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Optimizing Cash Flow Management and Inventory Control in Engine Power Plant Sales Proposals: A Case Study at Wärtsilä Finland Oy

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ABSTRACT:

This case study investigates how cash flow management and inventory control affect financial risk assessment during sales phase of the Engine Power Plant projects in Wärtsilä Finland Oy. This qualitative research applies inductive approach by conducting semi-structured interviews. Also, a recent sales project showed the real case of the phenomena.

The study found that existing cash flow tool in internal software system does not present required picture of the risks related to the projects without payment guarantees. The financial success of these projects depends on how well cash inflow is compared to inventory commitments. This thesis suggested to integrate the handmade tool into the company's internal system. This would allow proposal departments to improve the accuracy and speed of financial assessments under time pressure. Thus, upgrading existing tool was found to be the essential step in optimizing sales proposals.

KEYWORDS: Cash Flow Management, Inventory Control, Financial Risk Management, Payment Guarantees, Advanced Tool, Engine Power Plant, Project Sales

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TIIVISTELMÄ:

Tämä tapaustutkimus tutkii miten kassavirran hallinta ja varastonhallinta vaikuttavat Wärtsilä Finland Oy:n moottorivoimalaitos -projektien myyntivaiheen rahoitusriskien arviointiin. Tämä kvalitatiivinen tutkimus soveltaa induktiivista lähestymistapaa tekemällä puolistrukturoituja haastatteluja. Myös eräs tuore myyntiprojekti toimi käytännön esimerkkinä aiheesta.

Tutkimuksessa todettiin, että olemassa oleva kassavirtatyökalu sisäisessä ohjelmistojärjestelmässä ei anna vaadittua kuvaa projekteihin ilman maksutakuita liittyvistä riskeistä. Näiden hankkeiden taloudellinen menestys riippuu siitä, kuinka hyvin kassavirtaa verrataan inventaariositoumuksiin. Tässä opinnäytetyössä ehdotettiin käsin tehdyn työkalun integroimista yrityksen sisäiseen järjestelmään. Näin tarjousosastot voisivat parantaa taloudellisten arviointien tarkkuutta ja nopeutta aikapaineen alla. Näin ollen olemassa olevan työkalun päivittäminen todettiin olennaiseksi askeleeksi myyntitarjousten optimoinnissa.

AVAINSANAT: Kassavirran hallinta, Varastonhallinta, Rahoitusriskien hallinta, Maksutakuut, Kehittynyt työkalu, Moottorivoimalaitos, Projektimyynti

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Abbreviations

AHP = Analytical Hierarchy Process
BDM = Business Development Manager
CCC = Cash Conversion Cycle
CRM = Customer Relationship Management
DSO = Days of Sales Outstanding
DIO = Days of Inventory Outstanding
DPO = Days of Payables Outstanding
EAC = Estimate at Completion
EOQ = Economic Order Quantity
EPP = Engine Power Plant
ERP = Enterprise Resource Planning
EVM = Earned Value Method
LC = Letter of Credit
OCC = Operating Cash Cycle
VAC = Variance at Completion
WMS = Warehouse Management System

1 Introduction

This study investigates how Wärtsilä Finland Oy's Africa-Europe (AFEU) Proposal Management -department in Energy Business analyses cash flow and inventory control during the Engine Power Plant (EPP) sales proposal stage. It is conducted as a case study. The research aims to review the current financial evaluation methods that are used in the proposal phase and recognize opportunities for improvement in managing financial risk as well as further project feasibility forecasting. The outcome of this study can hopefully benefit all the EPP proposal departments within the company.

1.1 Background and motivation

In capital-intensive industries like Energy Business, cash flow management is key to financial stability and business sustainability (Pyatkina et al., 2021, Introduction). Wärtsilä along with other large project sales companies tend to have huge financial commitments, especially after signing a contract. The sales phase is critical to a project's success as it defines the payment terms of the contract and determines the financial risk of the project execution (Gladysz & Kuchta, 2022, pp. 3–4).

Currently, Wärtsilä has an existing cash flow measurement tool in its Customer Relationship Management (CRM) software environment. However, it has been found to be unclear by the users and therefore it is rarely used. This could potentially lead to a habit of not evaluating commitment costs properly in advance. Additionally, commitment to make large investments is made immediately after signing a contract, sometimes without a full understanding of the risk that comes with it. Committed inventory refers to all the manufactured or ordered equipment that Wärtsilä prepares for a specific sales project. Usually, the engines and generators have the longest lead time and therefore are ordered immediately after signing a contract. They are also the most expensive components, which makes the financial commitment very high especially in the beginning of a following project execution. It is thus important to have an appropriate evaluation of cash flow and committed inventory comparison already in the proposal stage of sales.

1.2 Research objectives and questions

The primary objective of this thesis is to evaluate how cash flow and inventory control affect the financial risk management in Wärtsilä's EPP project sales. The aim is to refine Wärtsilä's internal processes and financial analysis tools and provide suggestions towards better readiness for a financial decision-making in the sales phase. The research questions are listed below:

1. *How does cash flow visibility affect sales proposal approvals in Wärtsilä's EPP projects?*
2. *What role does committed inventory play in a sales project's profitability and cash flow management?*
3. *What are the key tools used for financial analysis during the sales proposal process?*

The overall goal of this study is to identify potential gaps in the current way of working and initiate process improvement. This can be achieved by implementing qualitative data analysis in a form of semi-structured interviews. Additionally, a recent sales project will serve as an example of the phenomena. The conceptual framework of the study is shown below in Figure 1.

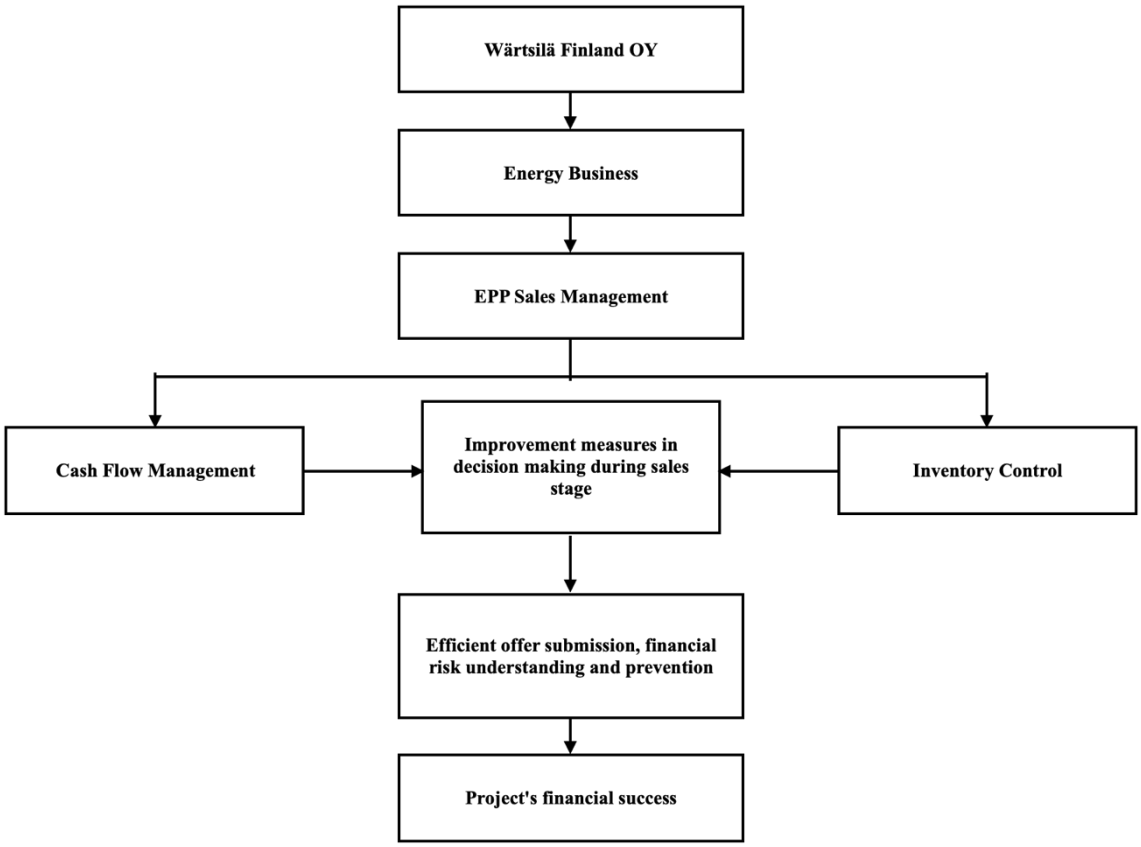

Figure 1. Conceptual framework of the study (Adapted from Anorue & Ugwoke, 2022, p. 375).

