TALLINN UNIVERSITY OF TECHNOLOGY
SCHOOL OF ENGINEERING
Department of Mechanical and Industrial Engineering

DEVELOPMENT OF THE STRATEGIC MANAGEMENT FRAMEWORK FOR FINEST STEEL AS

STRATEEGILISE JUHTIMISE RAAMISTIKU VÄLJATÖÖTAMINE FINEST STEEL AS NÄITEL

MASTER THESIS

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Tallinn 2021

AUTHOR'S DECLARATION

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No academic degree has been applied for based on this material. All works, major viewpoints and data of the other authors used in this thesis have been referenced.

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Department of Mechanical and Industrial Engineering

THESIS TASK

Student: Sander Laide, 192572 MARM

Study programme, main speciality: MARM06/18, Industrial Engineering and Management

Supervisor: Visiting Lecturer, Eduard Ševtšenko

Thesis topic:

(in English) Development of the strategic management framework for Finest Steel AS

(in Estonian) Strateegilise juhtimise raamistiku väljatöötamine Finest Steel AS näitel

Thesis main objectives:

1. Identify the company Finest Steel AS
2. Conduct a strategic audit for Finest Steel AS
3. Develop and present digital twin for Finest Steel AS

Thesis tasks and time schedule:

No	Task description	Deadline
1.	Overview of the company	14.03.21
2.	Strategic audit	28.03.21
3.	Developing implementation framework	25.04.21
4.	Financial prognosis. Conclusion.	09.05.21

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PREFACE

In these turbulent times, every successful company needs a strategy. A strategy that would ensure the company's survival and long-term sustainability.
This thesis was initiated by the Supervisory Board of Finest Steel AS and Sander Laide, who is a member of the Management Board of Finest Steel AS. Finest Steel AS needs for the next period a solid strategy, a plan for its implementation and monitoring.

Finest Steel AS offers metal work outsourcing services. Company`s primary focus is in sheet metal cutting technologies.

The author would like to thank co-workers from Finest Steel AS for the help and advice received in compiling this thesis.

Keywords: strategy, business process, digital twin, key performance indicators, master thesis

List of abbreviations and symbols

BPM – Business process management

CAD – Computer aided design

CAM - Computer aided manufacturing

CNC - Computer Numerical Control

EFAS - External factor analysis summary

EPC - Event Process Component

ERP - Enterprise resource planning

IFAS – Internal factor analysis summary

KPI - Key performance indicator

PMS – Production monitoring system

MTO – Make to order

SFAS - Strategic factors analysis summary

SWOT - Strength Weakness Opportunities Threats

VAC - Value-added chain

WIP – Work in progress

INTRODUCTION

The critical state of the world economy, the devastating pandemic, the changing society, these factors are causing concern and uncertainty for both people and companies. What an exemplary company should do in a situation where there was no employment for employees yesterday, there is more work today than can be done and there is a great deal of uncertainty about tomorrow. The author tries to find an answer to this question in this Master's thesis.

An exemplary company needs a great strategy. The company's strategy forms a comprehensive master plan that tells how the company will achieve its mission and goals. Continuous improvement is one of the key factors in helping to stay competitive in the industrialized world. In order to stay on top of the competition, the company must evaluate its strategies from time to time. Great organizations in strategic management, are usually successful organizations. In order to find the best possible strategy, the author of this work performs the strategic audit of the company Finest Steel AS and develops the framework necessary for the implementation of the strategy. This framework can later be used to implement subsequent strategies. The aim of the work is to find the best possible strategy for the sustainability of the company and to create a framework for the implementation of this and subsequent strategies.

Finest Steel AS offers metal work outsourcing services based on modern production technologies. The company specializes more narrowly in metal cutting work. The strongest aspects of the company are the laser cutting service for sheet and pipe materials. Gas cutting and bending of sheet material is also performed. Mild steel, stainless steel as well as aluminum are processed [1].

The first chapter of the work focuses on the company. An overview of the services offered by the company is made, the main customers of the company are identified. The company's manufacturing structure, business processes and current performance are examined in more detail. All this is necessary to be able to successfully formulate the strategy in the following chapters. In addition, it helps similar companies to identify and, if possible, use the same strategic management framework.

In the second chapter, the strategic audit of Finest Steel AS is performed. A strategic audit provides a comprehensive analysis of the organization by presenting targeted thematic control questions with the aim of developing strategy and improving organizational performance. The current strategic situation of the company is reviewed,

the factors of the external environment and the internal environment of the company are reviewed in detail. The factors covered are thoroughly analyzed and a recommended strategy formulated.

The most important thing about the strategy is its implementation. The third chapter defines the framework needed for the operational implementation, monitoring and improvement of strategies. A multi-level digital twin will be created to ensure transparency of the company's goals and operating processes for all parties involved.

Finally, all the information presented in the work gives the author the opportunity to prepare a financial prognosis for 2023. From this it is possible to conclude whether it is worth dealing with such a complex thing as managing the strategy.

1. OVERVIEW AND IDENTITY OF FINEST STEEL AS

Defining an organization's identity has become more important over time. Its main factors are growing competition, the accelerating invasion of new technologies and the increasing intrusion of external factors into the company. It is very important that the company's employees, customers and suppliers know exactly what kind of organization they are dealing with. This is essential to stay competitive in an accelerating and changing world. Here the overview and identity of the company Finest Steel AS is discovered.

The company was founded in 2001. Production plant and the main office is located in Saue, which is a fast-developing industrial area. Finest Steel AS has over 5000 m² production area and processes approximately 8000 tons of metal per year. The company offers metal work services an outsourced basis based on latest production technologies. The primary focus is in metal cutting technologies. Laser cutting of sheet and pipe material is the main service. The company also undertakes plasma cutting, gas cutting and sheet bending. Materials processed are mild steel, stainless steel, aluminum, copper and brass. The Company is 100% dedicated to selling its services and do not have own product. Finest Steel AS has developed a quality management system that complies with the requirements of the international standard ISO 9001: 2015 and ISO EN 1090 [1].

1.1. Services

The services offered in Finest Steel AS form the core processes of the company. Finest Steel AS makes sheet metal parts and billets from specifications and drawings provided by the customer with sheet and tube cutting machines. Materials vary from mild steel, galvanized or hot-dip galvanized steel, stainless steel, abrasion resistant steel, aluminum, brass and copper. Allowable material thicknesses are 0.5 mm up to 100 mm. For tube lasers tube diameter varies form 10 mm up to 260 mm. The cutting technologies and machines used allow for very economical use of the material and high production flexibility. In addition to cutting services, the company also offers bending and grinding of details. If the company's customers need painting, milling, turning, welding, assembly etc. in addition to the above, then the company has a network of suppliers to offer it.

1.1.1. Laser cutting

Laser is made from the words Light Amplification by Stimulated Emission of Radiation. Lasers have been a known for efficiency and quality in materials processing since their advent in the sixties. Laser cutting is a thermal process in which a focused beam is used to melt material in a small point. A gas jet is used to eject the molten material and create a kerf. A continuous cut is produced by moving the laser beam under Computer numerical control (CNC) [2].

Finest Steel AS uses laser fusion cutting and laser flame cutting technology:

- In fusion cutting, an inert gas nitrogen is used to expel molten material out of the kerf. Nitrogen gas does not exothermically react with the molten material and thus does not contribute to the energy input. Fusion cutting usually offers greater cutting speeds but needs higher power output from laser source. Fusion cutting is mainly used when cutting with the company's latest fiber lasers [3].

- In flame cutting, oxygen is used as the assist gas. In addition to exerting laser force on the molten material, this creates an exothermic reaction which increases the energy input to the material. This type of cutting is used when cutting thicker materials or using older machine [3].

The accuracy tolerance for positioning is +/- 0.05 mm. Latest laser machines in the company have outstanding cutting speed and two of them are equipped with an automatic material loading and unloading system. This gives the productivity levels comparable to sheet metal punching and nibbling. When cutting with a laser, the thermal effect to the material is reduced and therefore it is possible to cut a small hole (minimum diameter =~1/4 material thickness), as well as holes that can be threaded after cutting without additional machining required. The width of the cut line is minimal – it is smaller than 0.5 mm for most materials. Thickness of the material can range from 0.5 mm to 30 mm [4].

The laser machine park is enviably new in the company, the oldest sheet laser dates from 2013 and the newest from 2020. The company's fleet includes four sheet lasers, the exact description of which is given in Table 1.1. These machines account for about 55% of the company's total output today. Figure 1.1 shows the bench that has recently arrived at the company, which is currently the absolute pinnacle of technology. There is very little competition for this machine in the Baltic and Nordic countries.

Table 1.1 Laser cutting benches available for sheet cutting [1]

Sheet laser bench	ByStar Fiber 6225	Trumpf 3050 Fiber	ByStar Fiber 3015	Trumpf TruLaser 8000
Production year	2020	2018	2016	2013
Laser power	12000 W	8000 W	6000 W	6000 W
Table measurements	2600 mm x 6250 mm	1500 mm x 3000 mm	1500 mm x 3000 mm	2500 mm x 8000 mm
Curb rate (in between movements)	Up to 300 m/min	Up to 300 m/min	Up to 300 m/min	Up to 260 m/min
Cutting speed	Up to 80 m/min	Up to 65 m/min	Up to 58 m/min	Up to 40 m/min
Loading system	Manual	Automatic	Automatic	Manual

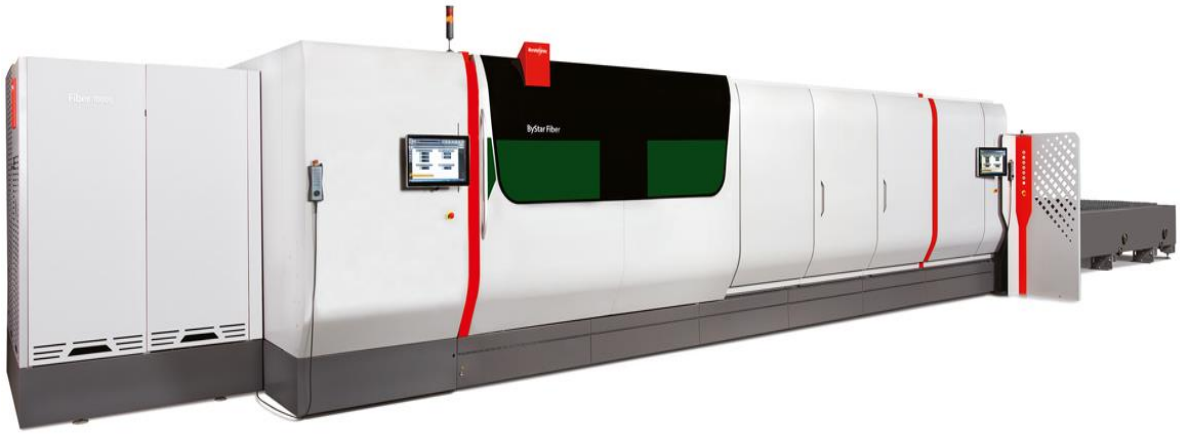


Figure 1.1 ByStar Fiber 6225 12kw [5]

1.1.2. Tube material laser cutting

Technologically tube lasers cut like sheet lasers. Laser tube cutting machines enable the cutting of materials of different tubular profiles, from either mild steel, stainless steel or aluminum. Tubes can be round, square, oval, rectangular cross-section or angle bars. Tubular profile does not play a major role here as long as the tube's diameter or diagonal measurement is within the cutting bench parameters. The tube's exterior diameter or diagonal should be between 10 mm and 260 mm for our cutting benches. The advantages of laser tube cutting compared to mechanical processes, such as sawing, drilling or milling, is a greater productivity and production flexibility. Details which would have demanded various separate work operations and a high number of working hours when produced with traditional methods and equipment, are cut with a laser in just one, quick operation. The details are always with high precision and all pieces of a batch are identical [1].

Today, the company has two tube lasers, which were the pinnacle of the Germans ten years ago. The specifications of these machines are given in the Table 1.2. In July 2021, a completely new tube laser from Italy arrives at the company, which will increase production capacity to a new level. Today these machines account for about 30% of the company's total output.

Table 1.2 Available laser cutting benches for tubes and profiles [1]

Laser tube cutting bench	**TruLaser Tube 7000** **TruFlow 3600 laser**	**TruLaser Tube 7000** **TruFlow 2000 laser**
Production year	2010	2009
Laser power	3600 W	2000 W
The maximum length of the raw material	Up to 6500 mm	Up to 6500 mm
Minimal residual material (for fixing it to the cartridge)	120 mm	120 mm
Minimal diameter or diagonal of the raw material	15 mm	10 mm
Maximum diameter or diagonal for the raw material	260 mm	200 mm

Laser tube cutting bench	TruLaser Tube 7000 TruFlow 3600 laser	TruLaser Tube 7000 TruFlow 2000 laser
Maximum tube weight	37 kg/m	37 kg/m
Loading system	automatic	automatic
		

1.1.3. Plasma and flame cutting

The plasma and flame cutting are the first thermal cutting technologies and also one of the most common technologies for metal cutting. The primary advantage of those technologies is the high cutting speed with thick materials, especially when cutting parts without small holes.

Materials range from 3 mm up to 40 mm for Esab Suprarex SHD 4000 plasma cutting machine and up to 100 mm for Esab flame cutting machine. Since plasma cutting bench has a bevel cutting head, it enables to cut details with one or two-sided welding chamfers. The cutting head is programmable in 3 dimensions so cutting welding chamfers can be done simultaneously while cutting the part. Therefore, it does not matter whether the chamfers are on a straight line or on a curve, on an exterior or on an interior contour. Plasma is usually used to cut large scale parts from mild and stainless steel. Plasma cutting bench also allows for the marking of parts.

The primary advantage of flame cutting, compared to other thermal cutting technologies, is the low cost of production. Thanks to four cutting heads machine enables to cut four parts simultaneously. Similarly, to plasma cutting, flame cutting technology is not suitable for cutting small details [1]. These machines account for about 15% of the company's total output.

1.1.4. Additional services

In order to add even more value to the cut parts, the company offers various other treatments for the cut parts. For this purpose, the company has two Bystronic bending brake presses. They can be used to shape the geometries required for details cut from sheet materials. The benches have a compression force of 150 tons and 320 tons and allow to bend parts up to 4.2 meters. In addition to bending, grinding, threading and rolling of parts are also offered. If the above is not enough for the customers, then the company is ready to organize and offer complete solutions by purchasing outsourcing. The most common purchased services are turning, milling, painting, welding, etc.

1.2. Customers

Old English proverb says: *"Tell me who you go with and I'll tell you who you are."* This statement is equally true in business. As a service providing company, customers have certain expectations for the company. Therefore, by mapping the company's main customers, it also gives understanding about the company's profile.

Finest Steel AS main customers are generator factories, tractor and agricultural machinery factories, ship factories, furnace factories, door and window factories, electronics industry, construction companies, etc. They all need sheet metal to assemble their products.

The company currently has about 500 active customers. Serving from the largest industrial companies in the region to private customers. The share of direct exports is 20% on average. For the end user 90% of the company's production ends up being exported by local customers.

The company's customers differ in terms of production capacity and requirements. There are customers who buy individual parts, customers who buy project-based products,

customers who buy series products and also some customers order mass production parts.

Some customers are very demanding, thanks to such customers, the company is also in constant development. The main requirements of customers are timely delivery and high-quality production. Many large customers also have separate packaging and transportation requirements. Larger customers also conduct periodic audits of the company to make sure that the company is able to meet the set requirements. These clients provide action plans on how the goals could be achieved. It has become the standard that customers demand the existence of the quality management system ISO 9001 and soon also the environmental management system 14001. Finest Steel AS wants to achieve results that serve both parties.

1.3. Work structure discovery

When presenting to customers, Finest Steel AS calls itself a job shop. A job shop is a type of production process in which small batches of parts are made from various customer orders. In the process flows of workstations, the products produced need a unique setup and sequencing of process steps. Job shops are usually companies that make parts for other companies [6]. Job Shop like features of Finest Steel AS are as follows:

- Layout, similar equipment is grouped together, for example, all tube lasers are in one area and sheet lasers in another area. The layout is designed to minimize material handling, costs, and labor when processing inventory. A CNC machines are used to give workplaces the flexibility to change the settings of different machines very quickly.

- Routing, when an order arrives at the workplace, the working part moves in different areas according to the sequence of operations. Not all machines in the factory are used to produce same part.

- Employees, the staff is made out highly skilled craftsmen who can operate several different classes of machines. These workers are paid a higher salary for their skill level. Due to the high level of skills, the employees of Finest Steel AS need less supervision.

- Information is the most critical aspect. The information is needed to quote the price, route the order through the production and specify the exact operations. All the information needed is managed in Enterprise resource planning (ERP) system.

- Planning, the work is characterized by its route, processing requirements and priority. Material selection is a key issue when deciding how and when to plan a schedule. Work must not be completed on the basis of their arrival pattern in order to minimize costly material waste.

- Workload is difficult to measure and depends on batch size, job complexity, mix of jobs already planned, ability to plan work well, number and condition of machines, quantity and quality of labor, and any process improvements.

1.3.1. Process discovery

Finest Steel AS process structure is shown in Figure 1.2. The company's management processes are handled strategically by the supervisory board and operatively by the management board:

- The Supervisory Board of Finest Steel AS has five members – four are outsiders. Chairman of the Supervisory Board also serves as managing director. Other members have different type of industrial or engineering backgrounds. The stock of Finest Steel AS is privately held by The Supervisory Board. Most of The Supervisory Board has been serving over ten years. The Supervisory Board meets once a quarter, where the Management Board presents the previous month's financial indicators, highlights more critical events and publishes future plans. The Supervisory Board advises on key activities and plans. The Supervisory Board elects the Management Board in every 5 years.

- The Management Board of Finest Steel AS consists of two members. One works as a sales manager and the other as a production manager. Both are highly experienced in the sector and have a combined experience of 30 years in the company. The production manager has a higher education in mechanical engineering and is currently studying for a master's degree. The Management Board is very clearly aware of the company's strategic goals and participates in their development. The Management Board strives on a daily basis for the further development of the company. Both managers have enough skills and knowledge to manage a company through ups and downs.

