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Investment Decision Making

Case Muuraus Nahkala Oy

Anssi Juntunen

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Abstract

The topic was assigned by the masonry company Muuraus Nahkala Oy which had an idea of investing in their own transportation fleet for the lifts and container housing for the workers on the construction sites. So far, they have been buying these services from service providers. The aim of the thesis was to determine how much investing in their own equipment would require capital and what the desirable cost savings would be in the long run.

The basis for the theory consisted of cost and investment accounting and what to consider when investing in new equipment and personnel. The results were supported by sources that covered the areas of bookkeeping and financial management. Finally, the fields and numbers in an excel table were selected to match with the views in practice.

As a result, the case company was provided an excel table where the factors and formulas were set up in a way that they could provide accurate figures as long as the entered data was correct. The biggest cost factors were also analyzed as well as their impact on the final figures.

Another goal, which was to determine how much savings would be achieved by investing in the company's own equipment, could not yet be determined due to the fact that with the current amount of purchased services, there was no need for the investment. However, potentially in the future this need will arise.

Keywords/tags (subjects)
Cost accounting, investments

Miscellaneous (Confidential information) **The thesis does not include confidential information**

Contents

1 Introduction

For a short term or in fluctuating economic situations, outsourcing services are necessary and sometimes a vital action for companies to control their costs but in the long run, depending on the nature of the needs, investing in the companies' own equipment is expected to provide savings. These savings can then be directed to some other business areas or to increasing profitability. Once a company has an idea of how they could improve their cash flow and productivity, they need to calculate the profitability of the investments, which means that capital is bound to certain activities in the beginning but will pay itself back with an interest later. In order to keep the desired activities profitable, investment accounting is a necessity. Thus, the investment calculations will tell us how much capital is needed and how the future cash flows are affected over time. (Vehmanen, 2008.)

A careful planning of investments is vital for determining the costs because they can be difficult to change in the execution phase. Investment accounting is especially important in cases where multiple options are being considered and they need to be rated. It is recommended to estimate the profitability by using at least two of the five common accounting methods, which are Present Value, Annuity, Internal Rate of Return, Return on Investment and Payback Period. (BusinessOulu.)

The aim of this research was to generate information and provide an accounting model for a masonry company to help in decision making and learn how much capital will be needed for investing in a transport fleet and transportable housing for construction sites. Specifying the cost factors and how they might change during the lifetime of the investment is vital since they play major roles in deciding whether to invest capital in new assets or not, which is why the investment needs to be examined as a whole and not only the initial costs.

1.1 Company presentation and needs

The company is called Muuraus Nahkala Oy, and their headquarters is located in Southern Ostrobothnia, Alavus. in 2018, they employed 26 and in 2019, around 30 people full-time. They primarily work on the building sites in Finland but sometimes also in Sweden and Norway. Since their establishment in 2010, the company has done brickworks for various projects, for instance housing, hospitals, schools and fire stations.

This research topic was first presented by the company, so that it was safe to assume that they had been purchasing transportation services for their work equipment constantly for many years, which had made them see that acquiring own transport equipment could provide cost savings after a certain period of time and the savings would decrease the cash outflow, and, thus increase profitability. The length of this period depends on the price of the possible truck and the payback time for it, the salary costs for the worker(s) operating the vehicle and factors that affect the variable costs, such as development of oil prices and driven kilometers. Moreover, the accommodation services are a potential factor for cutting costs, and thus, having transportable housing for the workers on the construction sites was presumed to benefit the company in the long run. Another driver for being able to reside at the actual workplace was learned from the employees themselves that eliminating travelling between the site and accommodation would boost their work motivation. These two different investment proposals were also expected to serve each other, meaning that the workers' housing could be transported with the same truck as the machines, thus increasing the utilization rate of the truck to be as high as possible.

Since the topic was to study whether acquiring the company's own trucks and transportable housing would create less costs in the long run compared buying these services from an outside provider, the cost saving would be the difference between the total costs that the operations, maintenance and usage of these acquisitions create and the price of the services from third parties in favor for acquiring the company their own equipment. In other words, the purpose was to examine how much the

company would “pay” to itself for the services and what a viable payback time for these investments would be. The study also observes some of the potential risks that should be acknowledged when making a remarkable investment.