1.3 Structure of the research

This thesis has five main chapters. First chapter introduces the topic by outlining the importance of cash flow management and inventory control in EPP project sales. Also, the research objective and key questions are defined. The second chapter continues with literature review of existing studies. It also builds theoretical framework for the concepts that are discussed further in the case study. The third chapter reveals the research approach and data collection methods. Finally, the last two chapters will discuss findings and provide recommendations for optimization of the current practises. The further research directions are guided at the very end.

2 Literature review

This section will assess existing studies with their findings on cash flow management, inventory control, and financial risk management. Considering that the topic of this thesis includes many different concepts, the focus will be held on highlighting the most relevant ones. The literature review builds the foundation for further case study's better understanding.

2.1 Cash Flow Management

Companies operating in the energy sector are dependant on their cash flow management practices due to the long project cycles. Moreover, these companies deal with expensive products which means that the costs of possible errors may be fatal. These businesses often face delays in customer payments, regulatory uncertainties and project financing challenges. This increases the importance of maintaining a necessary cash flow. (Gandhi et al., 2022, pp. 9–10; IEA, 2020, p. 134; De et al., 2018, pp. 13–15)

Liquidity management ensures that companies have enough liquidity to deal with their financial obligations. Liquidity refers to ability to convert assets such as inventory into cash without financial losses. It usually becomes complicated especially in the energy industry, since there are constantly changing volatility in prices. Additionally, as energy companies tend to expand more into renewable projects, it can require higher investment costs with slower returns. (Onabowale, 2024, pp. 1–4)

According to Zimon (2020, p. 366) one of the strategies dealing with liquidity is called the conservative strategy. It includes maintaining inventory at an optimal level in order to not increase liquidity to the excess point, unless creating reserves. *"Receivables turnover in days must be definitely shorter than liabilities turnover in days."*, he states (2020, p. 366).

Cash flow management is a continuous process that consists of the inflows and outflows of cash (Pyatkina et al., 2021, p.2). According to Laghari et al. (2023, Introduction) cash flow management determines efficiency of a firm's financial performance. Furthermore, Dharma & Pratiwi (2020, p. 13) mentioned that financial measures such as cash flow affect company's sales growth. Thus, it is crucial to adopt a strategic approach to cash flow planning well in advance, starting already in the sales stage.

According to Kolegowicz & Sierpinska (2020, pp. 95–96) energy companies apply conservative, moderate or aggressive cash flow management strategies. A conservative strategy aims to maintain high levels of cash and receivables, increasing the possibility to sale and manufacture accordingly. However, this may result in increased reliance on external financing. In contrast, the aggressive approach minimizes cash holdings and implements strict payment policies. Moreover, it reduces opportunity costs but potentially increases business risk during economic uncertainties. The moderate strategy seeks a balance between both previously mentioned approaches. It tries not to generate excessive receivables and at the same time allocate its funds in low-risk liquid securities. (Kolegowicz & Sierpinska, 2020, pp. 95–96)

Cash flow management can be measured with cash conversion cycle (CCC), which compares the time it takes for a company to convert its investments to cash (Richards & Laughlin, 1980, chapter 4). According to Kroes & Manikas (2014, chapter 2.1) the CCC consists of three main components:

a) *Days of sales outstanding (DSO) – time required to collect payments from customers after a sale.*
b) *Days of inventory outstanding (DIO) – time of goods remaining in inventory before being sold.*
c) *Days of payables outstanding (DPO) – time a company takes to pay its suppliers.*

These components define a company's cash flow position. Kroes and Manikas (2014, chapter 2.4.1) found that reducing DSO and DIO contribute to better financial performance by increasing liquidity and reducing working capital requirements. In chapter 2.2.1.3 they also said that while extending DPO can improve short term cash flow, delaying supplier payments too much may harm supplier relationships and disrupt supply chain efficiency.

Another part of cash flow management is the operating cash cycle (OCC). It focuses on the period during which cash is tied up as inventory before revenue from the sales is collected. Unlike the CCC, OCC does not account for supplier payments, which makes it a clearer measure of internal cash flow efficiency. Therefore, firms with shorter OCCs can reallocate their cash more quickly into other financial investments. (Kroes & Manikas, 2014, p. 38)

Laghari et al. (2023, p. 15) stated that companies with low CCC tend to experience better financial performance. They also mentioned in introduction that leverage has a direct impact on a company's cash flow management. Leverage refers to the company's reliance on taking debt. Companies with high leverage often experience liquidity constraint, which increases the risk of business collapse (Laghari et al., 2023, p. 4). Moreover, lower leverage companies tend to benefit from cash flow measures more than higher leverage ones (Laghari et al., 2023, Abstract).

There are different considerations about OCC and how it relies on leverage levels. Firms with higher leverage are advised to shorten their OCC to maintain liquidity, while lower leverage firms have more financial freedom to invest in such things as inventory. Kroes & Manikas (2014, Abstract) argue that a longer OCC can negatively impact firm performance. Additionally, high leverage companies may need to optimize their CCC by reducing DSO and increasing DPO to establish their liquidity levels. The relationship between CCC, OCC, DSO, DIO, and DPO is visually illustrated in the Figure 2 below. It shows how they are all related to one another and how they affect the performance of a firm.