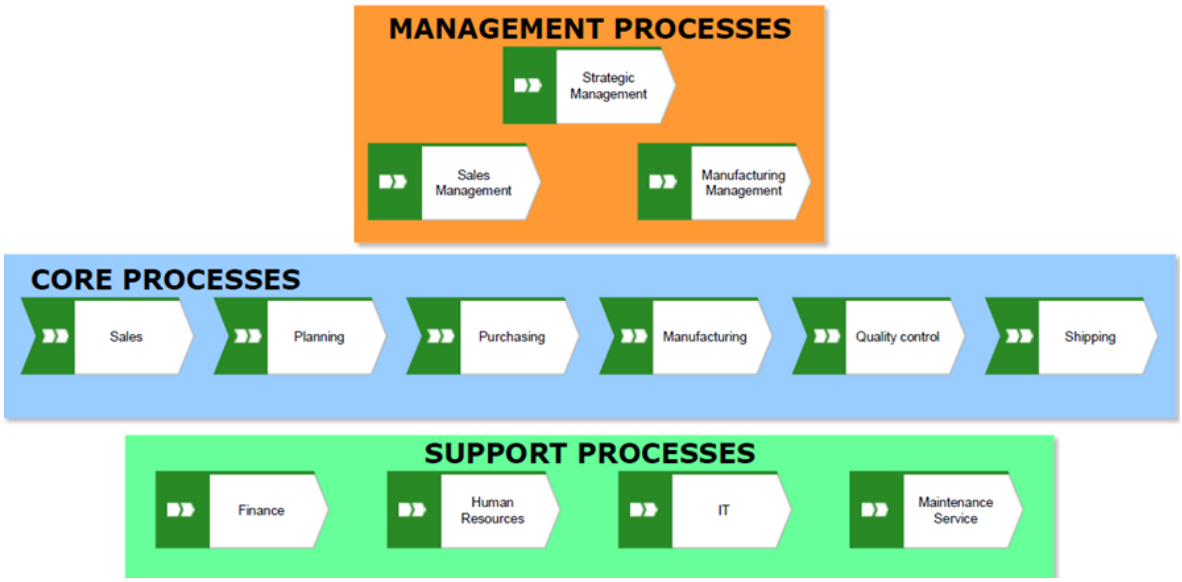


Figure 1.2 Finest Steel AS process structure

The quotation (sales) process is typically a response to a request from a customer. The quotation is made by the sales manager or the sales representative. The quotation is usually preceded by a query from the customer, on the basis of which the price calculation of the materials is made. The cost of technological preparation and processing is added to the cost estimate of the materials. The prepared quotation is sent to the client. After receiving a positive response from the customer to the quotation, the order is then confirmed, which also serves as the basis for order fulfillment.

The manufacturing process is the core process of Finest Steel AS. It covers all stages of the manufacturing process, from production planning, production to packaging and expulsion. Production activities are managed by the Production Manager. The manufacturing process is the process by which the planned products are manufactured in accordance with the applicable documentation. The manufacturing activity, which involves the gradual modification of the parameters of the article being manufactured and which results in the production of a quality product, is the responsibility of the workers carrying out the relevant work operations. The main task of the Technologist is to develop production technology that ensures quality and efficiency of production and to draw up appropriate management programs and to give the necessary advice to the workers. Inputs to the production process are:

- Order list sales Monitor in ERP. Planning takes into account available resources (equipment, workplaces, workload);

- Designer's documentation - working drawings / sketches (client-side or internally developed);
- Technological processes for the production of developed products - management programs.
- Product cutting schemes (layout), which enable the sustainable use of materials and the implementation of optimal cutting schemes.

The purchasing process is triggered by the need to purchase raw material. The need for the purchase is prepared by the production technologists, but the purchase is made in the sales department.

The material handling and warehouse logistics process is closely linked to the purchasing process. The input of the warehouse logistics process is the quantity of goods received and the output is the delivery of materials to production. The purchase documents for the materials are sent to the accounts. The key to storing materials is ensuring that they are properly stored. In particular, corrosion, deformation or other physical or chemical damage to the materials shall be avoided.

Production process control covers all stages of production activities, from production planning, technical preparation to packaging and delivery of products. On-time completion of production is monitored by both the sales manager and the production manager in ERP.

1.3.2. Production technique

The production of Finest Steel AS is triggered on Make to Order (MTO), each order is treated as a separate project. Orders are placed after a quotation is made, where sales ask the customer's engineers for input (typically a drawing) to provide the best solution for the company and the customer.

Make to Order (MTO) is a manufacturing technique in which a company begins to produce a part only after the customer has ordered it. In this case, the parts are manufactured according to the customer's specifications. This is also called a supply chain pull strategy. A pull strategy is a strategy in which the whole process of production, assembly and marketing of any good is based on the actual demand of consumers. The process of manufacturing parts only begins when the order has been received from the customer and is produced exactly as the ordered quantity. Unlike Make to Stock, the

purpose of the MTO does not require companies to maintain stocks of finished products. Therefore, there is no risk of wasting stocks. Main advantages and disadvantages of MTO are following [7]:

Advantages of MTO production

- The WHO eliminates companies' reliance on consumer demand forecasts, which can sometimes be inaccurate and misleading. Instead, the focus is on real demand and the risk of obsolete parts is ruled out.

- Reduces waste, if parts are not sold, not only the materials used to make them are wasted, but also the money and labor spent on producing them. Because MTOs produce parts after receiving a customer order and in a specified quantity, waste and loss are minimized.

- Less inefficiency, if many different goods are produced on a large scale, there is a risk of inefficiency because workers and machines have to follow different rules. MTO is committed to manufacturing the product to customer specifications so that workers and machines tend to be more efficient.

- Larger variety, as only custom parts are produced and sold, MTO offers a wider range of products. In fact, it offers customers the product exactly the way they want it.

Disadvantages of MTO production

- Irregular sales, it is difficult to determine when demand for a certain product may arise. This can be periods of high sales and months of low sales.

- Longer delivery time, as production starts after receiving the order, the product will reach the customer after a while.

- Availability of raw materials, uncertainty in demand makes it necessary to maintain sufficient stocks of materials so that production can begin immediately upon receipt of the order. If the raw materials are not available, it will take more time to procure them and deliver the wanted parts to the customer.

1.4. Current performance

Understanding the current situation is the basis for all subsequent activities. In order to fully understand the current situation of the company, it is necessary to look at the situation from 2017 onwards. The company's turnover figures are declining since 2017 which was the best year for the company it is shown in Figure 1.3.

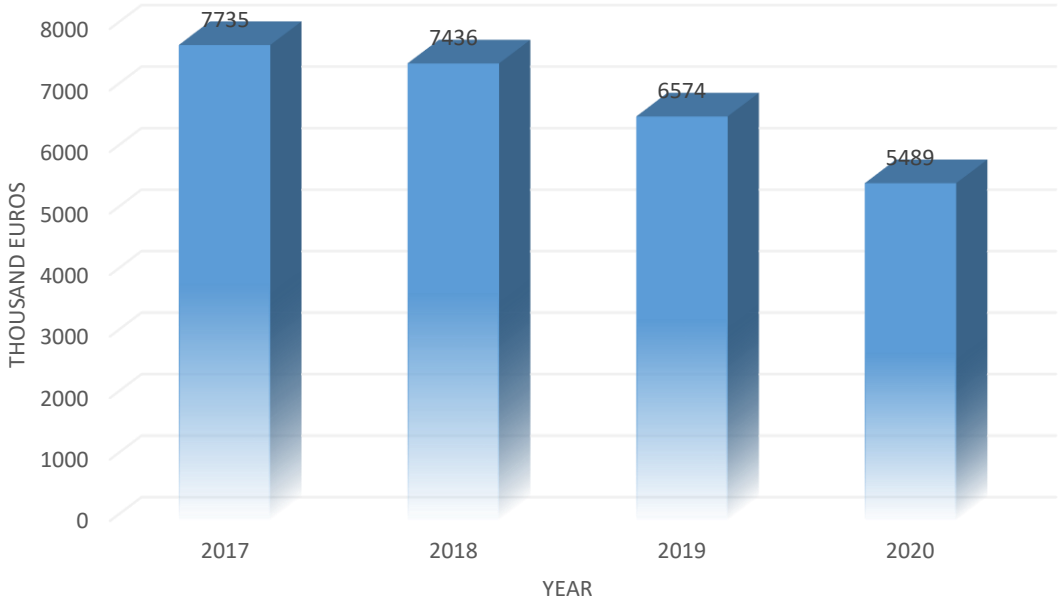


Figure 1.3 Finest Steel AS turnover from 2017-2020 [8][9][10][11]

2017 was a successful year for the company. As the economic situation was good Finest Steel AS significantly increased turnover and slightly profitability. In 2017 the company invested ~ 38,000 € in fixed assets. The management developed internal procedures and made preparations to procure IT solutions for production planning [8].

Growth based on increasing market masked flaws in a company, flaws that would be immediately evident in a stable or declining market. A growing flow of revenue created a large amount of unused resources. Growth also provided a big cushion for correcting those strategic mistakes during next years.

2018 was also a successful year for the company. In the second half of 2018 Finest Steel AS switched to the new resource planning software Monitor ERP. The transition period had a short-term setback in terms of sales, but creates preconditions for further

growth. The company further developed in-house procedures to satisfy customers. Investments to fixed assets were 902,637 euros [9].

2019 was a year of smaller and larger changes for the company. In the middle of the year, the market turned into decline. Finest Steel AS thoroughly changed the production layout, optimized the production processes, developed software solutions, continued to modernize the equipment and prepared investments in new technologies. In 2019 there were no major investments into fixed assets [10].

The company started to pursue retrenchment strategy to strengthen the competitive position in Estonian market. That strategy imposed a great deal of pressure to improve performance. In an attempt to eliminate the weaknesses that are dragging the company down, the management made the company thinner and got rid of employees whose contribution to the company's efficiency was below average. Tracking systems were introduced to monitor the use of the company's resources.

In 2020 the company continued to modernize equipment and prepared for investments in new technologies by 2021. The recession caused by the global Covid-19 pandemic left its mark on the turnover figure. Sales fell in the spring and began recover in the fall of autumn. In 2020 Finest Steel AS invested 895,303 euros in fixed assets [11]. In 2020, the company served 466 customers, registered 24,802 production orders, producing a total of 184,1359 parts.

Retrenchment strategy was continued during the first half of 2020. From late summer 2020 the management started to develop growth strategies to expand the company’s activities. Mainly in mind was to achieve horizontal growth by expanding its sales into nearby countries and increase the range of products and services offered to current market. All prerequisites for this have been created in the form of a well-functioning ERP system and well-refined production processes. Investment in the latest production equipment from the world's leading manufacturers will continue through 2021 and 2022.

The company is currently in a growth phase and is hiring more people, current number of employees is 43. Considering the above-mentioned indicators when determining the size of Finest Steel AS, it is a medium-sized company. Main financial ratios are shown in table 1.3.

Table 1.3 Main financial ratios of Finest Steel AS [8][9][10][11]

	2017	2018	2019	2020
Sales revenue (thousand euros)	7735	7436	6574	5489
Turnover growth	44%	-4%	-12%	-17%
Gross profit margin%	12%	10%	9%	11%
Net profit (thousand euros)	421	375	107	149
Profit growth	91%	-11%	-71%	40%
Net profitability	5%	5%	2%	3%
Current liabilities coverage ratio	1.29	1.24	1,57	1,28

2. STRATEGIC AUDIT

In hindsight, everything that wants to last over time, be it a state or a corporate empire, have one thing in common: a vision, a plan, a strategy, a way to project itself to grow, expand, and eventually flourish. Today, where globalism is so prevalent, every strategic and financial decision has a primary impact on the future of any business. Both political, economic, social and ecological factors must be taken into account. These strategies, which have been refined over time and through experimentation, allow us to understand and make decisions that are now designed for reactions that benefit everyone.

The dream of the owners of Finest Steel AS has always been to grow and modernize the company to compete with the best in the market. To make this dream a reality, the management needs an excellent strategy for today's situation. This strategy must come in a way that takes advantage of all the company's strengths and corrects the weaknesses. The purpose of a strategic audit is to highlight this. To reach goals author uses Strategic Audit of a Corporation framework and methods [12, p.34]. The framework is illustrated in Figure 2.1.

Figure 2.1 Strategic management framework system [13]

2.1. Strategic posture

To provide an accurate analysis of a company, it is important to understand its philosophy, nature, and vision. The strategic posture is divided into four parts, which allow to understand and analyze both the existing strategic and philosophical situation. Strategic positioning is essential for proper analysis in order to provide sufficient information to implement the most intelligent strategy.

Formulating a strategic position is part of a broader strategic planning process as managers work together to develop a company's vision, goals and strategies for the foreseeable future. By acknowledging the nature of the strategic position, it is possible to take control of the success of the strategy.

Finest Steel AS has clearly stated its mission and policies on its website. Strategies to get there and objectives are continuously reminded to workers. The company's guiding principles are listed on all information boards in production.

Mission

The company's mission is to provide the most efficient laser cutting service in Estonia through investments to production equipment and employee training. Finest Steel AS wishes to establish and maintain a good and long-term relationship with its customers and partners, which will ensure maximum benefit for all interested parties [4].
This mission has accompanied the company since its inception. As the company sells the service, it is always emphasized to the customers that the company's interest is to grow into a great supplier.

Objectives

At present, the company's objectives are primarily to dominate the local market and increase the export. It is important to increase production efficiency by introducing new, more energy-efficient equipment. The company's objective is to ensure efficient and resource-efficient production, maintaining production growth and product quality. The company expects to reach a turnover of € 12 million by 2023 (of which exports € 2 million).

Strategies

To achieve these ambitious goals, the company needs to be ahead of competitors. Commitment to quality, continuous innovation is the company's goal to exceed

expectations. Challenging goals are achieved by involving the talent and passion of the company's people.

Finest Steel AS has focused its strategy on the most efficient production possible. The company has invested and continues to invest for increasing efficiency in various production segments. By optimizing production, it is desired to eliminate bottlenecks in order to increase productivity and minimize resource consumption. This helps to assure high quality for low price point.

Policies

The main policy of Finest Steel AS is to be flexible and maximally customer-oriented, to meet deadlines, to offer quality products and to maintain an optimal quality-price ratio. For that a good communication with the suppliers and the shareholders is indispensable. Emphasis must be placed on effective business management and effective monitoring of performance indicators. The company has no own product, only services are offered.

2.2. External environment

By conducting an external analysis, the company identifies critical threats and opportunities in its competitive environment. It also examines how competition in the environment is likely to develop and the consequences of change for threats and opportunities.

As Estonian processing industry matures it becomes more competitive, there are rapid changes in the external environment. To stay in top of competition information from external environment adds crucial details to the effectiveness of long-term. As environment is dynamic, it is essential to scan surrounding environment regularly to assess its developments and understand factors that can contribute to success.

Managers need to be aware of all the factors that can affect their organization and be able to respond to them. Navigating in modern chaotic work environments is like flying a drone during a thunderstorm. Just like this little drone, modern organizations and their leaders face a significant number of factors that require an immediate response. The forces driving this change in business are known as external environmental factors [14].

Ta analyze external and internal factors author decides to use Strength Weakness Opportunities Threats (SWOT) matrix. SWOT analysis is a tool for strategic planning and strategic management. It can be used effectively to create different strategies. SWOT analysis has two dimensions: internal and external. The internal dimension includes organizational factors as well as strengths and weaknesses, the external dimension includes environmental factors as well as opportunities and threats [15].

2.2.1. Natural environment

The environment has a huge impact on all companies, because the company must operate according to the rules of nature. Companies operating in Estonia have been lucky that there are no major hurricanes and earthquakes in the region. The operation of Finest Steel AS is most affected by winter. As the company stores a lot of raw materials outdoors, it is necessary to dig them out in case of snowfall, which takes a lot of working hours. The company is also affected by the increasingly stringent environmental laws that the company has to comply with, but there is often more bureaucracy than good for the nature. Air pollution, packaging circulation, etc. must be monitored. As the environment is extremely important for people and thus for the sustainability of the company, the company must always try to save the environment.

2.2.2. Societal Environment

The world is currently experiencing a corona crisis. All people and industries have been affected to a greater or lesser extent by this crisis. The number of possible strategic factors in the societal environment is enormous. Author subcategorizes them into four categories where there are opportunities (O) and threats (T):

- Trends in the economic part of the societal environment can have an obvious impact on companies activity.
  (O) A turbulent economy provides an opportunity to win competitors customers by offering them better credit terms. Some of the devastated companies do not have the immediate money to pay for the materials, but they do receive it when the work is done and the customer pays the bill.
  (O) As the unemployment rate increases, more people will enter the labor market. If before the crisis it was very difficult to find good employees and keep the existing ones, then now is the opportunity to improve the company's staff.

(O) Price pressure may increase the share of the Nordic market. Rising material prices may shift more production to cheaper Baltic countries

(O) Use of good credit terms. Banks are currently offering loans with very good interest margins, but care must be taken, as it is not known when interest rates will be raised again.

(T) Supply chains may stop working properly. Due to the severe shortage of materials in the market, situations may arise where orders can no longer be made because the material does not exist. Also, customers may no longer be willing to buy parts at a higher price.

(T) Many customers may run into payment difficulties and fail to pay their bills on time. If the number of unpaid invoices becomes very large, there may be a shortage of working capital.

(T) Prolonged money printing and state aid can overheat the economy. If prices start to rise too fast in the stock markets and in real estate, then the cannibalization of production capital may take place.

- Changes in the technological part of the societal environment can predict the future of industries.

  (O) Accelerating digital development. Industry 4.0 and other digital solutions allow to develop and use lean and agile manufacturing control systems. Those IT solutions allow companies to continuously acquire data from the shop floor. This allows for a very prompt response to various changes and problems.

  (O) The technological possibilities of teleworking are being developed vigorously. As people can work flexibly at home, it is also possible to make the company's operating times more flexible. For example, in case of problems in the evening, an operative approach is possible.

  (T) Artificial intelligence-based applications. Highly investor-driven applications that provide a cutting service can disrupt the market. With the support of investors, such companies can offer services below production cost.

- The political–legal part of the societal environment can have a significant impact not only on the level of competition within the market but also on which strategies might be successful.

  (O) The European Union supports business investment through recovery packages. The European Regional Development Fund supports investments to make production equipment more resource efficient. There are certainly many support packages for the green revolution.

(O) The Estonian state supports its exporting companies through Kredex and Enterprise Estonia. Various incentive measures have been set up to support exports, such as sales promotions and various insurance policies to mitigate export risks.

(T) The government may close production if the viral situation changes. In the practice of many southern European countries, there are situations where all life is stopped.

(T) The government makes populist decisions that harm businesses. The government can create severe labor shortages and cost increases if too many infrastructure projects, such as road construction and building construction, are put to work at one time.

- Sociocultural environment reflects demographic trends

  (O) Due to the crisis, people's wage demands have fallen. This increases the company's competitiveness. This option may be temporary.

  (O) The general hygiene of people has improved, so there are fewer employees on the sick leave. Compared to the time before covid, the number of sick leaves has decreased by 90%. People no longer carry the disease to work, it used to be common for someone to go to work with a runny nose.

