second highlighted that customers understand the importance on the use of indexes but indicate that more project specific information is required in order to fully integrate it.

BDM from MEA *"Personally, I have not received any specific training on forward pricing mechanism".*

Proposal Manager from MEA *"Customers are aware of indexation to capture inflation; project specific details are needed to be elaborated in proposal or indexation document".*

6 Conclusion and Discussion

This chapter will present the conclusions and discussion of the thesis work. First up is a summary of the findings, followed by a further research part where directions will be given. Finally, a summary of the thesis work and some final words.

6.1 Implications and recommendations

The results show that just over half of the participants are involved in sales projects using either forward pricing or index-based pricing, which means that almost half of the participants have not been involved in such projects. As Chapter 5.3 highlights, it is a must within the company to use either forward pricing or index-based pricing when offering. Therefore, the results suggest that better internal communication is needed to ensure that all employees are on the same page regarding the use of the pricing models.

Based on the training results of forward pricing and index-based pricing, as well as the participants' general knowledge, a recommendation would be to provide the employees with additional training. The data gathered revealed a few responses that showed lack of basic knowledge, and the average rating on the training provided was low. One comment also mentioning that they had not received any specific training on forward pricing. Therefore, additional training would improve the employee's knowledge of using them.

Customers find the methodology behind indexed-based pricing quite confusing, particularly in transport pricing, as indexes seem to be hard for them to understand. Therefore, it can be concluded that discussions with customers are even more important than before, to make sure that there is no misunderstanding between the two parts. Additionally, providing cost breakdowns to help the customers understand the rationale behind the pricing could improve the acceptance.

At last, it has to be noted that forward pricing is an internal solution and is not visible to the customer. This highlights the importance of gathering feedback from internal stakeholders, as no feedback will be received from customers on this pricing. Internal stakeholders can give valuable information, as which this study shows.

6.2 Suggestions for further research

As stated in the research part of the thesis, feedback was gathered from a range of relevant employees, including proposal engineers and BDMs. However, project controllers were considered as having valuable insights into index-based pricing, but the questionnaire was not designed to gather that specific information. Therefore, there is potential for further research on the perspective of project controllers regarding mitigation strategies.

Additionally, the research was done in the early stages of forward pricing and index-based pricing. As a result, most of the participants were involved in projects that were still in the sales stage. Future research could focus on how well the mitigation strategies actually mitigated the risks, after they have been implemented in actual projects.

6.3 Thesis summary

The aim of the thesis was to find areas of improvement in the two newly implemented pricing models. This was achieved using a mixed-method approach that made it possible to gather both quantitative and qualitative data through a questionnaire. The use of questionnaire enabled the author to gather feedback from a larger amount of people, including 63 relevant employees from all different regions. A total of 16 responses were received, resulting in a response rate of 25,4%.

In the results chapter, identified key patterns across the answers on the various subjects, such as strengths, weaknesses, challenges encountered are shown. These patterns can be in great use when discussing the future of the pricing models and seeking to further improve them. With this said, the work has fulfilled its purpose.

One of the challenges encountered during this thesis was analysing the collected data. This was due to the high number of qualitative questions, which allowed the participants room to express themselves freely. As a result, summarizing the collected data without leaving out any logical answers that were not mentioned by others was challenging. Still, meaningful data and recommendations for future improvements was presented.

6.4 Final words

This study helped the author to strengthen his understanding of the pricing models and broaden his knowledge across the sales stages that occur during sales. This knowledge will be beneficial during the upcoming summer internship at the same department in Wärtsilä Energy. The author wishes to express his gratitude to the supervisor from Wärtsilä, Benny Krohn, for taking his time to discuss the work throughout all the stages and providing useful points to understand the methodologies behind the strategies. Additionally, the author wants to thank his supervisor from Novia University of Applied Sciences, Biniam Amare for the support received throughout the entire process, which had a significant impact on the overall structure and writing of the work.

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8 Appendices

Indexed-based pricing / Forward pricing

1. How many sales projects (EPP) have you been involved in that used Forward-looking pricing? *

- ◯ None
- ◯ 1-2
- ◯ 3-5
- ◯ More than 5

2. How many sales projects (EPP) have you been involved in that used Indexation? *

- ◯ None
- ◯ 1-2
- ◯ 3-5
- ◯ More than 5

3. What are the best "features" with Forward-looking pricing? *

Enter your answer

4. What are the best "features" with Indexation? *

Enter your answer

5. What are the worst "features" with Forward looking pricing, pls add suggestions for improvements, if any *

Enter your answer

6. What are the worst "features" with Indexation, pls add suggestions for improvements, if any *

Enter your answer

7. Do you see any other options to Indexation and Forward pricing (any other risk mitigation actions we could implement)? *

Enter your answer

8. What challenges or limitations have you encountered using these pricing strategies, and how have you addressed them? *

Enter your answer

9. What lessons have you learned from the cases, and how do you plan to apply these lessons to future projects? *

Enter your answer

10. What kind of future improvements do you think are needed to further enhance these pricing strategies? *

Enter your answer

11. How effective do you think the training and support provided to the sales team was in Forward-looking pricing? *

1	2	3	4	5	6	7	8	9	10

12. How effective do you think the training and support provided to the sales team was in Indexation? *

1	2	3	4	5	6	7	8	9	10

13. What feedback have you received from customers or other stakeholders about the new pricing models, and how has this feedback been incorporated into future projects? *

Enter your answer

14. Is there anything else you would like to add or is there any other insight or experience that you think could be relevant? *

Enter your answer