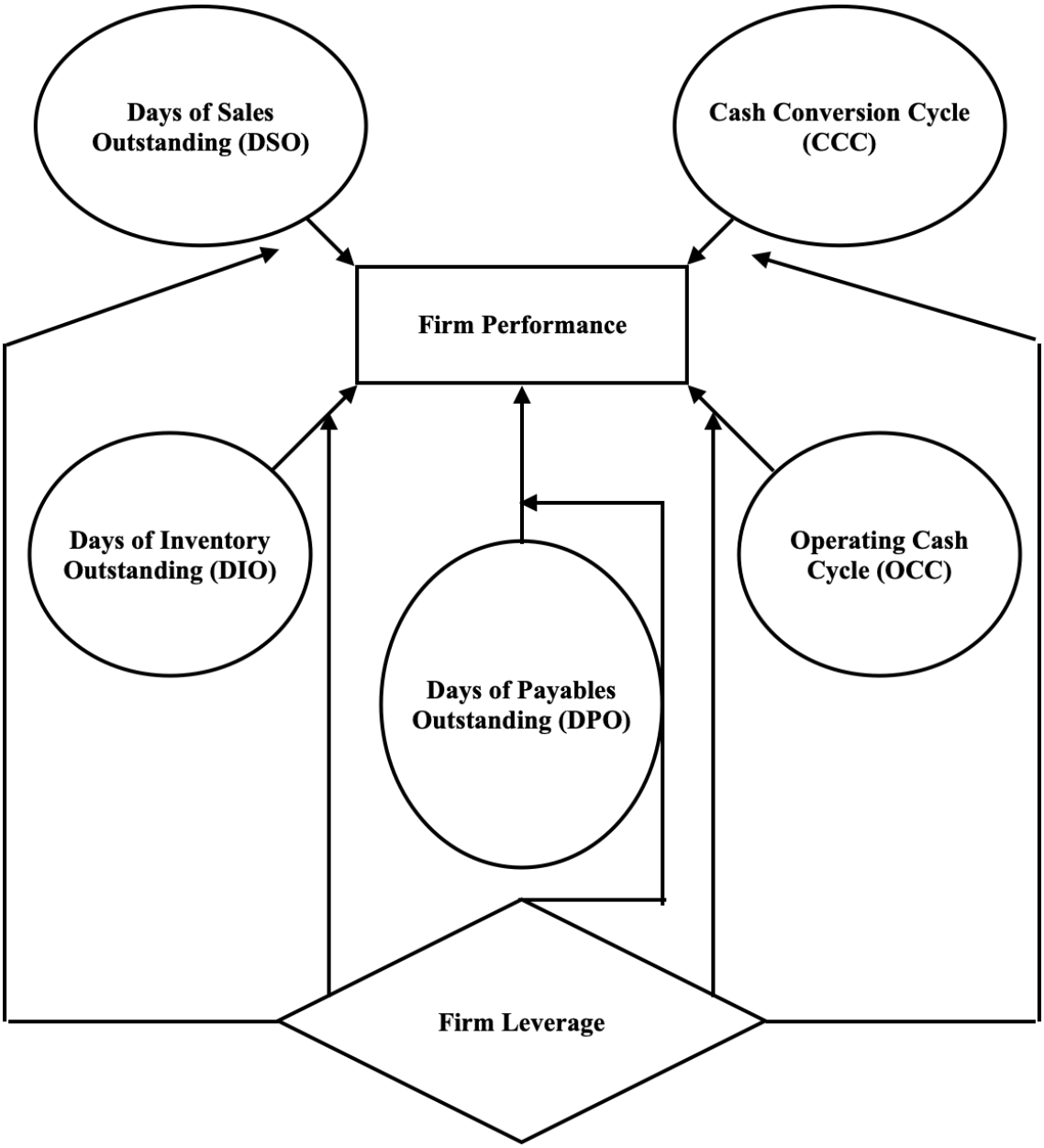

Figure 2. Conceptual model of Cash Flow Management (Adapted from Laghari et al., 2023, p. 7).

Another cash flow optimization strategy takes working capital into account. According to Lifland (2011, pp. 61–62) working capital measures the combined value of DSO and DIO and compares it to DPO, however, excluding cash and interest-bearing debt. This comparison's net result acts as valuable measurement parameter when optimizing working

capital. He also mentions (2011, p. 62) that proper payment terms are important when mitigating risks related to receivables from the customers.

2.1.1 ERP systems in the energy sector

Enterprise resource planning (ERP) systems are essential tools for managing cash flow, procurement, and financial reporting. They are implemented in a form of software platforms. ERP systems integrate data across departments within a company, and therefore offer a better readiness for decision-making. They can support cash flow management by automating core financial transactions. This can be for example accounts receivable and payable tracking. SAP is one of the systems used for accounting or supply chain purposes. In the case of Wärtsilä, CRM software platform is used across sales departments. It functions as a database for storing information about customers and proposal preparation. Offer package documents are also automatically printed by this system. As energy companies deal with complex projects, ERP systems support them in systematic data storing purposes. (Ogundipe et al., 2024, pp. 3416–3419)

2.2 Inventory Control

According to Evans (2016, chapter 1.1) inventory control ensures the competent use of storage and materials. In the same chapter, he also stated that the link between production and sales is created by inventory; optimal stock levels are maintained to prevent both shortages and excess inventory. Lolli et al. found (2017, p. 284) that inventory classification supports the improvement of a firm's inventory management systems. According to Yang (2016, chapter 2.1) the combination of classification with control decisions supports order fulfilment and reduces holding costs. He then highlighted in the same chapter that effective classification methods, such as ABC and multi-criteria, allow businesses to accurately allocate their resources.

In their research about dynamic inventory management, Chao et al. (2008) asserted in the introduction that firms with cash flow constraints must align inventory decisions with

financial planning. This is important especially in industries where seasonal demand varies (Katehakis et al., 2016, p. 1558). Furthermore, cash flow-based inventory management combines financial planning with inventory control to secure sustainable stock replenishment. Hence this approach is beneficial for companies that deal with large inventory commitments and must balance their cash flow accordingly.

Manual inventory tracking can sometimes expose to human error. According to Atieh et al. (2016, pp. 568–572) the automation of inventory processes through a customized warehouse management system (WMS) improved the reliability of operations. Their software integrated barcode systems to automated serial number management. This enabled more accurate stock identification. Moreover, Atieh et al. (2016, pp. 571–572) found improvements in processing time and reporting capabilities. In EPP sales, where delays and cost overruns can have negative financial consequences, the efficiency of automated systems could be valuable. Thus, utilizing such technological systems in the EPP sales phase is recommended.

2.2.1 Committed Inventory

Inventory refers to a company's possession of raw materials and components that it keeps for the purpose of production, sale or maintenance (Heizer et al., 2017, p. 490). Industries like energy that deal with high-value assets use inventory as a strategic asset that determines financial performance and operational efficiency (Srour & Azmy, 2021, pp. 46–48). In this thesis, committed inventory refers to a manufactured or ordered inventory that has been tied to a specific sales project. However, if the project gets cancelled for one reason or another there becomes a risk of staying with that expensive inventory for a long time. It is a part of financial decision making as it reserves capital and therefore affects financial flexibility (Ali, 2023, chapter 2). The challenge with committed inventory in the EPP business is long lead times of key components. Moreover, maintenance costs can be expensive.

There are different methods of inventory control. According to Heizer et al. (2017, p. 496) economic order quantity (EOQ) model is one of the commonly used techniques. It is based on the principle of minimizing the total cost of inventory by identifying the optimal order quantity. In practise, this means determining how much inventory should be ordered each time to reduce unnecessary stock levels. The EOQ model assumes a constant demand rate and lead time, which makes it effective for standard components and frequently used spare parts (Heizer et al., 2017, pp. 496–497). This could be beneficial during EPP sales proposal stage; understanding the optimal order quantities for commonly used components can help proposal leaders to forecast cash flow more precisely. Moreover, it allows proposals to identify financial exposure well in advance.

Due to the complex nature of the EPP supply chains and production cycles, it is crucial to manage inventory levels before any proposals are sent to the customer. Companies should have a balance between maintaining sufficient stock levels, to avoid project delays caused by stockouts, and minimizing holding costs of unsold inventory (Razi & Tarn, 2003, pp. 114–115). This balance is important especially when dealing with costly and long lead time components. However, maintaining optimal inventory levels can be challenging because most of the time different projects require customized modifications to the products. Moreover, long lead time items can take several months to manufacture and deliver, meaning that procurement decisions must be made immediately after signing the contract. If inventory planning is inaccurate, it may lead to either premature financial commitments or costly delays in project execution.

EPP projects often include service agreements or warranties that require availability of spare parts. Predicting the quantity and timing of these parts is difficult, especially when each power plant may have custom configurations. Overstocking spare parts increases carrying costs, while understocking may damage contractual agreements. (Chao et al., 2008, p. 759) Inventory control methods such as previously mentioned EOQ are good in managing common items, however the complexity of project-specific and customized items may need extra planning. Therefore, inventory managers must collaborate with

proposal teams to understand the specific scope of each project and confirm the right parts availability.

Committed inventory must be aligned with the financial risk assessment. According to Gladysz & Kuchta (2022, p. 2) the financial risk of a project can be seen in advance. In the chapter 2.1 of their research (2022), they define risk value as combination of probability of risk occurrence with the impact of the consequences and non-detectability. The equation is shown in the formula (1) below:

$$Risk\ Value = Probability \cdot Impact \cdot Non\text{-}Detectability \quad (1)$$

Committed inventory falls under non-detectability category of the formula (1) as it includes already known large financial commitments and therefore helps in detecting upcoming risks before they occur when or if the contract is signed. Furthermore, they state that the data on the left-hand side of the formula (1) is determined subjectively based on a company's previous projects. Thus, prior sales projects' data is beneficial when evaluating risks associated with projects in the future. (Gladysz & Kuchta, 2022, p. 3)

Committed inventory is not just about managing materials. It is also an important financial factor that directly affects the success of a sales project. This section showcased that poor inventory decisions can lead to increased financial exposure. Especially in EPP sales, where components can be expensive. Therefore, implementing efficient ERP systems will support internal decision making. Proposal teams could have better preparedness for the assessment of procurement and payment schedules. Furthermore, management is interested in seeing inventory commitments compared to cash flow. By visualizing these commitments in advance it becomes easier to justify proposal approvals from the management and be aware of the financial exposure.