  (T) Growing well-being reduces people's willingness to work in dirty conditions. Metal production is inevitably dirty and harder work, and people's willingness to do so is declining due to potential health risks.

  (T) Change in employee preferences. People no longer want to focus on one long career. Many variations and flexible forms of work are desired, but it is difficult to train professionals that way.

2.2.3. External factor analysis summary

The summary of the external factor analysis (EFAS) highlights the most relevant opportunities and threats of Finest Steel AS. No company can successfully monitor all external factors. Choices must be made regarding which factors are important and which are not. Table 2.1 analyzes the six most important opportunities and the six most significant threats mentioned previously.

The first column gives the name of the external factor, first outlining the opportunities and then the threats. The weight indicates the importance of the factor and the rating score corresponds to the effect of this factor. (0 means low impact and 5 very high impact). The weighted result corresponds to the weight and effect coefficient.

Table 2.1 EFAS matrix for laser cutting industry

External Factors	Weight	Rating	Weighted Score
Opportunities			
Accelerated digital development	0.15	4	0.60
The European Union supports business investments	0.10	4	0.40
Price pressure in the Nordic market	0.10	3	0.30
Increasing unemployment rate	0.10	2	0.20
The Estonian state supports exporting companies	0.05	2	0.10
The technological possibilities of teleworking	0.05	2	0.10
Threats			
Supply chains may stop working	0.15	5	0.75
Customers run into payment difficulties	0.10	3	0.30
Artificial intelligence-based applications	0.05	4	0.20
The government makes populist decisions	0.05	4	0.20
Prolonged money printing and state aid	0.05	4	0.20
Change in employee preferences	0.05	3	0.15
Total Scores	**1.00**		**3.50**

The external factors with the highest scores are taken into account when constructing the SWOT analysis and also when generating the strategy. The factors are based on the current situation (spring 2021). All these factors will affect the company in the coming months and years.

2.2.4. Task environment

The task environment consists of different forces that make the market competitive. Competitiveness Strategy Authority Michael Porter argues that the company is most concerned about competition in its industry. The level of this intensity is determined by the main competitive forces. By carefully scanning it in the industry, a company must assess the importance of each of the five forces to its success: the risk of competition from new entrants, the rivalry of existing companies, the risk of substitute products or services, the bargaining power of buyers, the bargaining power of suppliers. The stronger these forces are, the more limited are companies to be able to raise prices and make a profit [16].

The metal cutting service has a working radius, as heavy steel is not worth transporting long distances, so it is worth focusing only on the market of the nearby region. The Baltic - Scandinavian market is mature and very competitive, offering high quality and low prices services. Here are the Porter`s five forces on local market:

- The risk of new entrants is low, due to the current economic situation, there is a lot of spare capacity in the market and there is a large shortage of materials in the market, which would make it extremely difficult to start a business.

- The bargaining power of buyers is fluctuating, until a few months ago customers were able to choose and dictate almost everything, today the situation is reversed. Customers order from where they get the fastest delivery, as customers' own factories would otherwise be down due to delivery difficulties.

- The risk of replacement services is still small in the coming years. The introduction of a replacement service, such as 3D printing, may not be jeopardized until ten years later. Today, cutting sheet metal parts are many times cheaper.

- The bargaining power of suppliers has risen to a high level, as a large shortage of materials allows them to raise the price in insane quantities. Suppliers do not have to engage in active sales at the moment, it is enough to accept orders.

- Competition between companies is average - some competitors are leaving the direct services market and have started to develop their own product. Others have fallen to lower levels due to low investment activity. There are also those who offer fierce competition on every front.

In order to fully position Finest Steel AS in the task environment, an industry matrix must be compiled. There are usually certain variables in each area - key success factors - that company management needs to know. The main success factors are the variables that determine the company's overall competitive position in a particular field. They usually vary from industry to industry and are crucial to a company's ability to succeed in that industry. They are usually determined by the economic and technological characteristics of the industry and include the competitive weapons. The industry matrix is a benchmark that ranks the competitiveness of companies in the same field. The

industry matrix covered in this work is in Table 2.2, it must be noted that selected factors are common to job shops.

To assess the industry, it is essential to know what is expected from this industry by customers. Surveys have found out what different companies value most about their suppliers. The author selects the most suitable factors from the article *"Supplier Selection and Assessment: Their Impact on Business Performance"*. Three sources were used in the article to identify supplier selection and evaluation criteria: previous literature, discussions with practitioners, and company-specific manuals. Based on these sources, 30 criteria were used to select suppliers. They reflect a variety of supplier attributes, including cost, quality, delivery performance, capability, and culture [17]. The main key factors chosen by the author are:

- Capacity is an extremely important factor in serving large customers, as large customers generally want to order large volumes at their production peaks.

- Flexibility has become one of the key factors in today's business, people are used to getting things faster and more customized.

- Market share plays an important role in finding and building trust with export customers. It is difficult for a company that is unknown to prove itself.

- The larger the range of the service, the easier the work of the customers' purchase department is. Everything you need can be ordered from one place and delivered at once.

- Machines, the newer and more high-tech the fleet of machines, the higher quality and more diverse service can be provided. Newer machines are also much more environmentally friendly and economical.

- The company's flexibility and delivery speed depend on a large and diverse network of suppliers. Another important factor in this is the price, the more supplies there are, the greater the likelihood of finding cheaper material.

- IT solutions, good IT solutions enable to make responsive offers to customers and find out the most competitive price possible.

- Many large customers require various ISO certificates.

Table 2.2 The industry matrix. Rating (R), weighted score (WS)

Key Factors	Weight	Finest Steel AS		OÜ Baltic Steel Center		Ferresto Laser OÜ		PlasmaPro OÜ	
		(R)	(WS)	(R)	(WS)	(R)	(WS)	(R)	(WS)
Capacity	0.20	5	1.00	3	0.60	2	0.40	3	0.60
Flexibility	0.15	2	0.30	2	0.30	4	0.60	5	0.75
Market Share	0.15	5	0.75	4	0.60	3	0.45	3	0.45
Range	0.15	5	0.75	4	0.60	3	0.45	4	0.60
Machinery	0.10	5	0.50	2	0.20	3	0.30	3	0.30
Supplier network	0.10	5	0.50	4	0.40	4	0.40	5	0.50
IT Solutions	0.05	5	0.25	2	0.10	3	0.15	3	0.15
Certification	0.05	4	0.20	3	0.15	3	0.15	5	0.25
Total	**1.00**		**4.25**		**2.95**		**2.90**		**3.60**

Decision to use those factors was made on authors previous experiences in industry. According to the industry Matrix Finest Steel AS is in the most competitive position. However, the table shows that the flexibility factor is weaker than the company's competitors. The key for success is not to assume that industry will continue as it is now but to assume that the industry will change. Successful company needs to be in position to take advantage of those changes.

2.3. Internal environment

Scanning and analyzing the opportunities and threats of the external environment is not enough for the company's long-term sustainability. Knowing internal environment is a key element to succeed by moving into a new profitable position in value chain. Sheet-metal cutting is considered very flexible mass customization production. It means customers can switch suppliers without any warning. Therefore, is very important to update the core competencies and internal environment as external environment demands. Internal strategic factors need to be identified, critical strengths and weaknesses that are likely to determine whether a company is able to seize opportunities while avoiding threats. Internal environment includes structure and resources.

2.3.1. Company culture and structure

Company culture is the collection of beliefs, expectations, and values learned and shared by its members. This collection shapes the behavior of people in a company, thus affecting the performance. For example, policies that emphasize the socialization of new employees have less change of jobs, leading to lower costs. Because those cultures have a significant impact on the behavior of people at all levels, they can affect a companies ability to shift its strategic direction. A great culture should not only promote existence, but it should also create the basis for a better competitive position by increasing members motivation.

Finest Steel AS wants to establish and maintain good and long-term relationships with both its customers and partners, which would ensure the maximum benefit for all stakeholders. In order to achieve and increase stakeholder satisfaction, the company constantly strive to improve our processes. That can be counted as strength as long it reaches also into shop floor.

Another strength in the company, quality ranks higher than quantity. Employees are encouraged to report quality issues without sanction. Employees are interested in a competitive salary and a safe working environment thus commitment to quality is shared by workers

Biggest weakness in work culture are some cultural leftovers from soviet working style. There are still employees who try to evade their duties or contribute as little as possible.

The structure of a company represents its operation by describing the ways, structure and hierarchy of decision making. This factor is essential as it determines the speed and efficiency of strategic decision making for the company.
Although there are an almost infinite number of structural forms, certain basic types predominate in today's complex organizations. Finest Steel AS uses the classic centralized functional structure, which is shown in Figure 2.2. Such a structure is common for us for job shops. Unfortunately, such a structure itself is already seen as a weakness today. Circular structures could be the new way, where decision-making authority is centralized around top management and interactions with managers and workers are quite high.
As a strength it can be pointed out that Finest Steel AS structure clearly understood by workers.

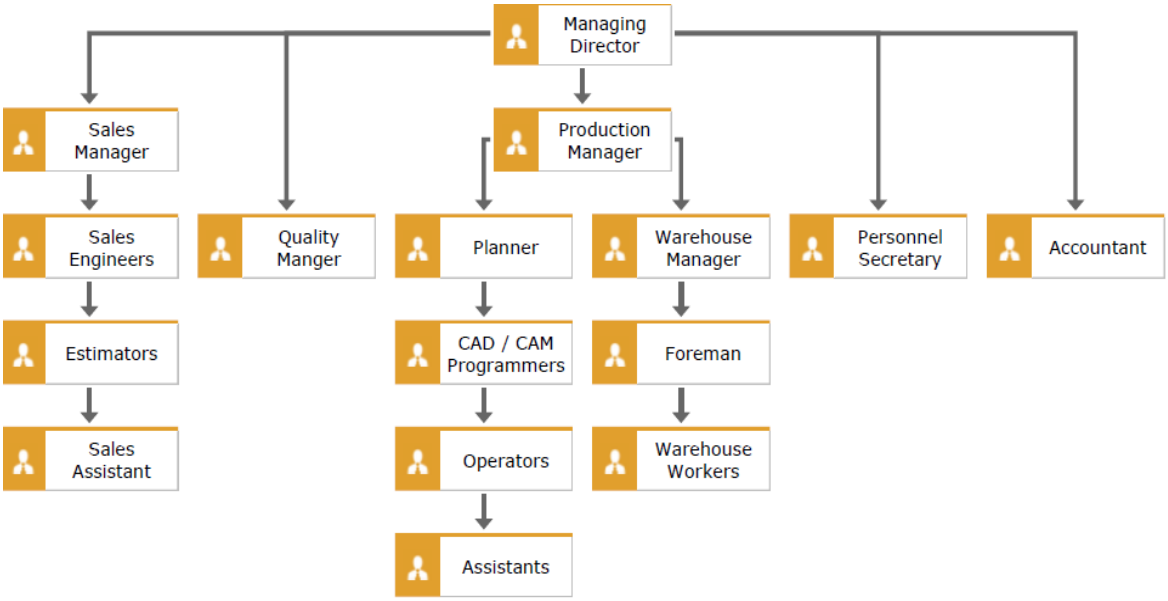


Figure 2.2. Finest Steel AS Structure

2.3.2. Company resources

Resources are assets to the company and are thus the basic elements of the organization. Here are presented different resources from company, author subcategorizes these resources into categories where there are strengths (S) and weaknesses (W):

- Marketing

  (S) The company's marketing strategy focuses on experience, state-of-the-art technology and the efficiency of production processes. People are proud to be part of cutting-edge technology.

  (S) The company's marketing campaign sets out the company's mission very clearly. The campaign with a clear message will also be understood by people less involved in the sector.

  (S) Sales engineers specialize to various sales needs of the different areas. For example, a sales engineer in Finland runs a dedicated sales campaign for region.

  (S) Advertising is constantly done both on the newspaper, social media and on the Internet. The company must be visible to customers, suppliers and potential new employees.

  (S) The company has the largest market share in Estonia. Being a market leader, it is possible to direct the market to a certain extent.

(W) The sales manager is also responsible for marketing. As sales progresses and market demand grows, the sales manager's main resource is concentrated on receiving orders.

(W) Marketing is carried out irregularly. In good times, not much attention is paid to marketing, as the company's production capacity is largely sold out, such activities can hit hard as the market situation deteriorates.

- Finance

  In terms of economic indicators, Strong growth is forecasted for 2021, supported by very good first quarter results in 2021. Main financial ratios are shown in Appendix 1 and Income statement is shown in Appendix 2 [11].

  (S) The company has an impeccable financial background. This allows, if necessary, to obtain credit on good terms for the purchase of both materials and fixed assets.

  (S) During the last 18 years, the company has not experienced a loss during the fiscal year. This is an extremely ornate parameter for applying various grants from the European Union.

  (W) The company's profits are currently insufficient to reproduce itself. For terms of long-term sustainability, it is very important for a company to be able to invest to ever-changing technology.

- Research and Development

  (S) Company don’t have own product, research and development is process-oriented with focus on manufacturing process. This approach allows to keep the company LEAN.

  (S) From the beginning, the company's strategy has been to have the best possible technology. The best possible technology offers reliability in market peaks to produce orders on time.

  (S) Managers and workers deal with process developments on a daily basis. In today's highly competitive market, continuous improvement is very important. Small developments eventually come together into large ones.

  (W) Because the technology is bought from Western - Europe, it is very expensive. When machines are on average 30% more expensive than others in the industry, it is very important to put them to work efficiently. Otherwise, competitors will be able to earn more profit with cheaper machines.

  (W) The functions of the development manager are performed by the production manager. With high production loads, development activities may be left behind.

- Operations and Logistics

  (S) Laser cutting has been the company's core process since the beginning, and this process has been continuously developed. The key people have a very broad knowledge of the core processes.

  (S) The company has established a monitoring system that runs through the main process, which helps to differentiate the most important parts of the process and measure their performance.

  (S) A very good input for process improvement is the systematic handling of non-compliances and the performance of internal audits and customer audits. The company's procedures stipulate that, if necessary, processes must be implemented from the external environment.

  (S) Operational management follows the procedures and rules of the quality management system. The ISO 9001 quality management system has been successfully implemented in the company.

  (S) The company has knowledge of various lean production techniques. The company has started implementing the 5S methodology, TIMMWOODS etc.

  (S) Company has online warehouse monitoring. Online inventory tracking allows for exceptional flexibility. All raw material can be priced within minutes.

  (W) Production system is oriented towards flexible manufacturing system but the equipment is not perfectly located for that. The company has rapidly renewed its fleet in recent years. Due to the lack of space, it has not been possible to place the new machines in the best position in terms of production layout.

  (W) Machine utilization is below world average. This is a problem with most Job Shop and Make to Order productions. As there is no own product, it is not always possible to keep the machines running.

  (W) Work in Progress (WIP). In order to maintain the efficiency of the machines, orders are produced, the delivery time of which is in a few months. During this time, there is a risk that the parts will be damaged.

  (W) On Time Delivery (OTD). Delivery reliability for customers starts to decline usually during times of high market demand. There are several reasons for this: availability of raw materials, overload in planning and programming, machine failures, etc.

- Human Resources Management

  (S) The company has created good working conditions for the employees, the employees can use very modern CNC production equipment.

  (S) The employees are provided with work clothes by the company, there is a changing room and a rest room. Staff are provided with free coffee and water.

(S) The number of employees in the company is relatively small (43 employees), the working atmosphere and cooperation in the company is good. Staff turnover is very low in the company, in general employees come and stay for years.
(S) The company has implemented all legal requirements for both the work environment and occupational safety. Occupational safety is at a good level in the company. The last registered occupational accident took place in 2013. During the 19 years of operation of the company, 5 registered occupational accidents have occurred. The company has implemented legal requirements for occupational health.
(W) Given the nature of production, it is not possible to create mobile jobs. Flexible working hours are not allowed. The work of bench operators takes place in two shifts, from 08.00 to 20.00 and from 20.00 to 08.00. The office and warehouse are open from 08:00 to 16:30.

- Information Technology
  (S) Monitor ERP system has been implemented in the whole company. Processes and ERP are well married. ERP is a very powerful analytical tool for a company. This ensures fast response and flexibility.
  (W) There is no complete solution for the communication system, people communicate at different levels through different channels, some information is lost. Facebook messenger is mainly used for communication in the workshop. The office mainly uses email. In addition, traditional communication channels.
  (W) The company uses several different programming software. Because of this it is not easy to exchange information between all machines and software. Due to the large service scope of the company, the company has several different manufacturers of machinery. They all have different programming software. If it is necessary to reprogram the work due to a fault, the programs must also be redesigned. In addition, replacing programmers is difficult.

2.3.3. Internal factor analysis summary

After scanning the internal organizational environment and identifying factors for the company, the analysis of these factors is presented in a similar form seen on the external factor analysis summary matrix.

Table 2.3 IFAS matrix for Finest Steel AS 2021

Internal Factor	Weight	Rating	Weighted Score
Strengths			
Largest market share in Estonia	0.05	4	0.20
Impeccable financial background	0.05	3	0.15
Constant process improvements	0.05	3	0.15
Experience in core process	0.05	2	0.10
Implemented ERP system	0.15	5	0.75
Online warehouse	0.10	4	0.40
Weaknesses			
Information flow	0.10	4	0.40
Production layout	0.05	2	0.10
Machine utilization	0.10	3	0.30
Work in Progress	0.05	4	0.20
On time delivery	0.10	5	0.50
High number of programming software	0.05	1	0.05
Total Scores	**1.00**		**3.30**

The summary of the internal factor analysis (IFAS) highlights the most relevant strengths and weaknesses of Finest Steel AS. Every company wants to strengthen its weaknesses and maintain its strengths. Choices must be made regarding which factors are important and which are not. Table 2.3 analyzes the six most important strengths and the six most significant weaknesses mentioned previously.

The internal factors with the highest scores are taken into account when constructing the SWOT analysis and also when generating the strategy. The factors are based on the current situation (spring 2021). All these factors will affect the company in the coming months and years.

2.4. Analysis of strategic factors

There are too many factors listed in previous sections for people to formulate appropriate strategy. The Strategic Factors Analysis Summary (SFAS) analysis amplifies the key EFAS and IFAS results and therefore becomes a very important strategic audit tool that is responsive to the shortcomings of SWOT analysis. There is no ranking in the SWOT analysis and it is only a one-level analysis. SFAS matrix requires to condense

these strengths, weaknesses, opportunities, and threats into 10 or less strategic factors. This is done by reviewing and revising the weight given each factor [18].