2.3 Financial Risk Management

Financial risk as a term has been touched already in previous parts of this thesis, however, this section will explore it more in-depth. Gladysz & Kuchta (2022, p. 3) define risk as a possibly occurring event, that has a negative influence on project outcomes. They also link financial risks to sales.

Hopkinson (2010, p. 18) explains that risk management is an ability to respond to unknown risks, however, knowing about their existence. Dharma & Pratiwi (2020, p. 12) further clarify this approach by dividing it into identification and mitigation processes. The identification consists of determining possible risks such as cost overruns and delays in project completion in a form of probability (Dharma & Pratiwi, 2020, p. 13). In the same paper (2020, p. 17) they present Analytical Hierarchy Process (AHP), which can be viewed as mitigation process that prioritizes different type of risks according to their predefined priority levels.

In their article about sustainability of project's financial risk management Gladysz & Kuchta mentioned earned value method (EVM) as a useful approach to predict possible financial shortfalls. EVM consists of Estimate at Completion (EAC) and Variance at Completion (VAC). They work as a warning mechanisms for possible financial problems that can occur in the future. (Gladysz & Kuchta, 2022, p. 2)

Currency risk, or in other words exchange rate risk, is the risk that company may face when accepting foreign currencies as a payment currency. It can occur in both international and domestic companies, especially those involved in import and export activities. The risk comes from transaction exposure, economic exposure, or translation exposure. Transaction exposure concerns the impact of currency changes in foreign currency that has been accepted by the selling company as a payment currency. Contrarily, economic exposure refers to how exchange rate shifts affect company’s market competitiveness and long-term profitability. Finally, translation exposure arises during the consolidation of foreign subsidiary financial statements into the parent company’s reporting currency.

To mitigate currency risks, companies implement hedging to protect their financial stability. (Pobric, 2019, pp. 117–122) In case of Wärtsilä, the base currency is Euro, and all the proposals are given in that currency. However, sometimes USD is also accepted, but it needs to be evaluated by the hedging team and approved by the management.

According to Basel Committee on Banking Supervision (2000, p. 1) credit risk can occur from direct lending activities. In EPP sales, credit risk is associated with customer's fulfilment of contractually agreed payment terms. Usually, credit risks are mitigated through payment guarantees, for example, Letter of Credit (LC) (BCBS, 2000, pp. 10, 25). However, LC may not be accepted by the customer. Therefore, selling companies like Wärtsilä can negotiate advance payments according to their risk tolerance. Furthermore, assessment of a customer's creditworthiness may be beneficial during the sales phase.

Naniz et al. (2019, pp.667–669) claim that the risk identification process should begin by clearly defining the type of a risk. They also point out on the same pages that identification involves taking in consideration both internal and external information sources. These can be for example financial statements, audit reports or statistical data. Furthermore, they introduce matrix-based approach for risk assessment. This approach begins with the identification of indicators that are most relevant to the company's risk profile. These indicators can be net profit, revenue, cost of sales, net working capital, fixed assets, accounts receivable, accounts payable, equity and loan capital (Naniz et al., 2019, p. 669). The goal is to identify areas of potential vulnerability based on deviations in these financial indicators. According to their work, this process helps in recognizing existing risks and the ones that may be approaching in the future. After financial risks are identified, the mitigation process can begin.

Traditional risk mitigation strategies are described as reactive approaches as they often act after risks had already materialized (Nahid et al., 2024, p. 22). As the time went by, risk mitigation has evolved into more of a proactive manner. According to Nahid et al. (2024, p. 26) sensitivity analysis and scenario planning are useful when trying to mitigate

risks; exploring multiple risky scenarios early enough can save the company from potential financial losses. Instead of waiting for risks to materialize, modern risk mitigation tries to identify and simulate possible risky scenarios with the help of data-driven tools (Nahid et al., 2024, p. 23). They also suggested on the page 29 to use techniques like digital twins and predictive analytics for this kind of simulation of project outcomes.

Financial risks can be also managed in a quantifiable way. Research by Ray et al. (2013, Introduction) outlines the importance of predictive modelling when outsourcing contracts. They have developed a mathematical equation (2013, p. 195) for the estimation of the specific risk occurring in a contract. The equation uses data gathered from previous and similar projects, to calculate risk percentage.

Dharma & Pratiwi (2020, p. 14) cover project time and cost relationship by outlining the standard period, normal costs, and crash time. This phenomenon can be seen in Figure 3. Key takeaway from this is that projects can have negative cash flow at the start of execution period, hence making the evaluation and understanding of risk factors important. In the case of Wärtsilä, major risk factors are heavy inventory commitments, especially in the beginning of the project execution.

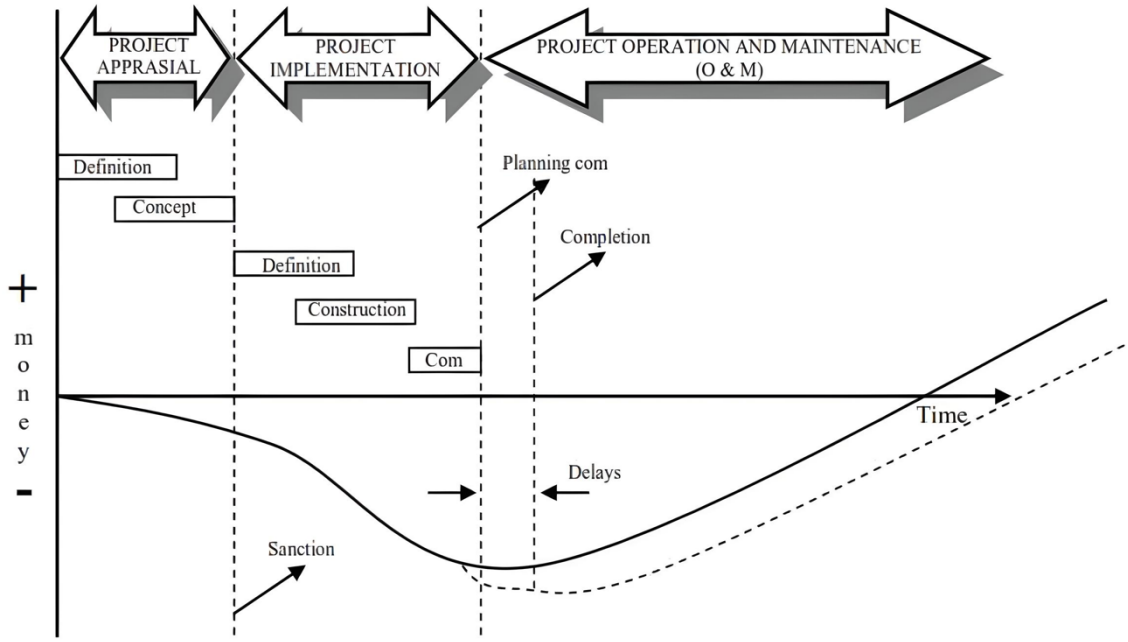

Figure 3. Project Time and Cost Relationship (Dharma & Pratiwi, 2020, p. 14).

2.4 Wärtsilä Energy

Wärtsilä Energy is on its decarbonisation journey towards 100% renewable energy future. Being one of the market leaders in the industry, they provide sustainable technologies with the power system expertise on the engine power plants and energy storages. They have 79 GW installed EPP capacity and over 130 energy storage systems across 180 different countries all around the world. (Wärtsilä, 2025, Leading the energy transition)

2.4.1 Energy Business - EPP

Engine power plants are the core of Wärtsilä's Energy Business. The ability to adapt continuously improved sustainable fuels indicates strong position in the future energy markets. Wärtsilä has designed their EPP catalogue to satisfy different types of operation modes, such as baseload and balancing for renewable energy production. The capacity of 50 to 400 MW is so called "sweet spot" for Wärtsilä, since this size tend to have best efficiency on various levels. (Lindberg, 2024)

2.4.2 Proposal Management

Proposal management includes the process of planning, preparing, and submitting proposals, or in other words offers, for the customers' requests (Wärtsilä, 2025). In Wärtsilä's EPP business there are Proposal Management -departments that are responsible for gathering all the data for the accurate proposal preparation. These departments act as a bridge between business development and project execution. Moreover, they have technical sales support team helping them to solve different type of technical questions of the EPP solution. Technical sales support consists of specialist in such fields as mechanical, electrical, noise, or emission.

Wärtsilä's EPP Proposal Management -department is part of Sales Management within the Energy Business. Proposal departments are divided into different areas of responsibility: Africa-Europe, Middle East-Asia and America. Each department is responsible for customers of their own area and prepares different kind of offers for them. There are three types of offers: price indication, budgetary offer, and firm offer. Each one of them have their own specifications and requirements. The only binding offer is firm offer and therefore it requires the most effort and accuracy. Before submitting any firm offer there is an offer review, where Business Development Manager (BDM) along with the proposal engineer or manager presents the offer to the management. However, other stakeholders are also involved in the preparations. BDM is responsible for gathering all the inputs from the customer and give them to the proposal leader who then prepares the offer package. Usually, there are many nuances that proposal needs to remember and clarify from experts of different fields within the company.

Figure 4. Sales to Order steps (Wärtsilä, 2025).

The sales process is illustrated in the Figure 4, which is shown above. The process begins with a sales lead coming from management. Then the opportunity is assessed based on its strategic fit in terms of profitability and available resources. After that, if the opportunity is confirmed as feasible, the Proposal Management -department starts offer preparation with the support from internal stakeholders. Once the offer is ready, it needs to undergo an internal offer review with the management. This includes validation of the technical scope, cost estimations, payment terms and possible risk exposure. If approved by the management, the offer can be then sent to the customer.

In case negotiations reach mutual agreement, the process of contract preparation begins. This involves aligning the final terms and conditions with the customer. After they are agreed upon, the next step is internal contract review. Management must again approve prepared contract. When approved, and hopefully signed by the customer, the sales phase comes to an end. All the documents are handed to the executive project team, which has been already involved since firm offer. They will take care of full execution of the project.

Preparing proposals for EPP projects can be challenging. Firstly, the offers are often built under tight deadlines. Involving different departments takes time and there is usually not a lot of it. Secondly, the EPP projects are complex in the nature; dealing with the technical, commercial and regulatory requirements vary between different customers and regions. Lastly, there are lots of projects without payment guarantees that require

extra accuracy in financial field, and the purpose of this thesis is to facilitate this challenge.

Cash flow and inventory commitments are the financial indicators that management is really interested in, because they determine whether the project will be profitable and what are the risks during different stages of payment milestones. It would be beneficial for proposal departments to adopt more advanced tools for visualizing the relationship between outgoing and incoming cash during all stages of proposed payment milestones. Currently, some proposal engineers have developed their own manual Microsoft Excel -tools to showcase these cash flow and committed inventory curves. However, they are completely manual and time-consuming to maintain. Proposals must enter all project-specific data by hand. Since Wärtsilä's CRM software is already regularly maintained with updated cost information, it could be useful to integrate them into the new tool. Automating this part would reduce the risk of manual errors and save proposal departments' time. Proposals could concentrate more on the accurate offer package preparation. However, this tool would still need the manual input of payment milestones. A recent project of Wärtsilä will be discussed in the findings section of this study. It will demonstrate how this manually created tool was used to highlight cash flow and committed inventory comparison

3 Methodology

In this section the methodology of the research will be discussed. Firstly, it outlines the research approach, then the data collection methods and analysis techniques. The methodology is designed to collect crucial data, enabling a comprehensive examination of the concepts presented in the literature review. The outcomes and findings of this section will be discussed in the next chapter.

3.1 Case study method

Case studies are often used when aiming to improve a company's functionalities. Concentrating individually on specific cases provide good preparedness for solving their predefined objectives. They are especially relevant when a large variety of factors and relationships are included. Hence, researchers gain more awareness and accuracy for filling specific gaps. (Fidel, 1984, p. 273)

This case study utilizes qualitative research methods. According to O'Brien et al. (2014, p. 1245) qualitative research interacts with literature by describing, interpreting, and generating theories. They also state on the same page that using qualitative approach builds relevance as it explores real situations. Moreover, the inductive research approach was selected to be used. Inductive research gathers general conclusions from specific observations, which allows the researcher to emerge theories from the data. Moreover, research objectives are compared to the findings and presented in the summary format. In this case study, inductive approach enables identifying patterns and constructing interpretations of the participants' experiences. This is in line with the goal of the study to gain insights on the subject. (Thomas, 2006, pp. 237–239)

3.2 Data collection

The case study's data was collected through interviews. Moreover, a recent project was used as an example. Naz et al. (2022, p. 42) stated that interviewing is a powerful way to

obtain data from qualitative research, especially in case study. Furthermore, on the same page, they highlighted the role of structured and semi-structured interviews, calling them an effective tool of investigation. Gill et al. (2008, p. 291) further clarified that semi-structured interviews include key questions about the topic of discussion while still leaving a room for responses in more detail.

Three semi-structured interviews were held during the month of March 2025. All of them were held face-to-face in Wärtsilä's Powergate office. The interview questions were presented to the interviewees in advance. All interviews were held in English for more congruent outcome. With the interviewees' permission, all interviews were recorded and transcribed to enhance the analysis of outcomes. The selection of interviewees was based on their experience and knowledge about the topic. Moreover, the aim was to gather several perspectives from different point of views. The identity of the interviewees is protected and classified as shown in the Table 1 below.

3.2.1 Interviews

Table 1. Interview sample.

Interviewee	Position	Length	Date
Interviewee A	Senior Advisor, Trade Finance	23 min	2025-3-24
Interviewee B	Proposal Engineer, AFEU Proposal Management	27 min	2025-3-25
Interviewee C	Project Sales Director, EPP	19 min	2025-3-28

3.2.2 Recent project

One recent project was selected to serve as a practical example of the financial and operational phenomena discussed in this study. Selected project is referred to as Project X. It represents a typical EPP sales project without payment guarantees, such as LC. Project X was chosen due to its relevance in terms of financial complexity of inventory

commitments. Moreover, it illustrates the common challenges that proposal team face during offer preparation stage, when financial planning is in early stage.

3.3 Data analysis

Data analysis takes place after the data is collected. According to Thorne (2007, p. 93) data analysis is the most difficult part of the qualitative research. Additionally, she stated that almost all qualitative analytic strategies use *constant comparative analysis* (2007, p. 95). This technique compares data pieces, i.e. interviews, to each other and conceptualize them together by reviewing differences and similarities. It is also found to be powerful way to identify patterns; hence this strategy will be utilized in the next section.

Constant comparative analysis involves comparing pieces of data, such as interview responses or observations, with each other to identify patterns, differences or similarities. This method starts with taking a single data point and comparing it with subsequent data as it is collected. As each new data item is introduced, it is systematically compared with all previously analyzed material. This process helps the researcher to develop conceptualizations and thematic patterns. Furthermore, the researcher refines categories and starts to recognize broader theoretical connections across the dataset. (Thorne, 2007, p. 95)

3.4 Quality assurance

Quality was assured by meeting academic standards. Moreover, the reliability, credibility and validity were prioritized throughout the whole thesis process. Validity was ensured by using multiple sources of evidence; interviews and archival data of Wärtsilä (Gibbert & Ruigrok, 2010, pp. 712–713). External validity and generalizability on the other hand was reached by aligning the case with theoretical framework of the concepts described in the second section of this study (Gibbert & Ruigrok, 2010, pp. 714–715). Furthermore, the results and findings have been presented to case company representatives to gain expert opinion and validity of the results and findings, using weak market test method.