Table 2.4 SFAS Matrix for Finest Steel AS 2021

Strategic Factor	Weight	Rating	Weighted Score
Accelerated digital development - O	0.15	4	0.15
The European Union supports business investments - O	0.10	4	0.10
Price pressure in the Nordic market - O	0.10	3	0.07
Supply chains may stop working - T	0.10	5	0.12
Customers run into payment difficulties - T	0.10	3	0.07
Implemented ERP system - S	0.15	5	0.18
Online warehouse - S	0.10	4	0.10
On time delivery - W	0.10	5	0.12
Information flow - W	0.05	4	0.05
Machine utilization - W	0.05	3	0.04
Total Scores	**1.00**		**1.00**

The revised weights reflect the priority of each factor as a determinant of the company's future success. The end result is the most important internal and external summary of strategic factors in a single table. Here in table 2.4 are presented most important of EFAS and internal IFAS factors listed in previous sections. The analysis of these factors is presented in a similar form seen on the external factor analysis summary matrix. The weighted score corresponds to the weight and rating coefficient adjusted for dividing by 1. Dealing with those strategic factors strongly affect the companies present and future performance. By reacting properly to these factors, a company can greatly improve its competitive position.

2.5. Strategy formulation

Thus far the author has identified all the important factors that a great strategy must include. Now is the time to put these factors to work. Strategy formulation is a combination of analytics, prognosis and science. In dynamic world, it is the prognosis of strategy formulation that usually generates fast growth and can drive a company into newer horizons. Finest managers must develop skills and capabilities to sense early opportunities and be quick in making strategic moves.

Before formulating a strategy, the current situation must be transformed into the desired situations. The TOWS Matrix (TOWS is backwards way of saying SWOT) draws out how the external opportunities and threats affecting the industry can be matched with a company's internal strengths and weaknesses [19].
Mixing external opportunities and threats with internal strengths and weaknesses result four logical combinations of possible strategic alternatives:

- Strength Opportunity (SO) strategies: internal strengths can be used to take advantages of external opportunities,

- Weakness Opportunity (WO) strategies: reduce internal weaknesses or develop missing strengths with help of external opportunities,

- Strength Threat (ST) strategies: internal strengths are used to reduce the impact of external threats,

- Weakness Threat (WT)-strategies: reduce the internal weaknesses to avoid external threats, this strategy should only come in action during worst case scenarios.

To further improve the analysis, mathematical choice of each strategy block added, it takes the weighted score from the SFAS Matrix and adds the sum of logical combination [19]. Author generates the TOWS matrix for Finest Steel AS 2021 in table 2.5. The information from the matrix is later combined with the company's mission, policies and objectives.

Table 2.5 TOWS Matrix for Finest Steel AS 2021

Internal Factors: Strengths and Weaknesses → / External Factors: Opportunities and Threats ↓	Implemented ERP system - S Online warehouse - S	On time delivery - W Information flow - W Machine utilization - W
Accelerated digital development - O The European Union supports business investments - O Price pressure in the Nordic market - O	**SO Strategy 0.25** Use the Monitor ERP system (Swedish Developed) for ERP-to-ERP communication advantage. It gives huge advantage to enter Swedish market due to Price pressure in Scandinavia.	**WO Strategy 0.46** Use of latest digital technologies can help to overcome the weaknesses related to OTD, Information flow and machine utilization. Digitalization is subsidized by EU.
Supply chains may stop working - T Customers run into payment difficulties - T	**ST Strategy 0.40** To reduce the risk related to supplies of raw material, safety stock, lead time etc. must be overviewed in ERP system. Online warehouse gives greater agility when material planning information is determined.	**WT Strategy 0.35** The focus should be on serving large customers. Large customers are less likely facing payment difficulties and they give reliable production prognosis. Therefore, it is easier to be on time with delivery and utilize equipment.

2.5.1. Possible new strategies

Logical combinations from TOWS matrix mixed with the companies strategic posture from section 2.1 allows author to form possible new strategies.

Horizontal growth to Swedish market powered by Monitor ERP system. The company should try to enter the Swedish market. A local sales office for Swedes should be set up. Enterprise Estonia highly supports growth activities related to increasing export.
Pros: Allows to significantly increase the market portfolio. Bargaining power of local buyers drops. Monitor ERP system is designed for Swedish companies.
Cons: Due to current high market demand, the company is operating at full capacity when finding large customers in the Swedish market, the home market may be neglected and new competitors may emerge in the home market. This strategy can mask the company's efficiency problems.

Competitive growth with taking advantage of digital opportunities to overcome weaknesses. Various digital twin and tracking systems have become readily available, enabling efficient and real-time monitoring of the company's operations. All this allows the company to become agile and efficient.
Pros: Eliminating weaknesses and improving OTD, machine utilization and information flow have a great side effect, they provide naturally horizontal growth.
Cons: This kind of differentiation is not sustained, competitors imitate sooner or later.

Caution strategy to reduce the risk related to supplies of raw material. Deliberate attempt to make only incremental improvements like safety stock and lead time in ERP system until the crisis situation changes. It is conceived as a temporary strategy to rest before continuing a growth strategy to be used until the environment becomes more hospitable.
Pros: Should the economic situation deteriorate, the company has incurred costs, which would have helped to survive the difficult times. The people hired today should be redeployed.
Cons: In the meantime, competitors can significantly improve their position. Opportunities may slip out of hand.

Retrenchment strategy to only serve large customers. The complexity of the company must be significantly reduced and the company must be made thinner.
Pros: Liquidity risks will become significantly lower and the utilization of machinery will improve significantly. It is easier to manage a company.

Cons: Finest Steel AS waives the opportunities to grow. In long term sustainability the company gets eaten out of market. New competitors will emerge.

2.5.2. Recommended strategy

It is highly recommended to move on with horizontal growth strategy. But it is important to learn from the mistakes of the past. Rapid growth due to market demand may mask the company's weaknesses. The strategy of a sustainable company must ensure that the company does not forget its mission, goals and policies in times of high market demand. Taking all these factors into account, it is strongly recommended to move the company forward with a competitive growth strategy. This strategy had also the mathematically strongest score in the TOWS matrix.

A competitive growth strategy offers long term sustainability and horizontal growth as a side effect. It requires an extremely high degree of agility, reliability and quality from the company. For a company, this means: excellent control over operations, very good transparency, real-time metrics, etc. The study on "Industry 4.0 technologies as enablers of lean and agile supply chain strategies" highlights how the introduction of digital solutions can significantly improve a company's performance in terms of both agility and lean. Therefore, it is strongly recommended to introduce a digital twin [20]. This means creating a digital twin to monitor the level of operations. Setting various parameters to meet the objectives. And the most important thing is to create a transparent system so that people know what to follow to achieve the goals. In short, there is a need to create a framework for the digitization of the strategy. This will help to implement and to evaluate and control the strategy. Should a company change itself, the same framework can be used on the following new strategies.

If the establishment of such a framework proves successful, the company should start mapping the opportunities and threats again to ensure its long-term sustainability. Hopefully for next strategies, the already established framework can be used and strategies can be planned and managed much more operatively.

3. STRATEGY IMPLEMENTATION FRAMEWORK

Strategy implementation is a necessity in any company. Strategy implementation is the process that turns plans into actions in order to accomplish objectives and goals. Implementing strategy is as important, or even more important, than strategy itself. Critical actions move a strategy from a document that sits in the folder to actions that drive sustainable growth. The superior strategic management framework ensures the company's ambitions and goals can be met.

In this chapter, the author identifies what is needed to successfully implement and manage the desired strategy. What are the IT solutions that can help to do that? What parameters need to be monitored to ensure that the targets are met, and who needs to monitor it all?

3.1. Digital twin

Digital Twin approach enables to define and see the progress of strategic goals based on different manufacturing variables and to steer the company movement towards strategic goals supported by Digital Twin dashboard tier. The Digital Twin can be used in all actions, provide relevant information to managers and enable transparent collaboration between workers, goals and equipment. It is using the real-time data to validate and seek out problems in the company to support managing decisions [21].

Multitier Digital Twin concept consists four tiers: 1. Business process chain; 2. Operations workflow simulation; 3. Work cell digital layout model; 4. Strategic Management Dashboard [22]. In this work, the author does not consider it necessary to describe the Work cell digital layout model, because in the company Finest Steel AS the product nomenclature is so large, then describing it in terms of the job would not give the expected result. (Part sizes range from 0.5x2x2 mm to 100x2500x6000 mm with cutting times ranging from one second to one week.)

The author synthesizes the multitier digital twin for Finest Steel AS using:

- ARIS software to model and visualize the core process chain (Tier 1). Author selected ARIS software because it has enough functionality to meet requirements, also there is load of information and study materials available.

- Monitor ERP system to gather data, simulate scenarios, monitor the progress and evaluate the results (Tier 2 and 4).
- Key Performance Indicators to identify progress.

3.1.1. ARIS model

Business process modelling is the technique of making transparent the internal procedures of the company to find out the critical operations. "The main inspiration to use the Business Process Management (BPM) are well-organized process flow; spontaneous improvement and reengineering of a process flow when required" [23, 24]. Transparent Business Process create more value with fewer workers. The main criteria to measure value added at this level are time, cost, quality, productivity. Industry 4.0 that leverages on the use of Cyber Physical Systems in production systems, enables to build a twin of the real process in a digital world [25].

It is suggested to model tier of core processes by four levels: The company core process, Sub process phase, Process activity and Process task. Authors of "MULTITIER DIGITAL TWIN APPROACH FOR AGILE SUPPLY CHAIN MANAGEMENT" propose to model the first two levels by using Value-added Chain diagrams (VAC) to provide an overview on the functional areas of an organization and subsequent by using Event Process Component (EPC) notations because it integrates all relevant business perspectives and is embedded in the overall process landscape. [21, 26].

To properly construct the ARIS model author uses EPC in ARIS Cheat sheet which can be seen on Appendix 3 [27]. Author starts the building of a Digital Twin for Finest Steel AS from first tier level. It covers the business processes of the company.

First level is used to visualize the core processes and define the strategic goals and first Level KPI-s of the company, see Figure 3.1. Core process consist other sub processes where all are adding value. Each has logical sequence according to operations which are needed to provide cutting service. VAC shows core process with input and output. All core processes have department, that is involved in a task. First level KPI-s show the summary of all sub processes. Level 1 illustrates almost the company as a whole.

The second level shows the process of each value-adding unit, see Appendices 4-8. KPIs can be, but are not necessarily, connected to each other. If one process turns out to be

a bottleneck, other processes may have an unexpectedly high KPI. For example, due to low sales, the reliability of delivery will definitely start to increase. The second level of business process describes the level 2 KPI. Level 2 illustrates each department.

The third level is describing the activities of manufacturing process phase, see Appendices 9. The individual efficiency of each work center is shown here. These KPIs are no longer interdependent. At this level, the KPI depends on the skills of specific employees. Level 3 illustrates work center.

The fourth level contains the tasks included in sheet cutting activity, see Appendices 10. The fourth level KPI is the most accurately measured and its effect is most directly noticeable. Level 4 illustrates machine and workers ability to carry out tasks

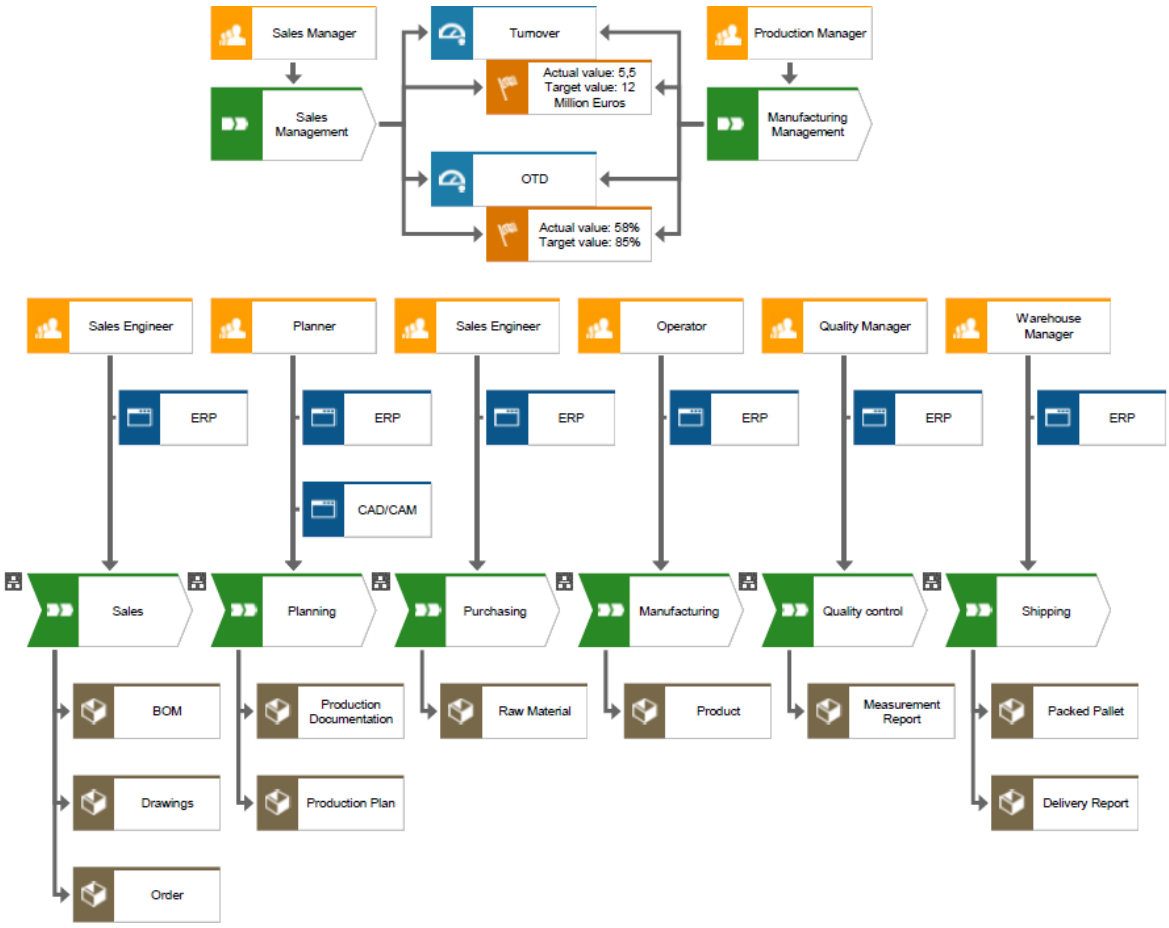


Figure 3.1 First level business process value chain for Finest Steel AS

The created process model makes the core of the company transparent. It gives both employees and managers the opportunity to understand how and from what tasks and

problems in the company are transferred. Most importantly, it highlights the bottlenecks that need to be addressed to achieve strategic goals.

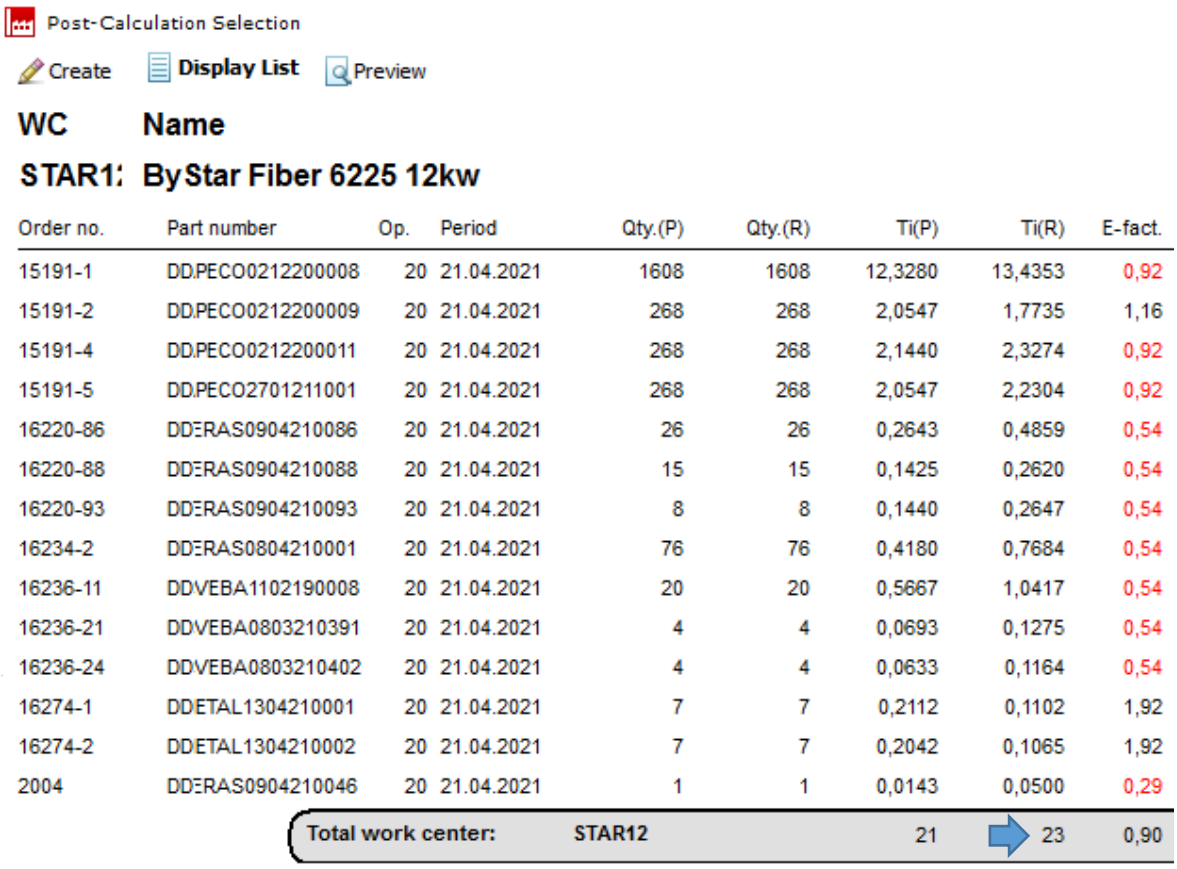
3.1.2. ERP system simulation

The second tier for Finest Steel AS Digital Twin is an operations workflow which enables to model and simulate the workflow of manufacturing, check delivery times for sales, analyze purchase material flow etc. Simulation results enable to see the bottlenecks of the workflow. This level is used to find out and test the improvements of operations in workflow simulation [21].

All these simulations would be done in the company's ERP software, which has the necessary accessories. Since 2018, Finest Steel AS has been using Monitor ERP software created by the Swedes.

MONITOR is a full-featured Enterprise Resource Planning (ERP) system that gives complete management over the company. The system is made up of multiple separate modules that, when combined, encompass all aspects of a modern manufacturing firm. The manufacturing module includes everything needed to manage, plan, and track the production. The Purchase module contains support for the entire purchase process, from inquiry to accounts payable. The Sales module contains all functionality regarding customers and sales, from quote to accounts receivable. The Stock module contains functionality for stock control, material control, and stock count. The Time recording is the module closest to the shop floor. The hub of the Time recording is the recording terminal where personnel record time for both attendance and work. The Accounting module manages the company’s current accounting and follow-ups [28].