Here, weak market test means that the proposed ideas of improvement are shared with professionals within the company to assess the possibility of practical implementation. This strengthens validity of the findings and ensures that the research outcomes are recognized as useful by the professionals.

Research can be viewed as reliable, when the outcomes do not differentiate much if conducted repeatably by different persons. Additionally, reliability means transparent documentation of the collected data. In this case study, all interviews' recordings and transcriptions were carefully stored for better evaluation. Moreover, the interviews followed semi-structured approach, meaning that the additional questions could provide more insights about the topic. (Gibbert & Ruigrok, 2010, pp. 715)

There are some limitations in this research. Firstly, the findings are based on one company limiting the generalizability of the results. Secondly, the research includes limited number of interviews which may not capture all the views about the topic. Although interviewees were selected based on their expertise, their views might still be influenced by subjective experience. And lastly, manual data collection and analysis may cause some human errors. These limitations were acknowledged throughout the research process and addressed by applying quality assurance. This study does not aim for broad generalization, but still could provide some valuable information for similar contexts.

4 Findings

The findings section examines the data gathered from the interviews and recent Project X. Main observations are divided according to their conceptualization described in chapter 3.3. Each category is then thoroughly reviewed by outlining the insights gathered from the data analysis. This structure supports the understanding of how the findings relate to theoretical framework and research questions presented earlier in the study.

4.1 Overview of the sales projects without payment guarantees

The interviews started with the questions about interviewees' roles in the sales process and involvedness in projects without payment guarantees. All the interviewees stated that they have been dealing with these kinds of projects. Although, Wärtsilä's priority is to always secure the contract by payment securities.

> *"I have all my projects where we could not manage to get any kind of a payment security from the customer. One reason for not providing the payment securities is that all these companies are quite big and it seems like they want to do business on trust." (Interviewee B)*

> *"After COVID it have been more front loaded payment milestone meaning that the customer are able to get the money, but they don't want the letter of credit or another security, so they pay us earlier." (Interviewee C)*

It became evident that when sending a budgetary offer, the heavy payment securities are included by default. However, the real discussion about payment terms starts during contract negotiating. If customer cannot come up with any guarantees, the management must carefully evaluate inventory commitments to mitigate possible risks. Moreover, Interviewee B who works as a proposal engineer stated that he manually prepares Excel calculation for the management's eyes. This calculation shows cash flow, which is always requested, and on top of it committed inventory with potential risks.

The absence of payment securities does not mean that financial risks are ignored. Rather, it means that the focus should be more on internal tools that help to understand the potential risk exposure for the project. However, as stated in the literature review, after the identification of the risks, comes the mitigation process. Wärtsilä could benefit from modern risk mitigation strategy that simulates possible scenarios with the help of data-driven tools (Nahid et al., 2024, p. 23). Moreover, since there is already an existing tool, it would be beneficial to make it more user friendly and integrate into Wärtsilä's internal CRM software. With the help of this tool, proposal leaders could easily simulate different case scenarios of project outcomes.

> *"If we have a liquid payment security, like letter of credit or possibly a non-demand bank guarantee, then the inventory commitments are not so much in focus. But if we don't have payment, then management also looks closely at this inventory commitments curve." (Interviewee A)*

> *"When you don't have any sort of payment securities from the customer, management is using these kind of analysis (Cash Flow vs. Committed Inventory) to make a decision whether we should go for the project or we should hold back. Or what changes we should propose to the financials of the project so that it's a win-win situation for both or it reduces our exposure towards the project." (Interviewee B)*

4.2 Committed Inventory vs. Cash Flow analysis

Previously mentioned Project X will serve as an example of the cash flow and committed inventory comparison. In this project customer didn't want to include any payment guarantees, so proposal department had to prepare commitment curves paired with estimated cash flow. The proposed option was presented to the management for the evaluation and acceptance. Project X was managed in the CRM system, where it had all the information related to preparing an offer package for the customer. Under this project's opportunity window in CRM there is a cash flow tool that was selected to be the tool for visualizing cash flow according to the inputted payment milestones. It is shown in the Figure 5 below.

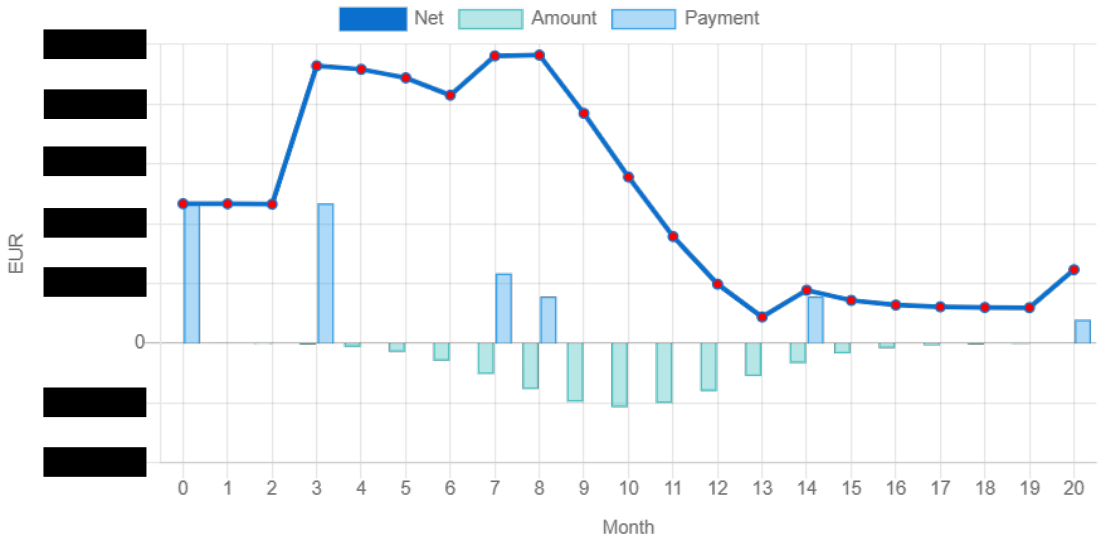

Figure 5. Project X's Cash Flow in CRM (Wärtsilä, 2025).

> *"There is one basic tool in CRM which you can use to do the basic analysis of the cash flow. But when you want to do detail study how much exposure you have and accordingly when you want to adjust your ordering of the equipment, I tend to do it in Excel. It's more of a manual work, but then there you have much more flexibility where you can decide out of the equipment, which are essential, which are having long lead and which are critical, and accordingly adjust their ordering so that you try to manage the positive cash flow throughout the cycle of the project." (Interviewee B)*

This tool in CRM has been found to be quite simple by multiple people in the proposal department. It only shows the assumed payments from the customer according to the payment milestones, which can be manually added. There aren't any expenses or commitments within it. Therefore, it is used only because of the company's way of working policy. Couple of employees figured that it doesn't show the whole picture and came up with their own manual calculations to show the accurate picture of the project financials. This manually conducted version of the Project X's cash flow in Excel is visible in Figure 6.