In order to create a true simulation great data is needed. Raw data from CAD / CAM program parameters are entered into the Finest Steel AS ERP system. These advanced programs are able to calculate the cutting times of various details quite accurately. The fine-tuning of the data is performed by means of real time production monitoring systems and post-calculations. The post - calculation compares the planned and the actual cycle time, see figure 3.2 showing takeout from the ERP system. Ti(P) marks the cycle time calculated by the estimator and Ti(R) shows the actual cycle time in work center. When looking the data, it can be seen that E-fact – meaning overall equipment effectiveness (OEE) is 90%. This all means data can be trusted and simulations can forecast actual situations.



Post-Calculation Selection

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WC Name

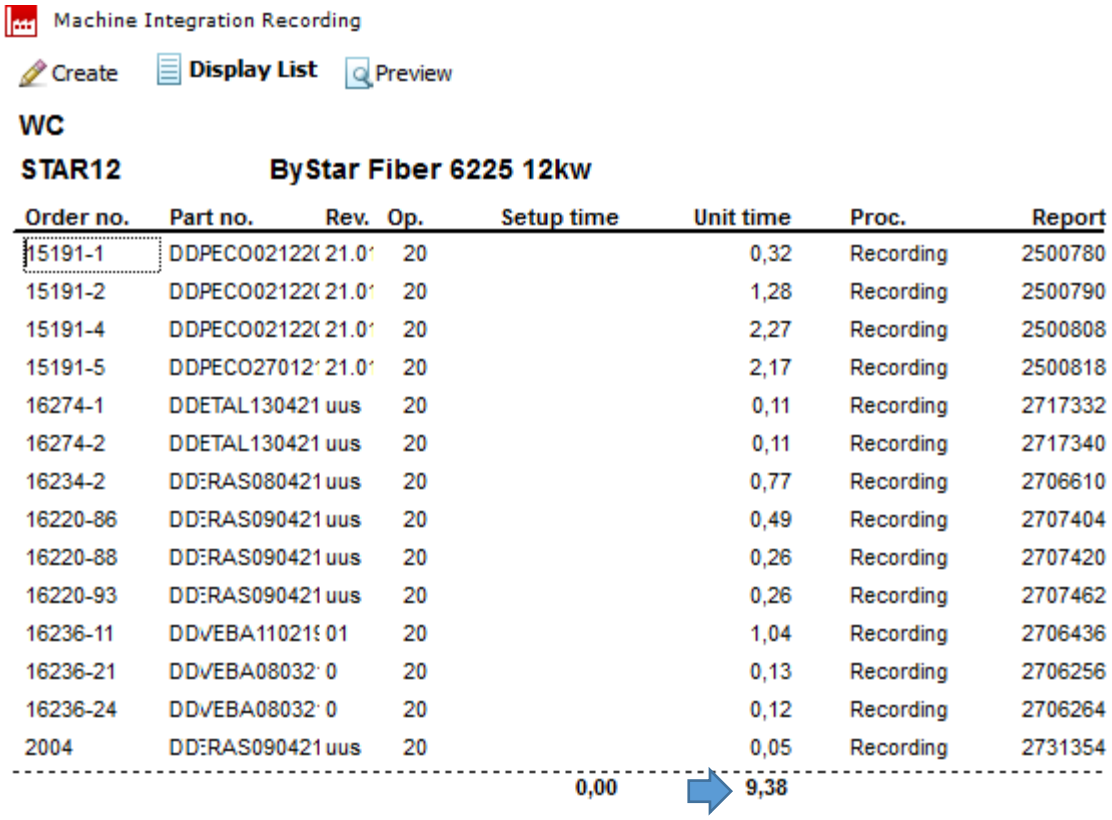
STAR1: By Star Fiber 6225 12kw

Order no.	Part number	Op.	Period	Qty.(P)	Qty.(R)	Ti(P)	Ti(R)	E-fact.
15191-1	DDPECO0212200008	20	21.04.2021	1608	1608	12,3280	13,4353	0,92
15191-2	DDPECO0212200009	20	21.04.2021	268	268	2,0547	1,7735	1,16
15191-4	DDPECO0212200011	20	21.04.2021	268	268	2,1440	2,3274	0,92
15191-5	DDPECO2701211001	20	21.04.2021	268	268	2,0547	2,2304	0,92
16220-86	DDERAS0904210086	20	21.04.2021	26	26	0,2643	0,4859	0,54
16220-88	DDERAS0904210088	20	21.04.2021	15	15	0,1425	0,2620	0,54
16220-93	DDERAS0904210093	20	21.04.2021	8	8	0,1440	0,2647	0,54
16234-2	DDERAS0804210001	20	21.04.2021	76	76	0,4180	0,7684	0,54
16236-11	DDVEBA1102190008	20	21.04.2021	20	20	0,5667	1,0417	0,54
16236-21	DDVEBA0803210391	20	21.04.2021	4	4	0,0693	0,1275	0,54
16236-24	DDVEBA0803210402	20	21.04.2021	4	4	0,0633	0,1164	0,54
16274-1	DDETAL1304210001	20	21.04.2021	7	7	0,2112	0,1102	1,92
16274-2	DDETAL1304210002	20	21.04.2021	7	7	0,2042	0,1065	1,92
2004	DDERAS0904210046	20	21.04.2021	1	1	0,0143	0,0500	0,29
	Total work center:		**STAR12**			21	23	0,90

Figure 3.2 Post – calculation cycle times (snapshot from Finest Steel AS ERP)

Real time production monitoring system (PMS) is a better alternative to manual data gathering and captures most of the production data without humans. The task of a PMS is to collect and report real time data of cutting machines. This data must be related to production orders then it is useful for decision making. Monitored data helps the company to respond operatively to the events that may affect the desired goals [29]. In Finest Steel AS machine active cutting time is automatically reported by the PMS system to ERP, where it is integrated in to active manufacturing order. PMS system measures laser on and off state. See Figure 3.3 for the actual cutting times. This method of data collection is very reliable.

When comparing the data (marked with blue arrow) of Figures 3.2 and 3.3, it appears that the manufacturing of these work orders takes 23 hours, but the cutting machine worked for only 9 hours. Based on this, it can be concluded that the machine resource is still available and the bottleneck is loading activities. Adding an assistant for loading activities could help to improve cycle time thus increasing the manufacturing output.



Machine Integration Recording

Create | Display List | Preview

WC

STAR12 **ByStar Fiber 6225 12kw**

Order no.	Part no.	Rev.	Op.	Setup time	Unit time	Proc.	Report
15191-1	DDPECO02122(	21.0'	20		0,32	Recording	2500780
15191-2	DDPECO02122(	21.0'	20		1,28	Recording	2500790
15191-4	DDPECO02122(	21.0'	20		2,27	Recording	2500808
15191-5	DDPECO27012'	21.0'	20		2,17	Recording	2500818
16274-1	DDETAL130421	uus	20		0,11	Recording	2717332
16274-2	DDETAL130421	uus	20		0,11	Recording	2717340
16234-2	DDRAS080421	uus	20		0,77	Recording	2706610
16220-86	DDRAS090421	uus	20		0,49	Recording	2707404
16220-88	DDRAS090421	uus	20		0,26	Recording	2707420
16220-93	DDRAS090421	uus	20		0,26	Recording	2707462
16236-11	DDVEBA11021(	01	20		1,04	Recording	2706436
16236-21	DDVEBA08032'	0	20		0,13	Recording	2706256
16236-24	DDVEBA08032'	0	20		0,12	Recording	2706264
2004	DDRAS090421	uus	20		0,05	Recording	2731354
				0,00	9,38		

Figure 3.3 PMS data in ERP system (snapshot from Finest Steel AS ERP)

Based on the previously acquired knowledge, 2 simulations are performed in the ERP system. The first simulation, see Figure 3.4 is the current situation in a work center with 1 operator. And the second simulation, see Figure 3.5 represents a situation where an operator and an assistant operate in a work center. In both simulations, active manufacturing orders are used.

Comparing the results of the two simulations, the previously over-planned work-center had actually free capacity when implementing an assistant to work center which is removing loading bottleneck. Increasing manufacturing output in this way allows the company to move more easily towards its strategic goals. The wider use of simulations in the ERP system widens the boundaries for setting and fulfilling new goals. The simulation makes the setting of KPI goals significantly more accurate. Playing with different simulation scenarios in sales, purchasing or manufacturing allows a company to notice different risks when setting KPI targets.

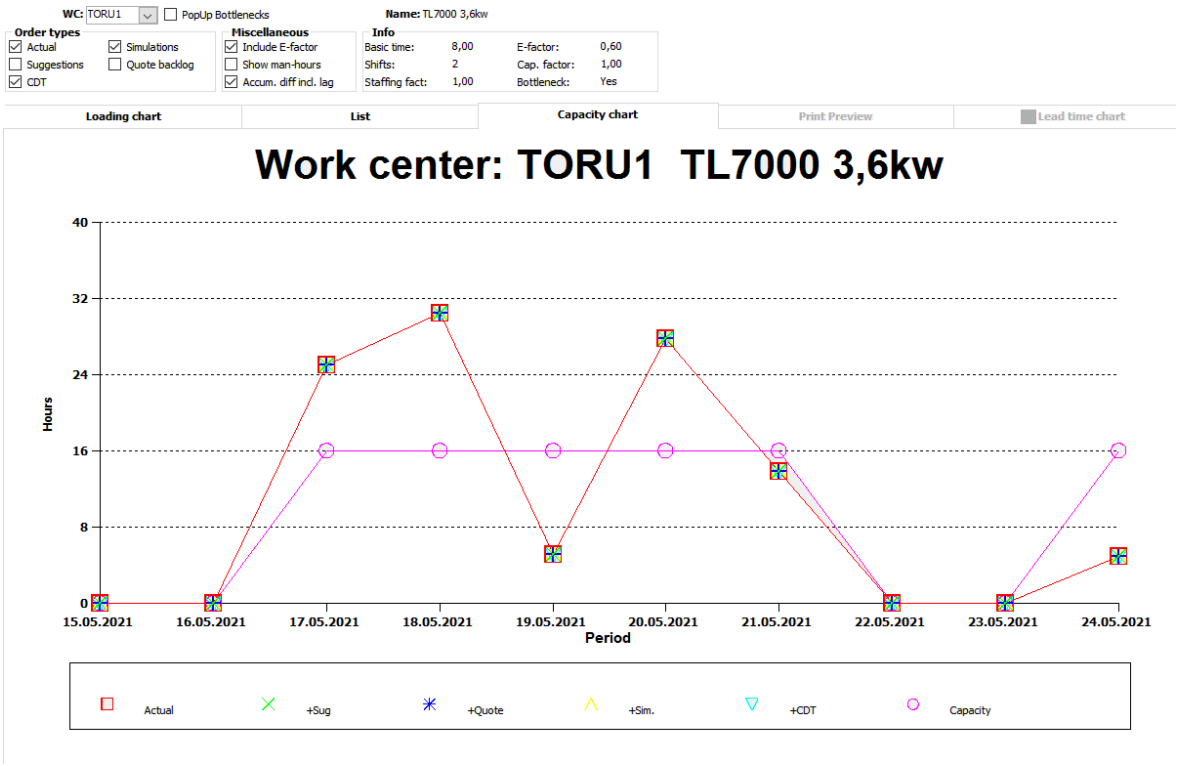


Figure 3.4 Simulation 1 current situation (snapshot from Finest Steel AS ERP)

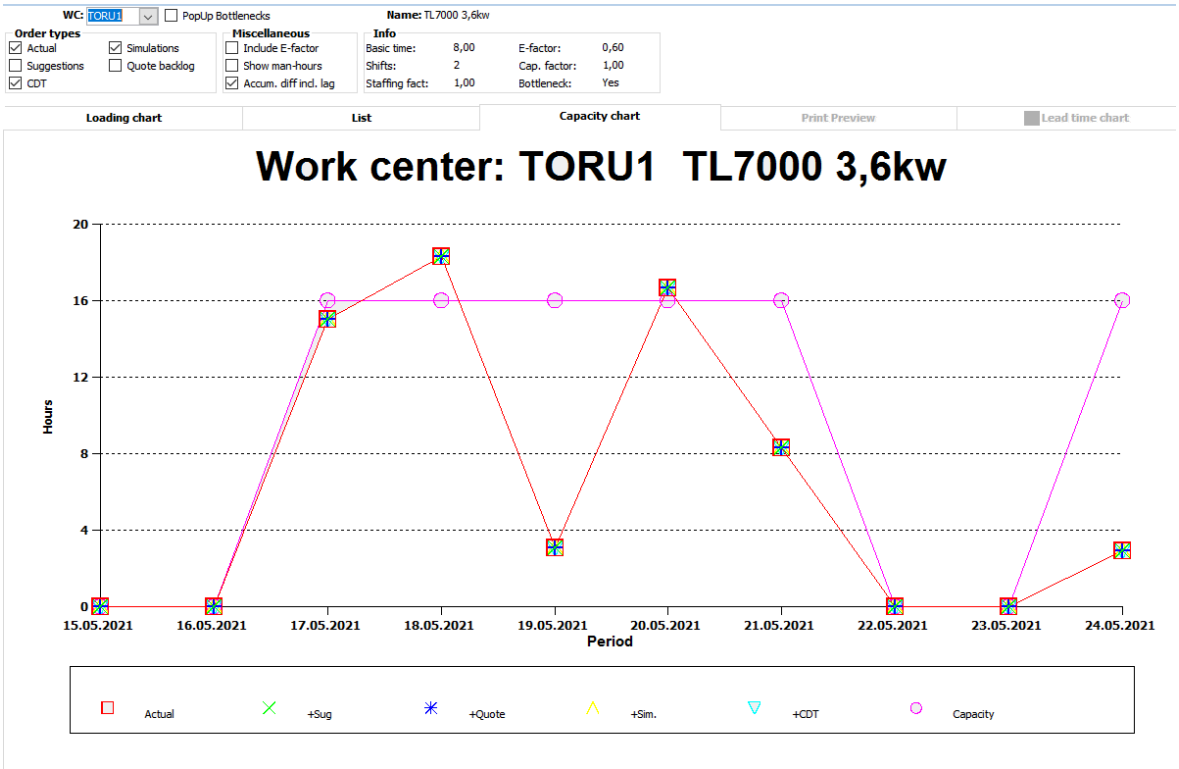


Figure 3.5 Simulation 2 with added assistant (snapshot from Finest Steel AS ERP)

3.1.3. Key performance indicators

The use of a Multitier Digital Twin allows the company to keep track of current tier KPIs and compare them to the expected behavior of simulated operations. If a KPI falls short of the target, the Multitier Digital Twin methodology displays the KPI and allows for the identification of the operation whose efficiency falls short of the aim. The Multitier Digital Twin's simulation capability helps to identify the problem's root cause as well as to identify and validate potential remedies [21].

To setup KPIs for Finest Steel AS author chooses to use SMARTER (Specific, Measurable, Achievable, Relevant, Timely, Explainable, Reviewed) key performance indicators [30]:

- Goals should be as specific and detailed as possible. Goals that are too broad or too vague are undesirable. When goals are specific, it is much easier to hold people accountable for their accomplishments.
- Measurable - Every goal, procedure, or KPI should be quantifiable. The measurement itself could be quantitative or qualitative, but it must adhere to norms and regulations in order to achieve the main purpose.
- Achievable - Goals should be set at the appropriate level. They must be both ambitious and practical; however, too easy goals will not be encouraging. Furthermore, each KPI should have a target value that must be met.
- Relevant - every team member or person must understand and compare how the goal relates to their function and the team's overall goals. In addition, KPIs should provide insight into the company's performance in achieving its strategy. When a KPI isn't assessing a team's or company's aim or has no impact on the organization's success, it's pointless.
- Time-specific – Deadlines should be set for work or assignments. Having a time range for completion would allow you to track and analyze your progress. Furthermore, each KPI has value if everyone understands the time limits in which it is measured and accomplished.
- Explainable - KPIs are frequently measured without a clear knowledge of their purpose or the entire process. Managers must ensure that everyone participating in the measurement process is aware of the objectives.
- Reviewed - KPIs should be relative, with definitions and targets that can still be used when the company grows and quantities increase.

Based on the principles above, the author added KPIs to the digital twin. In order to make these KPIs completely transparent, the author compiled KPI tables, see Table 3.6, there is a KPI of the company's turnover, the rest of the KPI tables are in Appendix 11.

Table 3.1 Turnover KPI for Finest Steel AS 2023 fiscal year

KPI Level 1	Turnover
How calculated	Monthly turnover x 12 months
Target value	12 000 000€
Monitored by	Top Management
Monitoring frequency	Monthly
Take action if	≥900 000€ in month
Required action	With a help from digital twin find out if it is due to an internal or external factor. If necessary, change the strategy.

Target values ensures that KPIs are specific. To add measurability transparency KPI table shows how KPIs are calculated. To be sure that KPI targets are achievable simulations are performed to validate target values. To make KPIs relevant and explainable they are marked into ARIS business process map, also into digital twin dashboard and process users must know where to find the KPI document. Monitoring frequency and period makes the KPIs time specific, PMS and ERP provide the KPIs with newest data. Actions make sure that KPIs are reviewed, if KPIs are monitored and reported frequently new targets can be set. If the KPI stays at the ideal reading all the time, it means that there is a surplus of resources somewhere, which in turn is a waste.

3.1.4. Digital twin synthesis

The strategic management dashboard is the fourth tier, and it allows to track how far each layer is from its ideal operations. It is an interactive approach for monitoring suitable Key Performance Indicators at each Digital Twin layer and across tiers based on the company's strategic aim [21].

The big challenge is to integrate the different parts of the digital twin together. When creating a digital twin dashboard, the author focuses on the principle that updating it must be automatic and take very little effort. It is known from the above that in the ERP system all the data is available to build this dashboard, the only thing that is not in the

ERP system is the business process map to increase transparency. However, transparency is crucial in managing a successful strategy.

After several experiments, the author came to the conclusion that it is most reasonable to synthesize this dashboard to the opening window of the ERP system. Because the data is present in the ERP system, it allows you to keep the dashboard updated at all times. The ERP system also allows to generate data indicators to monitor the specified KPI. The most difficult task is to add business processes and their interactivity alongside the indicators, in order to ensure the transparency of both the processes and the indicators for the participants in the process. The author solved the situation by saving the ARIS program as a website (.html). Every time a change is made in an ARIS program, it must be saved in html format to the company's server, so it can be displayed in the main window of the ERP system. With such a solution, employees can move freely between different processes and levels without knowing the ARIS program. It also allows the company to use ARIS without several licenses. A Dashboard has been created for each workplace, taking into account the needs of that workplace, a dashboard created for purchasing is shown in Figure 3.6 and a dashboard for the central manufacturing terminal is shown in Figure 3.7.