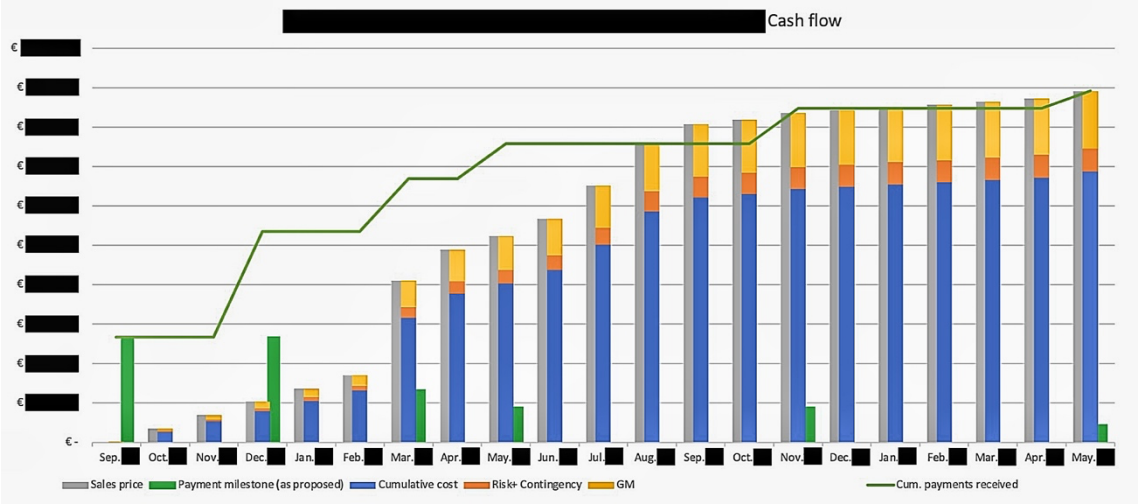

Figure 6. Project X's Cash Flow in Excel (Wärtsilä, 2025).

While this cash flow chart doesn't yet show any commitments, it is still visually clearer than CRM's calculation. To complement this cash flow curve, the committed inventory chart shown in the Figure 7 outlines the whole picture of the project. The inputs can be continuously adjusted to match the current state of contract negotiations. Hence, keeping up with the potential risks throughout the whole negotiation process.

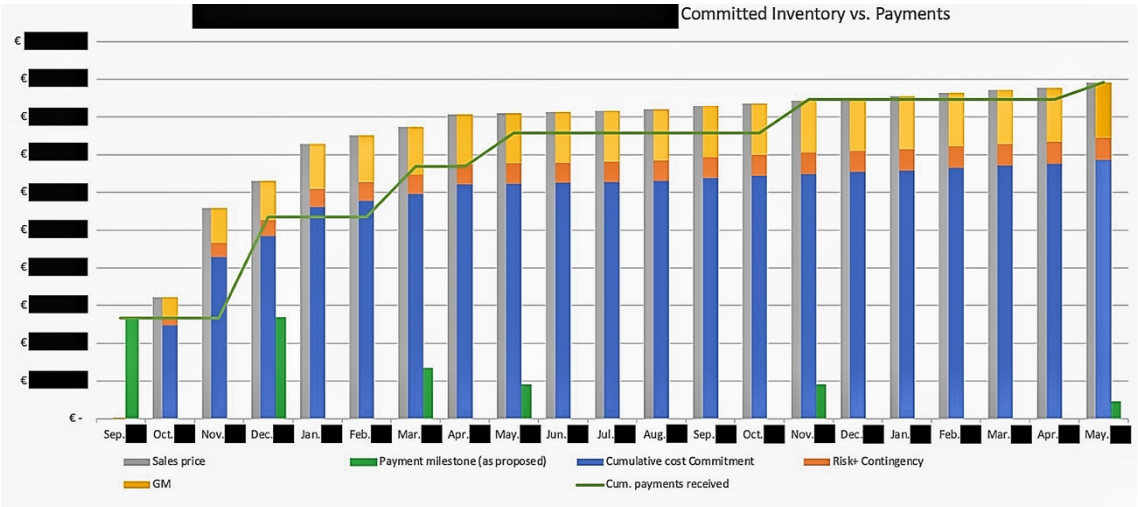

Figure 7. Project X's Committed Inventory in Excel (Wärtsilä, 2025).

The financial risks of commitments can be understood by comparing the green curve with the combined columns. If green curve is above blue and orange, it means that costs

and risk reservation are covered. Contrarily, if it is below then project costs are greater than payments at that time. If it is inside yellow, which is gross margin, it means that Wärtsilä has secured profits from the project. When the green curve reaches the top of yellow and whole combined column, the full margin is collected. In this Project X, the major risk occurred in between first and the second payments. Also, the time between second and third payments was a bit risky. After the third payment was received, project became risk-free. The better illustration of previously mentioned risks can be seen in Figure 8.

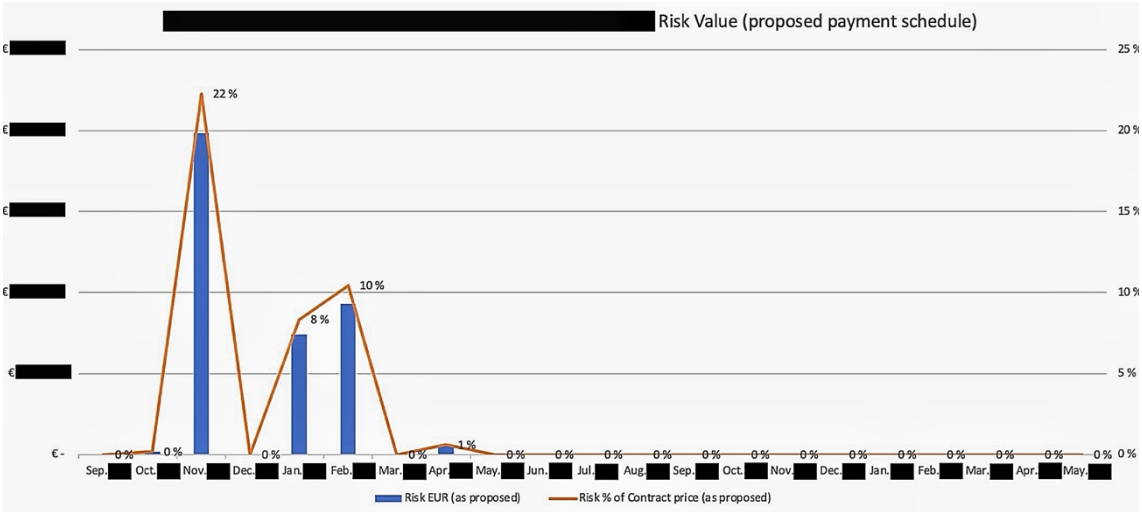

Figure 8. Project X's Risk Value in Excel (Wärtsilä, 2025).

This is a critical information of Project X's financial risks. Moreover, it gives the whole picture of the project financials. As already stated, the integration of this tool in CRM software could significantly improve the efficiency of contract negotiations. Knowing precisely where the risk exposure occurs is an advantage that supports management's decision making. To compare existing tool in CRM with this manually made, it is evident that the Excel gives more accurate visualization of the inflows and outflows of cash. This level of detail is not available in the current CRM tool, which limits its convenience. Therefore, integrating this functionality into the CRM system would improve the quality of financial evaluation during the proposal phase.

4.3 Risk exposure

Risk exposure in sales projects without payment guarantees is mainly associated with financial commitments, or as referred to in literature review, obligations. As described earlier, these obligations require significant investment and, if not supported by upfront payments, can lead to a high-risk situation. The interviewees pointed out that when evaluating such risks, the management relies on presented comparisons of expected cash inflows and outflows. They help to assess how much capital is at risk before any revenues are received.

> *"Two or three months into the project we already have sixty seventy percent exposure on inventory commitments." (Interviewee A)*

Without early cash flow planning Wätsilä could unintentionally commit to large procurements without sufficient liquidity. This matches the findings from Laghari et al. (2023); weak cash flow management paired with liquidity shortage increases the risk of financial distress. Moreover, shortening CCC by reducing DSO and increasing DPO should be the goal during contract negotiations to maintain liquidity levels. This would also minimize leverage expansion, which has been found to have a direct impact on a company's performance. Keeping the leverage low enables greater financial flexibility.

> *"Sometimes you could adjust your orderings and your payment milestone so that you receive the payment at an adequate time so that you don't have overexposure towards your customers." (Interviewee B)*

Interviewee B mentioned that even if ordering time cannot be changed for some of the components due to their long lead time, it is still possible to modify the payment milestone structure during the sales phase. Ensuring that the early commitments are covered by the payments will reduce the exposure. This is important especially at the early stage of the project, when the cash inflow is still limited but procurement of expensive items is already required. Thus, requesting heavy upfront payments should be always the priority in the projects without any payment guarantees.