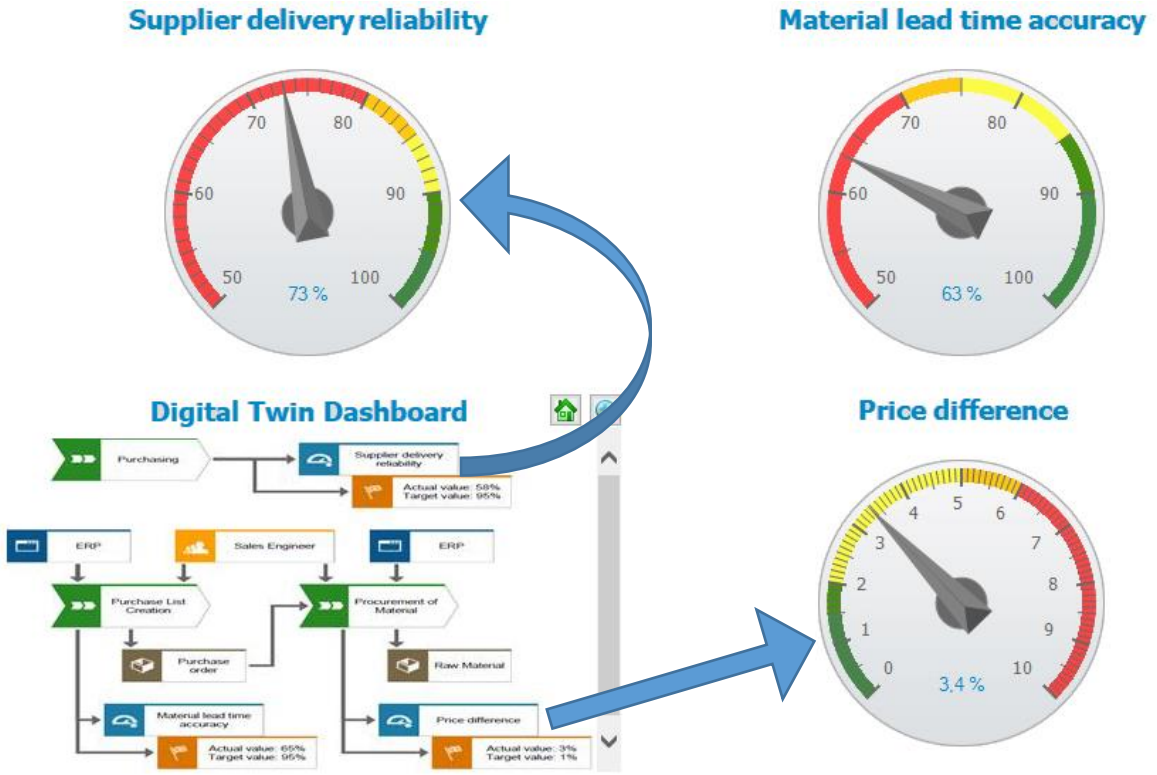


Figure 3.6 Purchasing dashboard (snapshot from Finest Steel AS ERP),arrows are representing links between processes and KPI speedometers

The purchase dashboard shows a process flow value chain process diagram and the KPIs defined for that process. Clicking on the KPI indicator it opens a detailed view of the data that the KPI currently consists of in the ERP system. For example, clicking on the delivery reliability meter will open purchase orders for the last 30 days with scheduled and actual arrival times. In this way, it is possible to find out which purchase orders were delivered later than promised by clicking on the display. All this provides an opportunity and transparency to solve problems quickly.

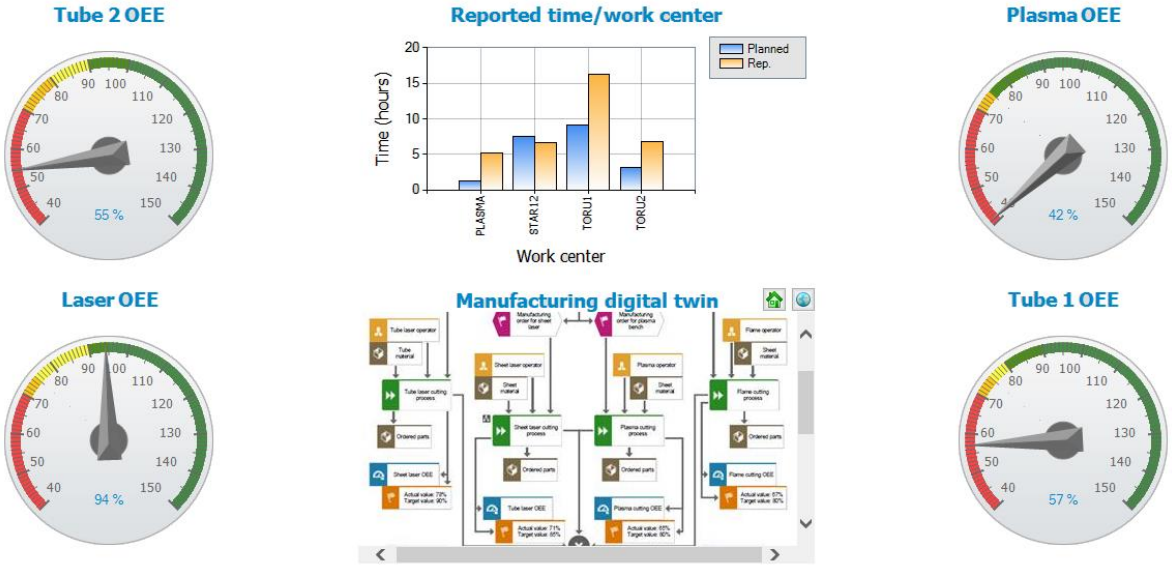


Figure 3.7 Central manufacturing terminal dashboard (snapshot from Finest Steel AS ERP)

The dashboard of the production terminal behaves similarly to the purchase, but it shows the data related to the efficiency of the work centers. By clicking on the indicators, it is possible to see in detail the planned and reported cycle times of work orders. If the operator feels that the scheduled time is incorrect it must be notified, the same applies to the execution of the work order in the event of an obstacle. By clicking on the process diagram, it is also possible to open and view other processes. This increase operator's awareness of the work chain.

Summarizing the above, the author can state that the ERP system has become a digital twin and ARIS a frame generator. If the company succeeds in implementing such a framework, it will be able to perfectly manage the implementation of various strategies. In the case of growth strategies, the framework showing red KPIs indicates problems that are holding back growth or its sustainability. For retrenchment strategies, the framework can demonstrate the need for reallocation of resources when some KPIs are constantly green and others are red hot. This method enables companies to gain

strategic target accountability at all levels, from the top down to the bottom up. The author demonstrated how the company's target can be met by putting the framework into effect and using current technical solutions for various tiers of modeling and simulations.

3.2. Implementation

"An unimplemented procedure is an empty thing, either killing trees to produce useless stacks of paper or taking up server space with useless folders and files; an uncontrolled procedure tends to work right at first and then gradually degrade" [31].

In order to implement a strategy or its framework, it must first be approved. In Finest Steel AS, the supervisory board and the management board have the authority to do so. To do this, the supervisory board first needs an overview of the strategy and framework, as well as an economic forecast. The task of the management board is to assess its feasibility and later to be responsible for the implementation of the strategy.

The first step in implementing the strategy in the company is to introduce it to the company's employees. The purpose of the introduction is to find possible contradictions before implementation. It is probable that some employees are against everything new because of the habit, their criticism should not be paid much attention to. After receiving the feedback, the management needs to move on to creating the necessary infrastructure. The framework of the strategy and the digital twin must be ready for the initial period of deployment, as the implementation of a half-digital twin could jeopardize the success of the entire deployment. At the moment, the implementation is in the first stage. The author of this work has created a strategy management framework and currently testing and improving the digital twin prototype in the company's information system. The rollout phase is scheduled for August 2021.

The next step is to establish the necessary procedures, the company's quality management system must describe in detail who will use the digital twin and how. Employees need to have a clear understanding of their role in implementing the strategy and using the digital twin.

Achieving the set goals will not be easy. In order for employees not to lose motivation to reach their goals, there is a need to start raising targets step by step. In addition, the bonus system must encourage the achievement of targets so that employees feel that they are also part of the achievement of the goals. The author of the work estimates that it may take about 1 year to reach the goals set in this work. In other words, the difference between the current situation and the goal could be divided into 12 increments.

Inevitably, tensions arise in the company when things have to be done differently from the habit. The tolerance of managers is being put to the test and some things may need to be changed on the run, but it is important to monitor and keep an eye on the whole process. Good communication and cooperation are key factors in the successful implementation of any plan. This success can be further enhanced by transparency and maximum awareness.

4. FINANCIAL PROGNOSIS 2023

The last part of the strategic management framework is the financial prognosis. Even if the company plans to save humanity, one of the company's main tasks is to make a profit. The sustainability of the company depends on the income earned, the income must be sufficient for the company to be able to reproduce itself, it needs to constantly invest in to new and more efficient technologies. The author of the master thesis prepares the income statement of Finest Steel AS for 2023. When constructing the forecast, it is assumed that the strategy management framework will be successfully implemented.

Understanding the historicals is required to forecast the income statement. This entails taking the given values from the previous year's income statement and adding assumptions to generate a new one. An income statement's assumptions include things like growth rates or changes in revenues and expenses based on certain factors and judgments [32].

Author takes the Finest Steel AS 2020 income statement for basis of prognosis 2023, see table 4.1. Sales revenue cell for 2023 is assumed to be 12 000 000 euros based on strategic goal.

Table 4.1 Finest Steel AS 2020 income statement and prognosis 2023 [11]

Income statement	2020	2023
Sales revenue	5 489 109	12 000 000
Cost of goods sold (goods, services)	- 4 892 675	- 9 705 821
Gross profit (loss)	596 434	2 294 179
Distribution expenses	- 279 468	300 000
General administrative expenses	- 233 543	250 000
Other operating income	96 677	0
Other business expenses	- 315	5000
Operating profit (loss)	179 785	1 739 179
Interest expenses	- 30 407	- 40 000
Other financial income and expenses	21	0
Profit (loss) before income tax	149 399	1 699 179
Income tax	0	0
Profit (loss) for the financial year	149 399	1 699 179

Cost of goods sold (goods, services) are braked down in appendix 12 [10]. To fill manufacturing capacity related cells for column 2023 author uses 119 % turnover

growth ratio based on sales revenue 2023. Depreciation expense is assumed to be 500 000 euros. Labor costs are assumed to raise 50 %.

Distribution expenses, General administrative expenses, Other operating income, Other business expenses, Interest expenses, Other financial income and expenses are assumed by the author using logical to be values.

The outlook for 2023 prognosis looks great. In order to obtain a more detailed overview, the author prepares an analysis of the main financial ratios for 2023 on the basis of prognosis, see Table 4.2. Formulas used to calculate the ratios [33]:

- Turnover growth (%) = (sales revenue 2023-sales revenue 2020) / sales revenue 2020 * 100
- Gross profit margin (%) = gross profit / sales revenue * 100
- Profit growth (%) = (net profit 2023-net profit 2020) / net profit 2020 * 100
- Net profitability (%) = net profit / sales revenue * 100
- Current liabilities coverage ratio (in times) = current assets / current liabilities
- Return on assets (%) = net profit / total assets * 100
- Return on equity (%) = total net profit / equity * 100

To calculate return on assets and return on equity author needs to make more assumptions. Based on Finest Steel AS Fiscal year report 2020 for 2023 assets are assumed to be worth 6 000 000 euros and for 2023 equity is assumed to be 3 000 000 euros

Table 4.2 Financial ratio prognosis for 2023 [11]

Financial ratio	2020	2023
Sales revenue (thousand euros)	5 489	12 000
Turnover growth		119 %
Gross profit margin%	11 %	19 %
Net profit (thousand euros)	149	1 699
Profit growth		1 040 %
Net profitability	3 %	14 %
Current liabilities coverage ratio	1,28	1,2
Return on assets	3 %	28 %
Return on equity	5 %	56 %

When analyzing those ratios, they seem to be too good to be true, but taking account late 2019 Repo market crisis and 2020 covid-19 pandemic recession, where the turnover of many companies fell by 50%, it is more than fair to assume huge growth over the next years. The only concern is rising inflation, which could reduce the real value of these values. Based on the long-term forecast of the Ministry of Finance, annual inflation in the coming years should be 2% [34]. Compounding inflation rates over three years results 692 131 euros for adjustment. Based on this sales revenue for 2023 should be 12 692 131 euros and other expenses as well.

SUMMARY

The person who has read the work shall now know what kind of company is Finest Steel AS. The company is a service provider for metal cut parts. The company only delivers on an order basis. The aim of this master's thesis was to develop a strategy management framework for Finest Steel AS. Both long-known and methodologies at their infancy were used to compile the framework. Whether the framework created proves to be successful or not is only shown by time, the prognosis for its success is excellent.

A full description and identification of the company was made. The main process of the company is the manufacturing process and the company only manufactures if there is an order placed by customer. The crises of recent years have not left Finest Steel AS untouched, but now everything is promising new growth.

Based on the strategic audit, it became clear that the company has a strong desire to grow in the future. Finest Steel AS should grow in such a way that high market demand does not mask the companies problems. To fulfill this desire, it is prudent to take advantage of the most important external factor, which is rapidly evolving digital solutions. The use of the opportunity is facilitated by the already existing most important internal strength Monitor ERP system. This synthesizes to the recommendation to establish a strategy management framework.

In order to realize everything ambitious, the author of the master thesis constructed the company's digital twin. The digital twin was created based on different authors academic research and the company's existing resources. The digital twin defines the company's business processes on several levels. Various key performance indicators have been identified through simulations. A strategic management dashboard has been compiled from the key performance indicators and business processes. This board will make it possible to monitor the success of the implementation of strategies operatively and transparently. In addition, it ensures the transparency of the company for employees.

Based on the collected data, the author managed to prepare an optimistic financial forecast for 2023. The forecast shows that the company will be able to double its turnover in a few years if successful.

Even though the implementation is in the first stage and the author of this master thesis is testing and improving the digital twin prototype in the company's information system, the scope of the master's thesis excluded procedural descriptions that are essential for the implementation of the strategy. The goals created with the current content look immediately into 2023, but in reality, it is necessary to set intermediate goals. There are also no guidelines for employees to use the digital twin. There is also no project management plan, but for successful implementation, the above must be created in the company.

In summary, it can be said that based on the current results, the strategic management framework is becoming the fuel for the company's next growth.

KOKKUVÕTE

Töö läbilugenud inimene teab nüüdseks, missugune ettevõtte on oma olemuselt Finest Steel AS. Ettevõte on teenusepakkuja, kuhu pöördutakse metallist lõigatud tetailide saamiseks. Ettevõte toimetab ainult tellimuse põhiselt. Käesoleva magistritöö eesmärgiks oli arendada strateegia juhtimise raamistik ettevõttele Finest Steel AS. Raamistiku koostamisek kasutati nii pikalt üldsusele teada olevaid, kui ka alles imiku eas olevaid metootikaid. Seda, kas loodud raamistik osutub edukaks või mitte, näitab ainult aeg, prognoos selle edukaks osutamisel on suurepärane.

Tehtud sai ettevõtte täiemahuline kirjeldamine ning idenfitseerimine. Ettevõtte põhiprotsessiks on tootmisprotsess ning ettevõte toodab ainult tellimuse olemasolul. Viimastel aastate kriisid ei ole ka puutumatta jätnud Finest Steel AS, kuid nüüd on kõik kiiresti paremuse poole liikumas.

Tehtud strateegilise autiti põhjal selgus, et ettevõttel on tulevikus suur soov kasvada. Kasvada tuleks nii, et suur turunõudlus ei maskeeriks ära ettevõttes valitsevaid probleeme. Selle soovi täitumiseks on valalik kasutada ära kõige kaalukamat välisteguri faktorit, milleks on kiirelt arenevad digitaalsed lahendused. Seda aitab lihtsamini teostada juba olemasolev kaalukaim sisemine tugevus Monitor ERP süsteem. Sellest sünnibki strateegia juhtimise raamistiku loomise soovitus.

Et kõike ambitsioonikat ellu viia konstrueeris lõputöö autor ettevõtte digitaalse kaksiku. Kaksiku loomisel lähtuti juba varem läbiviidud teadustööst ning ettevõtte olemasolevatest ressurssidest. Digitaalses kaksikus on mitmetasandiliselt ära defineeritud ettevõtte äriprotsessid. Simulatsioonide abil on määratud erinevad võtme näitajate indikaatorid. Võtme näitajate indikaatoritest ja äriprotsessidest on koostatud strateegilise juhtimise tahvel. See tahvel võimalda operatiivselt ja läbpipaistvalt jälgida strateegiate täitmise edukust. Lisaks tagab see töötajatele ettevõtte läbipaistvuse.

Kogutud andmete põhjal õnnestus autoril koostada aastaks 2023 optimistlik finants prognoos. Prognoosist järeldub, et ettevõte suudab edu korral käiba mõne aasta jooksul kahekordistada.

Ehkki juurutamine on esimeses etapis ja selle magistritöö autor testib ja täiustab ettevõtte infosüsteemis digitaalse kaksiku prototüüpi, jäid magistri töö ulatusest välja protsessilised kirjeldused, mis on hädavajalikud strateegia juurutamisel. Hetkesisuga loodud eesmärgid vaatavad koheselt aastasse 2023, aga tegelikkuses on vaja seada

vaheeesmärgid. Samuti on loomata kõiksugu juhendid töötajatele digitaalse kaksiku kasutamiseks. Puudub ka projekti juhtimise kava, kuid edukaks juurutuseks tuleb eelnimetatu ettevõttes kindlasti luua.

Kokkuvõtvalt saab öelda, et hetke tulemuste põhjal on strateegilise juhtimise raamistikust kujunemas kütus ettevõtte järgmise kasvu saavutamisel.

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APPENDICES

Appendix 1 Main financial ratios Finest Steel AS

Financial ratio	2020	2019
Sales revenue (thousand euros)	5489	6574
Turnover growth	-17%	-12%
Gross profit margin%	11%	9%
Net profit (thousand euros)	149	107
Profit growth	40%	-71%
Net profitability	3%	2%
Current liabilities coverage ratio	1,28	1,57
Return on assets	3%	2%
Return on equity	5%	4%

Appendix 2 Income statement Finest Steel AS (EUROS)

Income statement	2020	2019
Sales revenue	5 489 109	6 574 425
Cost of goods sold (goods, services)	-4 892 675	-5 959 985
Gross profit (loss)	596 434	614 440
Distribution expenses	-279 468	-316 492
General administrative expenses	-233 543	-221 523
Other operating income	96 677	49 256
Other business expenses	-315	-332
Operating profit (loss)	179 785	125 349
Interest expenses	-30 407	-18 769
Other financial income and expenses	21	19
Profit (loss) before income tax	149 399	106 599
Income tax	0	0
Profit (loss) for the financial year	149 399	106 599

Appendix 3 EPC in ARIS cheat sheet

EPC in ARIS

Cheat sheet

General Information

The Event-driven Process Chain (**EPC**) is a modeling notation to describe business processes. It integrates all relevant business perspectives and is embedded in the overall process landscape.

While Value-added Chain Diagrams (**VACD**) provide an overview on the functional areas of an organization, EPCs are used to detail them on a procedural level.

Core Elements

The EPC core elements allow you to model the procedural sequence of functions within the scope of individual business processes.

Event & Functions

An event describes a state that controls or influences the progression of the process. They trigger functions and are the results of functions.

A function is a task or activity performed to deliver process outputs and support business objectives.

Connectors

Connectors are used to split and join the control flow. Split connectors have one incoming and several outgoing connections. Vice versa for join connectors.

XOR (exclusive or) considers exactly one path.

AND considers all paths.

OR considers at least one path.

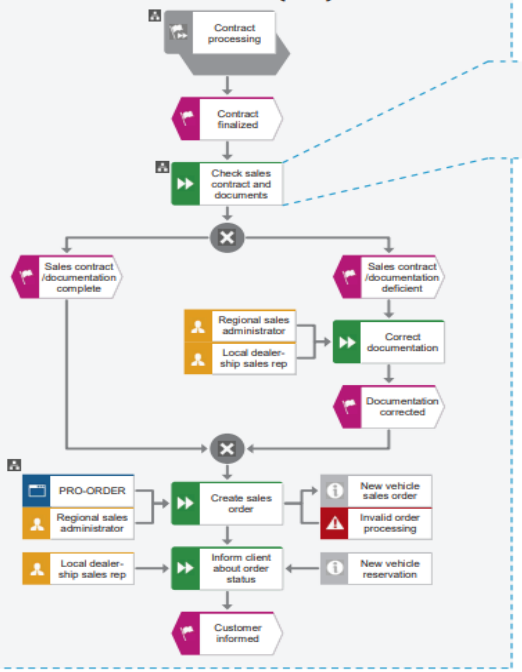
Linking & Hierarchy

Process interfaces link EPCs on the same process hierarchy level and navigate in a horizontal fashion.

Lower-level EPCs can be assigned to functions to describe them on a more detailed level. This provides a deeper process hierarchy level (vertical link).

Value-Added Chain Diagram (VACD)

Event-driven Process Cain (EPC)

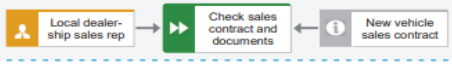


Extend Elements/Satellites

The extended EPC elements allow you to detail the pure procedural description of your business process by integrating data, risks, resources, organizational elements etc. The corresponding objects are called satellites. There are two modeling alternatives:

1. Model the satellites directly in the EPC and assign them to the function to get all information at a glance.
2. Move the satellites to a Function Allocation Diagram (**FAD**) to reduce the visual complexity of the EPC.

Function Allocation Diagram (FAD)



Organization

The organizational unit is a business department, that is involved in a task.

Positions are the smallest organizational unit in a company and are assigned to a single person.

A role typifies individual persons with identical properties such as privileges or responsibilities.

Group of people working together.

RACI/RASCI Connections

The RA(S)CI method enables you to simply describe how organizational elements participate in completing tasks in business processes. The EPC offers different connection types to connect organizational objects and functions:

- *carries out* → **R**ESPONSIBLE
- *decides on* → **A**CCOUNTABLE
- *contributes to* → **S**UPPORTIVE
- *has consulting role in* → **C**ONSULTED
- *must be informed about* → **I**NFORMED

Data & Risks

An information carrier stores knowledge/data.

A cluster is a collection of related entity types and can be used to represent business objects.

A KPI instance indicates the degree of goal accomplishment.

A risk represents the possible danger of a defined process objective not being achieved.

A business policy is a directive, whose purpose is to govern or guide the enterprise.

A requirement is a documented need of what a specific application system, product or service should be or do.

Enterprise Architecture

The application system type is he a software system that is used to support the execution of a function.

An application system represents a concrete, identifiable application system within a company.

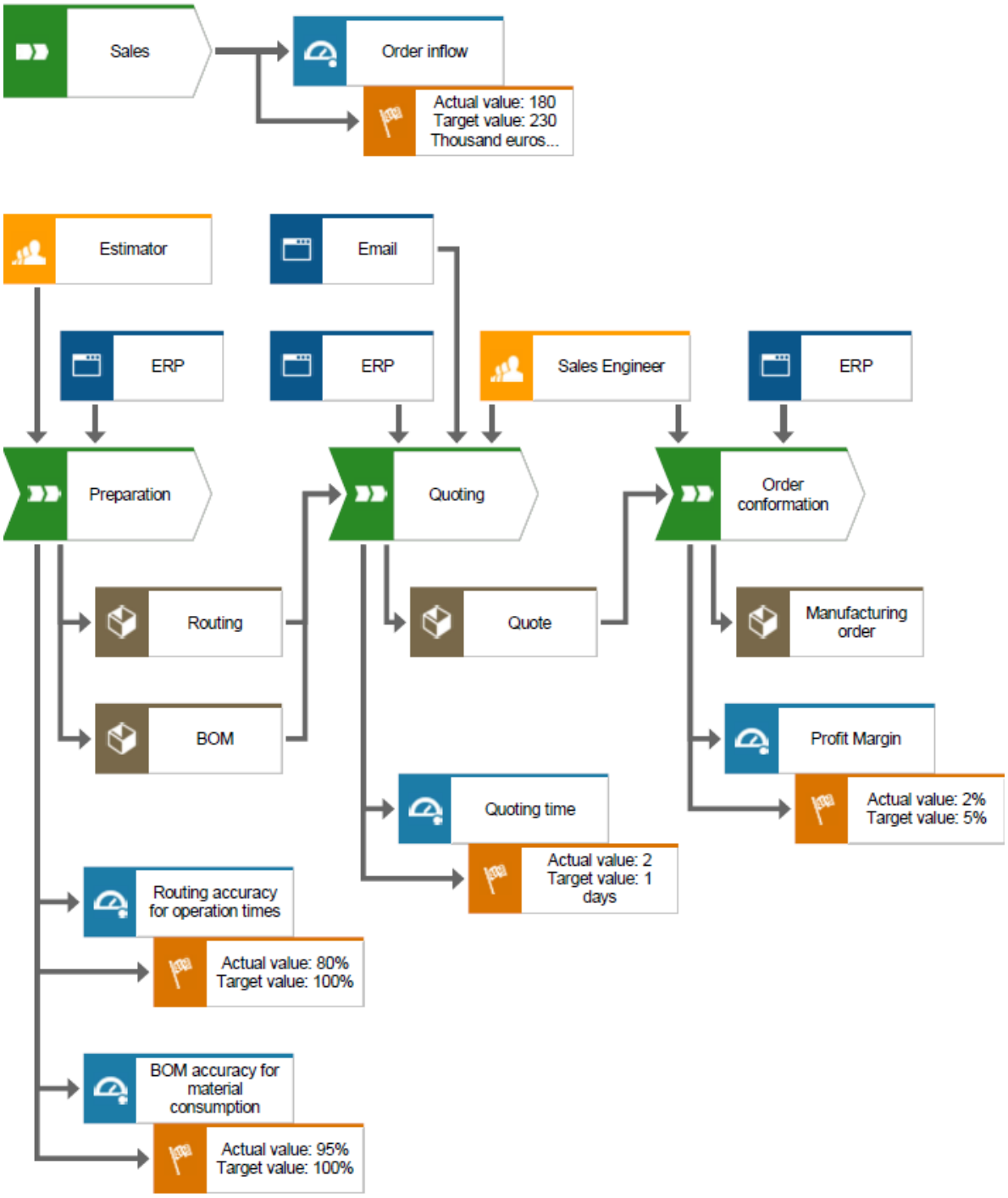
A software robot is an application system type that carries out a function autonomously (RPA).*

An attended software robot is a software robot (RPA) that requires human intervention.*

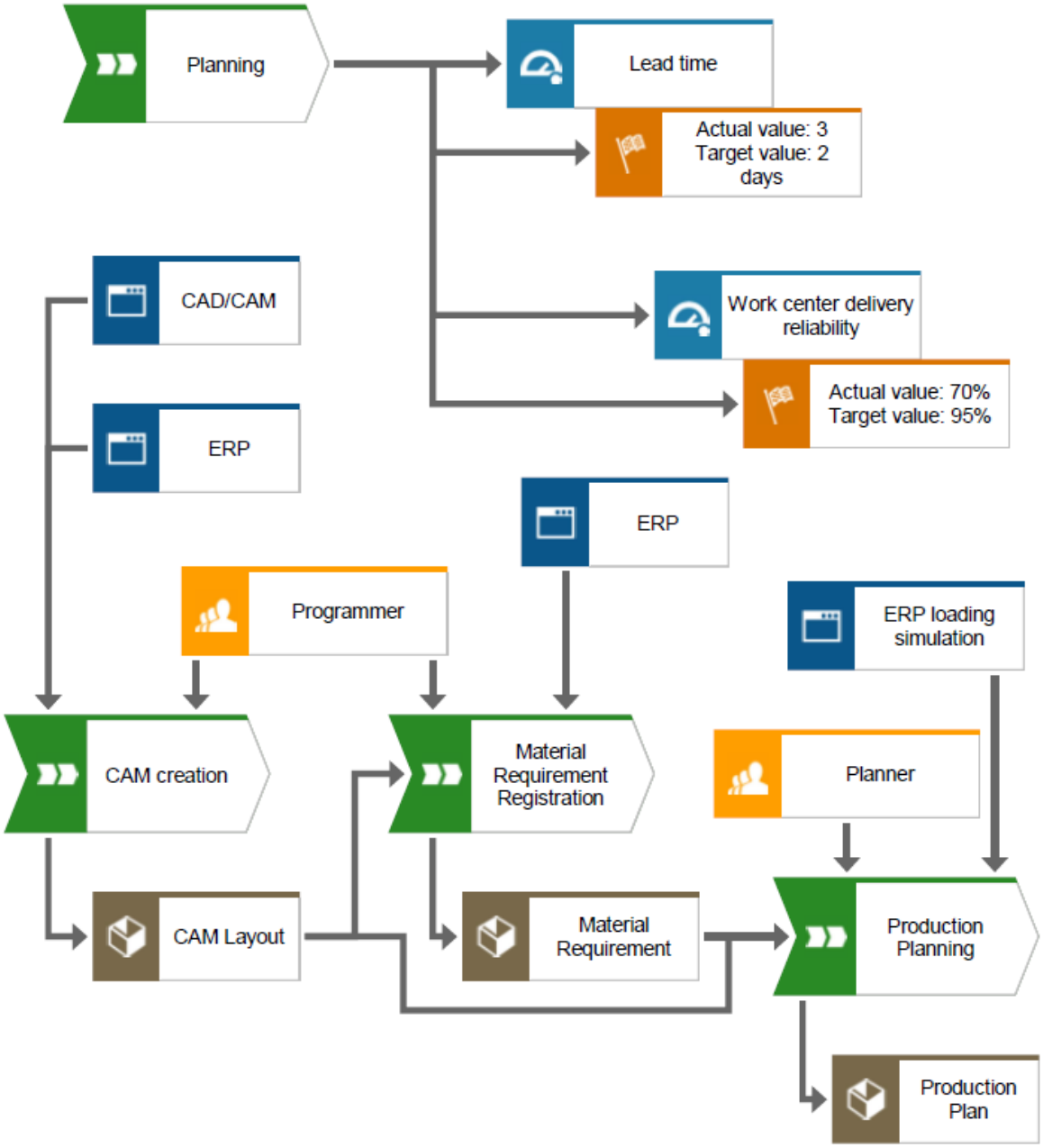
An IoT object represents a type of things that are elements of IoT and have similar properties.

* Available with ARIS 10 SR8 (April 2019)

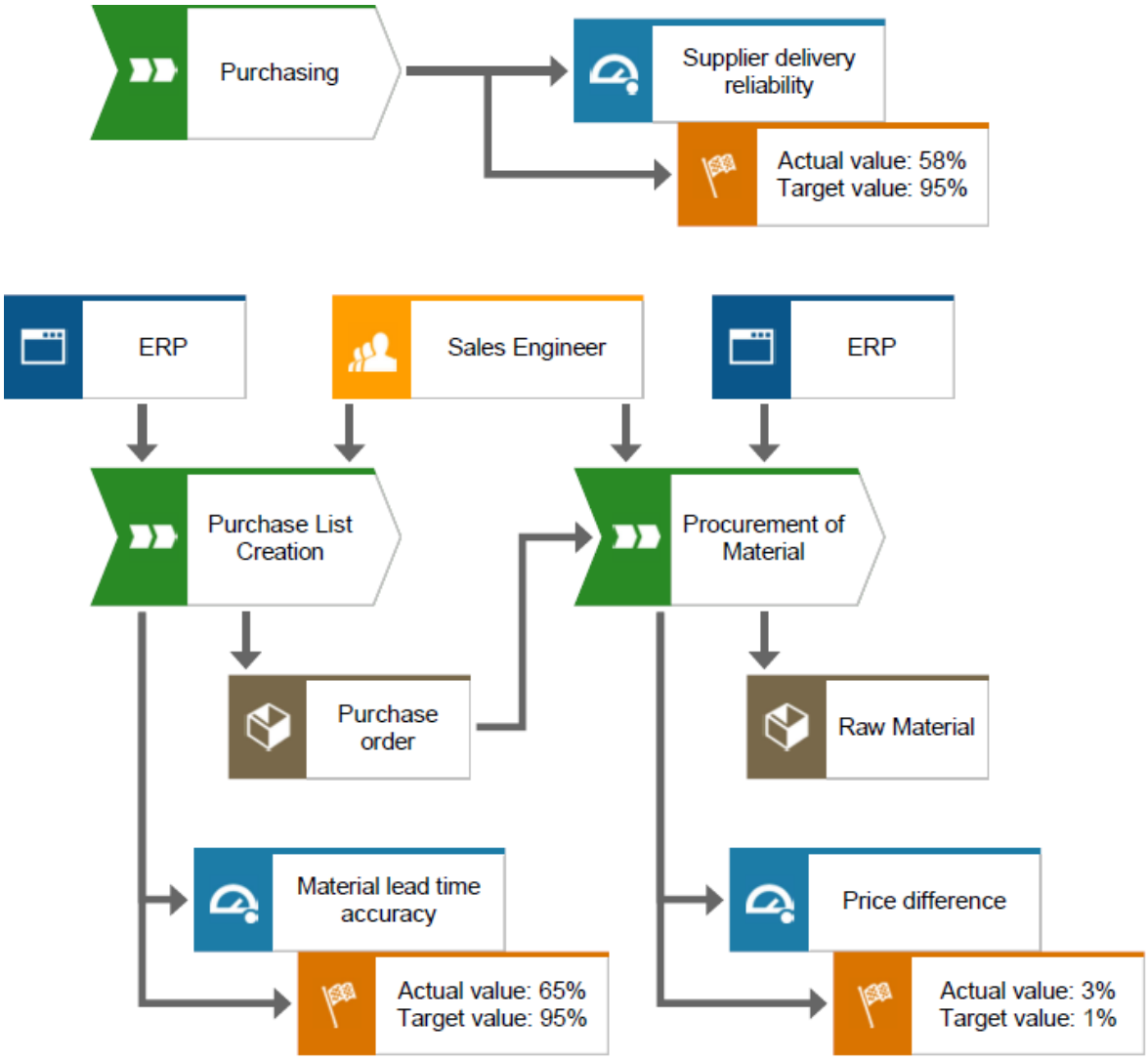
Appendix 4 Second level business process for sales



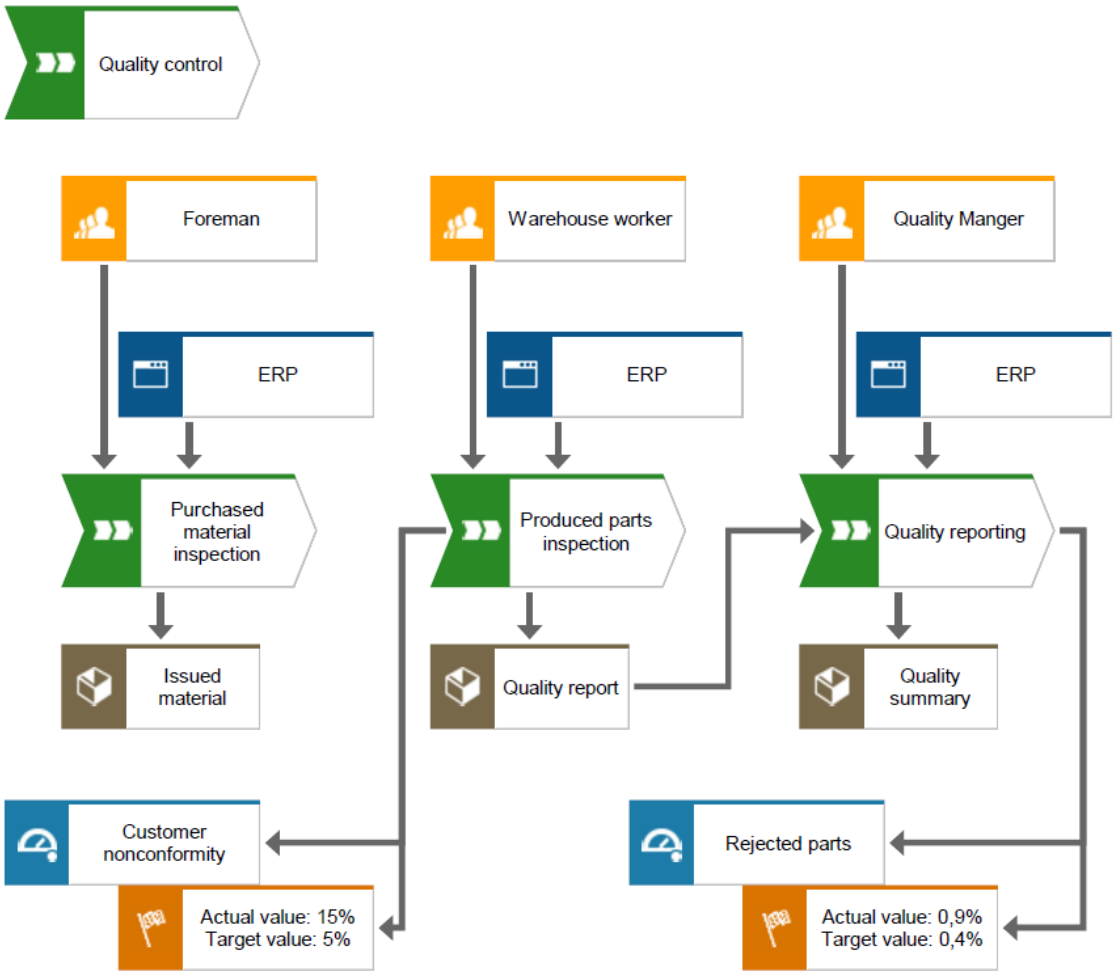
Appendix 5 Second level business process for planning