> *"Try to order something which is more generic in the beginning phase. There are certain equipment within our project purchases, which can be used if not here into some other project." (interviewee B)*

Interviewee B also shared a practical strategy for reducing the risk exposure. Ordering certain systems or auxiliary components, which can be utilized across different projects, can reduce the financial exposure. Moreover, interviewee C stated that Wärtsilä has a certain engine type that can be sold more easily in the other projects in case of something going wrong. He then revealed that in cases with this type of easy-selling equipment, the company is more open to accepting higher level of risk.

> *"We categorize the projects and according to their exposure, we have some risk reservation percentages." (Interviewee B)*

Another interesting insight from the interviews was that risk reservation is not always a fixed value. Wärtsilä has recently started to do a creditworthiness analysis of the customer; the financials and debt leverage are evaluated to get the understanding of customer's ability to pay. This is again part of risk identification process. To mitigate the identified risks, Wärtsilä can adjust their risk reservation levels accordingly. This could be done in the advanced tool showed in the previous chapter to keep up with the analysis.

Risk exposure can also arise from currency and volatility in global prices. Currency risk, as mentioned in literature, occurs when accepting foreign currencies as a payment from the customer. EPP projects usually costs millions of euros meaning that fluctuations in currency rates might have a huge impact on received cash. Wärtsilä has its own hedging department, which concentrates on calculating these currency risks all the time. To be on the safe side, it is advisable to accept only domestic currency as a payment.

> *"We need to hedge meaning that we need to take the currency that we are going to get paid and hedge, so we don't have a risk that for example US dollar would go much weaker and we would retrieve less money in Euro." (Interviewee C)*

Volatility risk refers to the price fluctuations in raw materials, shipping, logistics, and other external procurement costs that affect the execution of an EPP project. Since these projects have a long duration, prices might change in different directions. According to Interviewee C, once a binding offer is submitted Wärtsilä becomes locked into a price for an extended period. This creates a risky situation where prices might unexpectedly change. Volatility risk can be mitigated by agreeing to have a fixed price from suppliers. Hence, ensuring that the costs of items remain stable regardless of the global market price swings.

4.4 Decision making

The data gathered from interviews revealed that decision making during the proposal phase is rarely based on a single factor. It is hard to always make the right decisions during the tight timeline. However, devoting time to cash flow, inventory and project risk profile is inevitable especially in projects without payment guarantees. It became evident from the interviews that Wärtsilä's internal decision-making processes have been continuously improving to pay more attention on early mitigation of possible risks.

Current CRM tools still provide the basic framework for tracking incoming and outgoing cash. However, management has started to request more of the Excel simulations to support their decisions. Moreover, Finance and Control teams also became interested in these simulations. As interviewee B described these simulations are key to deciding "whether we should go for the project or we should hold back". At the moment, these simulations reserve a lot of time to collect different inputs, such as costs, and therefore could be optimized by the professionals. Partial automation of fetching costs directly from CRM could improve the accuracy and speed of financial assessments.

Another observation is about the classification of project risks. Interviewee B stated that Wärtsilä categorizes projects based on their exposure level and reserves risk percentages accordingly. This reserve is included in the offer as extra cash to mitigate predefined risks. However, it can depend on subjective judgement, which might not be always accurate.

Furthermore, interviewee A mentioned that the creditworthiness investigation should pay attention on who is the contractual byer, end customer or EPC contractor. This is because they might have different financial situations. Therefore, it is important to include both companies in the investigation.

Risk assessment should not be treated as a one-time task but as a continuous process throughout the entire project lifecycle. When project is evolving, so will be the associated risks. Some of them may decrease over time, while others can escalate. It is inevitable for proposal departments to constantly evaluate them. The focus of risk mitigation needs to shift accordingly depending on the stage of the project. This will allow Wärtsilä to stay proactive rather than reactive.

In conclusion, the findings section clarified the important role of cash flow management and inventory control. Committed inventory was found to be in key position determining the success of sales proposals. Automating the advanced tool in Excel that includes both cash flow and inventory commitments can significantly improve the process of offer preparation. Additionally, proactive risk assessment with the help of structured financial simulations was found to be useful in guiding sales projects without payment guarantees. Together, these implications can enable Wärtsilä to make informed decisions under the tight timeline and maintain control over financial exposure throughout the whole sales process.

5 Conclusions

This case study was about how cash flow management and inventory control affect financial risk management during the sales phase of EPP projects in Wärtsilä Finland Oy. Using inductive research approach included semi-structured interviews with professionals that are involved in the proposal process. Moreover, comparing the observations from the interviews with the recent Project X verified the relevance of advanced tool

The research found that comparing cash flows with committed inventory has become essential step during internal approvals of proposals. It is also linked to the overall success of sales projects without payment guarantees and therefore affects the profitability of the company. Financial risk exposure should be treated according to its continuous evolvement. Extra attention needs to be paid when ordering expensive and long lead time components; payments from the customer should cover these commitments to mitigate risks. However, it is not always possible to avoid all the risks, but it is management who makes the final decision. Proposal department's job is to prepare different case scenarios to support them in making the decision. Making sure that payment milestones are aligned with procurement schedules is necessary to reduce the risk of getting left with the expensive inventory that cannot be used in different projects. Moreover, it helps to maintain enough liquidity for the healthy operations of the business. The findings also highlighted that visualization of the cash flow and committed inventory comparison is beneficial for decision makers during internal reviews.

Wärtsilä's current cash flow tool in CRM was found to be limited on a functionality level. Therefore, more realistic scenarios are prepared manually. Combining and automating the CRM tool with the manual could improve the efficiency during proposal process, especially during contract negotiations. This would not only reduce the time spent on repetitive data entry but also minimize the risk of human error. Continuous risk assessment in a form of identification and mitigation must be treated as ongoing process during the whole sales phase because contractual agreements cannot be changed after a project is signed for the execution. With the help of advanced tool, the systematic approach can

be achieved. As soon as something changes it can be immediately modified to show the accurate picture, allowing to mitigate the risks in a proactive manner. In conclusion, this study showed that improving financial visibility could have a positive effect on how Wärtsilä manages risky projects. This way, the company stays financially strong even when handling challenging sales cases.

5.1 Further research

This research revealed several areas that can be explored on a more detail level. Developing the design and integration of a more advanced cash flow and inventory commitment tool in the Wärtsilä's internal CRM software can be the topic of the next research. Also, a study that compares different automation solutions to their cost effectiveness could be the topic. Additionally, evaluation of customer's creditworthiness was discussed in the interviews. Further research could investigate how current assessment methods can be improved with predictive analytics. Using previous projects' data to identify early warning signals related to customer reliability and risk exposure. Finally, as payment guarantees has become less common because of their costs, future study could investigate the effects of this trend.

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Appendices

Appendix 1. Interview Questions

Q1: General Questions

1. Can you briefly describe your role in the sales process?
2. Have you been involved in the evaluation of risks related to sales projects without payment guarantees?

Q2: Cash Flow Management

3. How important do you find cash flow during EPP sales process?
4. How do cash flow considerations affect the structuring of offers?
5. What are the main challenges in forecasting cash flows for EPP projects?
6. How is the risk of possible negative cash flow identified and evaluated?
7. What tools are used for the estimation of cash flow, and how essential do you find them?

Q3: Inventory Control: Committed Inventory

8. How does the risk of committed inventory impact cash flow planning?
9. What strategies are used to minimize risks of the committed inventory?
10. How does the lead time of key components, such as engines and generators, affect decision-making?

Q4: Financial Risk Management

11. What are the most significant financial risks in the EPP proposal process, and how are they mitigated?
12. Are there any specific risk mitigation techniques or risk assessment tools?
13. In your opinion, how can they be improved?