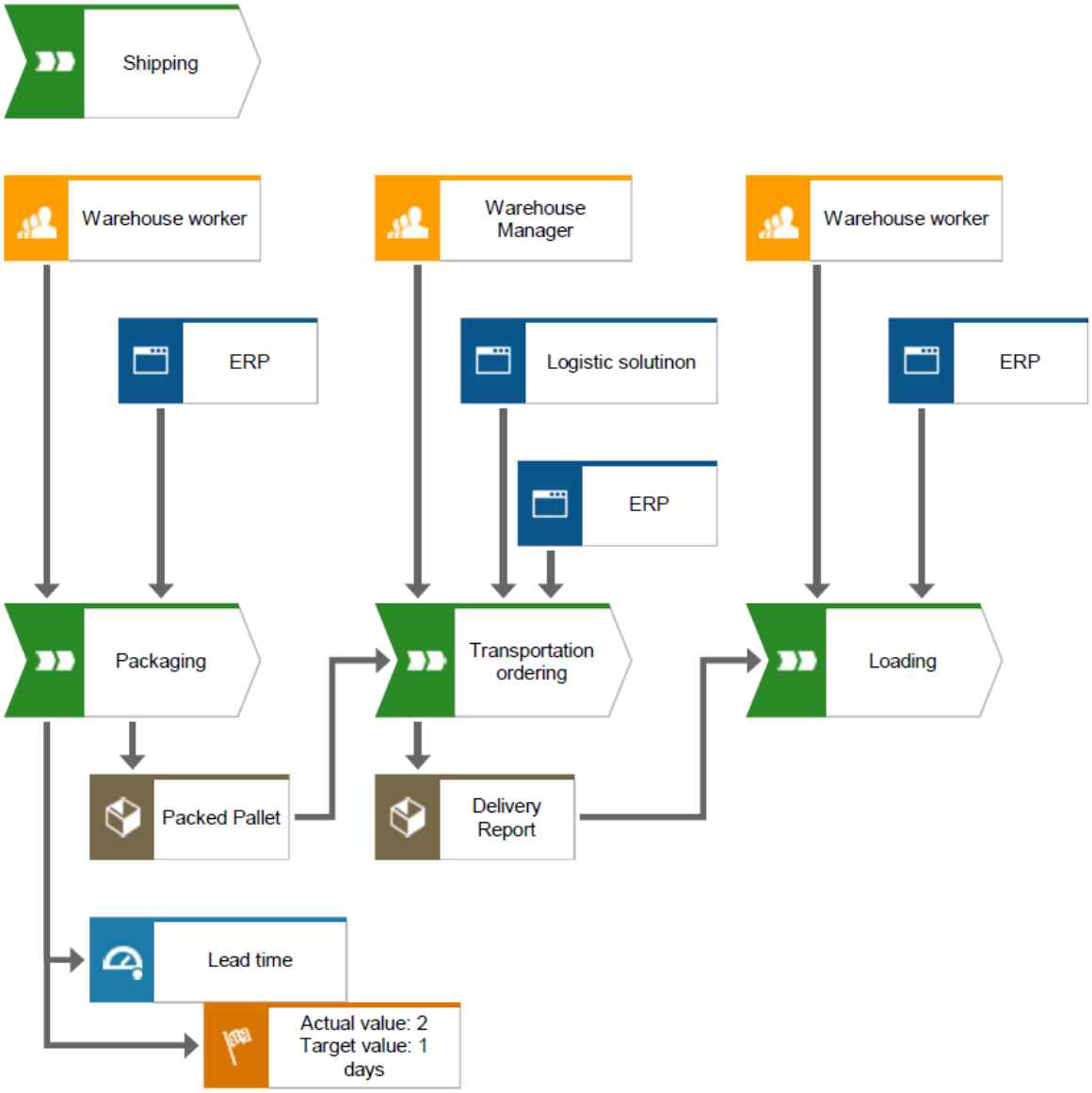
Appendix 6 Second level business process for purchasing



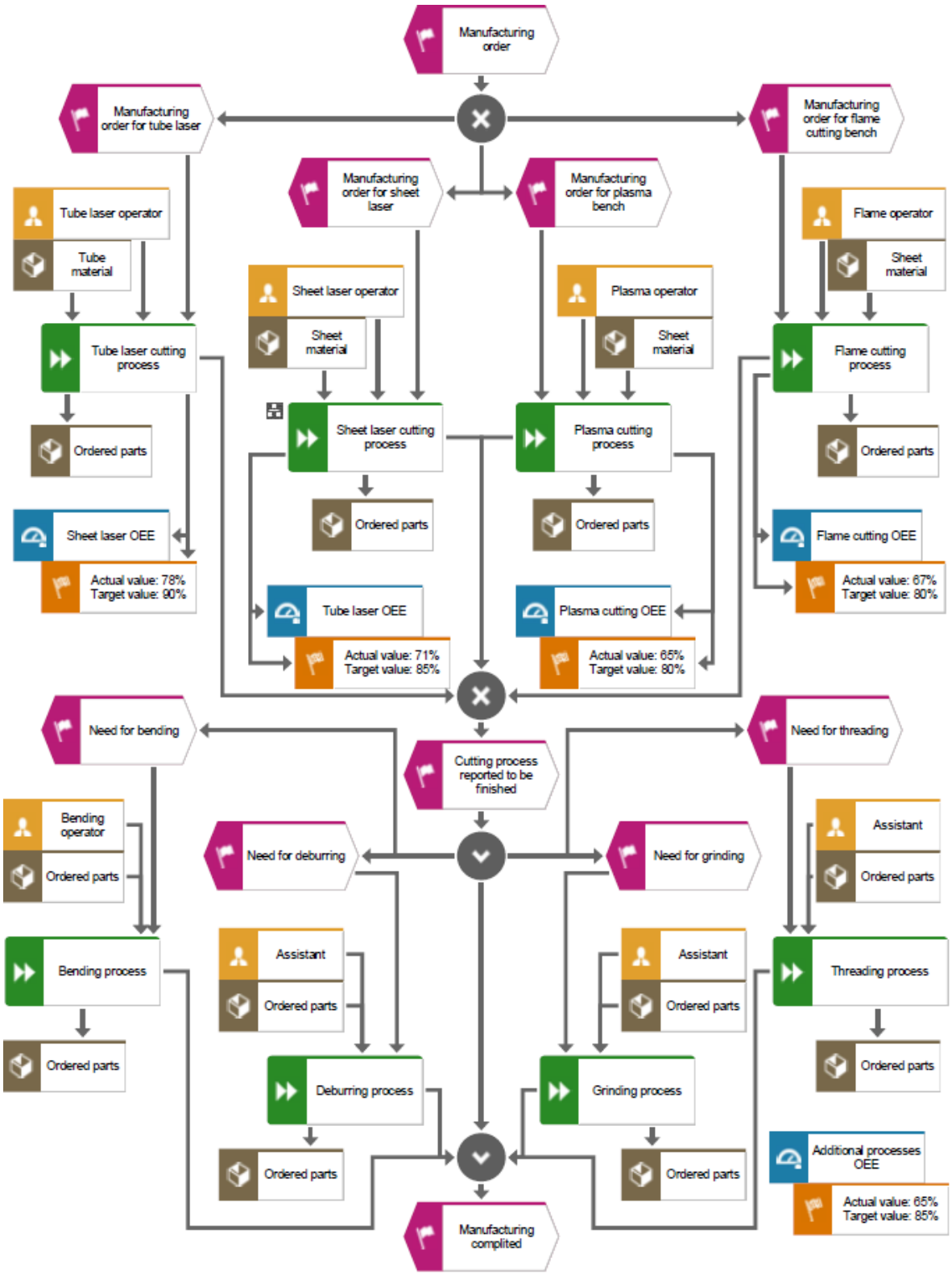
Appendix 7 Second level business process for quality control



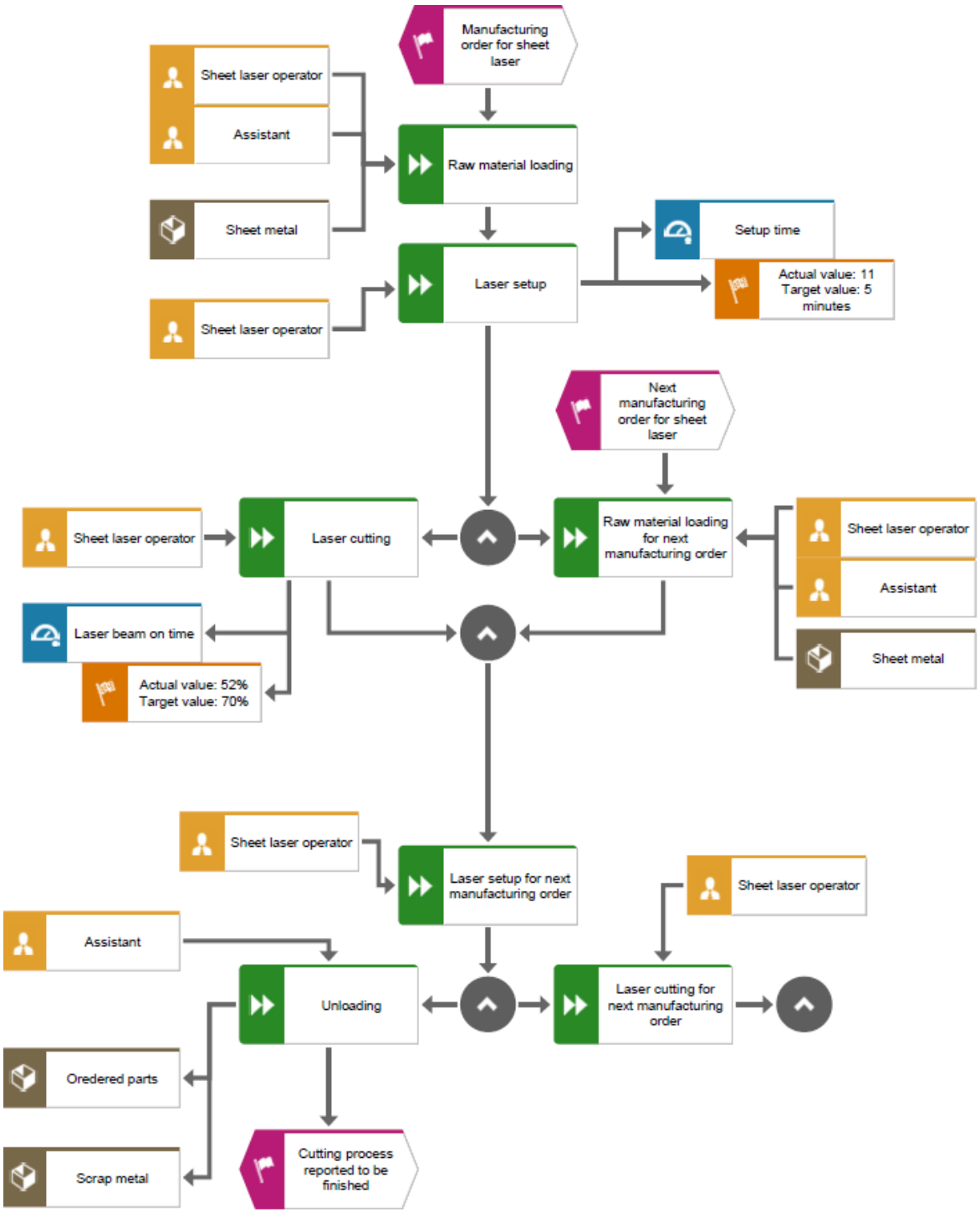
Appendix 8 Second level business process for shipping



Appendix 9 Third level activities of manufacturing



Appendix 10 Fourth level tasks in manufacturing



Appendix 11 KPI tables

KPI Level 1	OTD
How calculated	Actual delivery time vs target delivery time, -5 days, +0 days
Target value	85%
Monitored by	Top Management
Monitoring frequency	Monthly
Take action if	≥ 75 %
Required action	With a help from digital twin find out the bottlenecks, move resources or change lead times.

KPI Level 2 Sales	Order inflow
How calculated	Order inflow in value
Target value	230 000 € weekly
Monitored by	Sales manager
Monitoring frequency	Weekly
Take action if	≥ 180 000 €
Required action	Check the pricing policy, and loading, scan external environment

KPI Level 2 Sales	Routing accuracy for operation times
How calculated	Actual unit time vs calculated unit time
Target value	100%
Monitored by	Estimator
Monitoring frequency	Monthly
Take action if	≥ 90 %
Required action	Finetune routings using data from PMS

KPI Level 2 Sales	BOM accuracy for operation times
How calculated	Actual material consumption vs calculator material consumption
Target value	100%
Monitored by	Estimator
Monitoring frequency	Weekly
Take action if	≥ 95 %
Required action	Finetune material waste coefficient

KPI Level 2 Sales	Quoting time
How calculated	Quote registration vs Quote sent time
Target value	1 days
Monitored by	Sales engineer
Monitoring frequency	Monthly
Take action if	≥ 80 %
Required action	If constantly below more sales resources are needed

KPI Level 2 Sales	Profit margin
How calculated	Production price vs Sales price
Target value	5 %
Monitored by	Sales engineer
Monitoring frequency	Monthly
Take action if	≥ 4 %
Required action	Sales pressure must be increased to hike prices.

KPI Level 2 Planning	Lead time
How calculated	Order arrival vs CAM starting.
Target value	2 days
Monitored by	Planner; Programmer
Monitoring frequency	Weekly
Take action if	≥ 3 days
Required action	Planning list must be prioritized according importance.

KPI Level 2 Planning	Work center delivery reliability
How calculated	Actual delivery vs planned delivery
Target value	95 %
Monitored by	Planner; Programmer
Monitoring frequency	Weekly
Take action if	≥ 85 %
Required action	Daily capacity must be decreased

KPI L 2 Purchasing	Supplier delivery reliability
How calculated	Actual delivery time vs target delivery time, -5 days, +0 days
Target value	95 %
Monitored by	Sales engineer
Monitoring frequency	Monthly
Take action if	≥ 80 %
Required action	Train our suppliers. Send supplier performance report.

KPI L 2 Purchasing	Material lead time accuracy
How calculated	Actual lead time vs target lead time
Target value	95 %
Monitored by	Sales engineer
Monitoring frequency	Monthly
Take action if	≥ 80 %
Required action	Finetune lead times in ERP

KPI L 2 Purchasing	Price difference
How calculated	Actual price vs system price
Target value	1 %
Monitored by	Sales engineer
Monitoring frequency	Weekly
Take action if	≥ 2 %
Required action	Finetune material prices in ERP system

KPI L 2 Quality control	Customer nonconformity
How calculated	Customer nonconformity vs Internal nonconformity
Target value	5 %
Monitored by	Quality manager
Monitoring frequency	Monthly
Take action if	≥ 10 %
Required action	Make procedures to ensure in house defect detection.

KPI L 2 Quality control	Rejected parts
How calculated	Parts rejected vs parts OK
Target value	0,4 %
Monitored by	Quality manger
Monitoring frequency	Monthly
Take action if	≥ 0,6 %
Required action	Make procedures to avoid mistakes from past.

KPI L 2 Shipping	Lead time
How calculated	Actual delivery time vs target delivery time,
Target value	1 days
Monitored by	Warehouse manger
Monitoring frequency	Monthly
Take action if	≥ 2 days
Required action	Resources must be rearranged.

KPI L 3 Manufacturing	Sheet laser OEE
How calculated	Actual cycle time divided by calculated cycle time x 100%
Target value	90 %
Monitored by	Operator; Planner
Monitoring frequency	Daily
Take action if	≥80%
Required action	Report occurred problems to planning, if needed planning needs to configure timings.

KPI L 3 Manufacturing	Tube laser OEE
How calculated	Actual cycle time divided by calculated cycle time x 100%
Target value	85 %
Monitored by	Operator; Planner
Monitoring frequency	Daily
Take action if	≥75%
Required action	Report occurred problems to planning, if needed planning needs to configure timings.

KPI L 3 Manufacturing	Additional process OEE
How calculated	Actual cycle time divided by calculated cycle time x 100%
Target value	85 %
Monitored by	Operator; Planner
Monitoring frequency	Daily
Take action if	≥75%
Required action	Report occurred problems to planning, if needed planning needs to configure timings.

KPI L 3 Manufacturing	Plasma cutting process OEE
How calculated	Actual cycle time divided by calculated cycle time x 100%
Target value	80 %
Monitored by	Operator; Planner
Monitoring frequency	Daily
Take action if	≥70%
Required action	Report occurred problems to planning, if needed planning needs to configure timings.

KPI L 4 Manufacturing	Laser beam on time
How calculated	Laser cutting vs machine turned on
Target value	70 %
Monitored by	Operator
Monitoring frequency	Daily
Take action if	≥80%
Required action	If loading times exceed cutting times, additional help must be requested

KPI L 4 Manufacturing	Setup time
How calculated	Setup time in minutes
Target value	5 minutes
Monitored by	Operator
Monitoring frequency	Daily
Take action if	≥ 10 mins
Required action	Additional help request or ways to improve loading

Appendix 12 Cost of goods sold (goods, services)

Finest Steel AS 2020

Cost of goods sold (goods, services)	2020	2023
Raw materials	3 028 672	6 632 792
Energy	106 006	232 153
Electricity	91 265	199 870
Thermal energy	9 998	21 896
Fuel	4 743	10 387
Water supply services	3 311	7 251
Subcontracting	177 098	387 845
Transport costs	36 468	79 865
Rent and lease	171 430	171 430
Travel expenses	0	10 000
Training costs	4 952	10 845
Labor costs	778 076	1 167 114
Depreciation expense	458 582	500 000
Equipment maintenance and repair	76 329	167 161
Low-value assets, tools	5 440	11 914
Insurance costs	5 535	6 000
Other	40 776	89 299
Total cost of goods sold (goods, services)	4 892 675	9 705 821