1.2 Research implementation

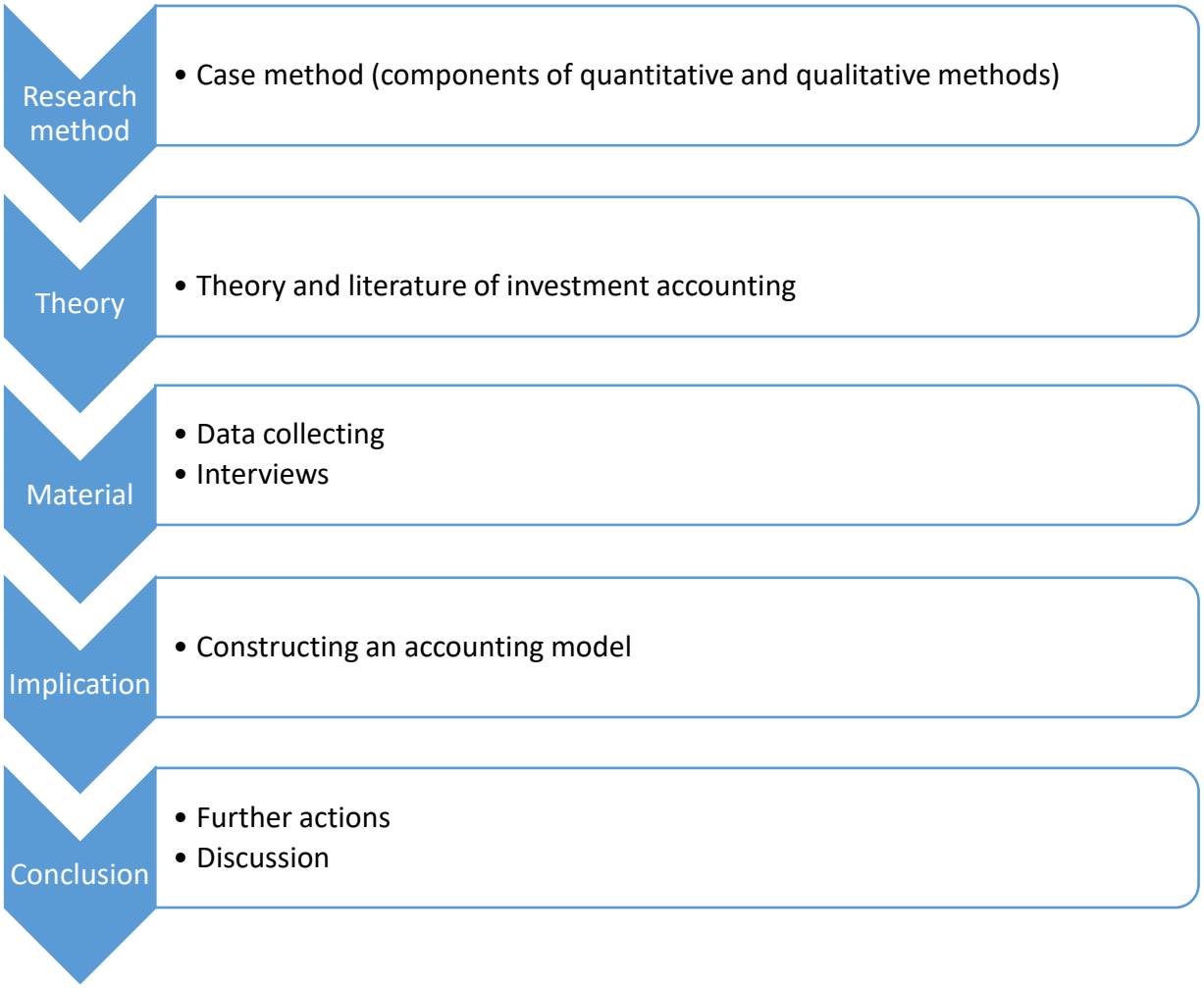
Research Questions

In order to build an understandable and thorough study of the topic and to reach the desired outcome, the following research questions were set to direct the course of the study:

- **What is the cost of current situation and the factors behind the model?**
  The purpose was to build a thorough picture of the company’s current cost structure and specify the cost factors so that the investment plan could be detailed and eliminate as many uncertainties as possible
- **What cost factors need to be considered in the investment and in the future?**
  The needs of the company had to be clear so that the desired investments can fulfil their purpose with little changes during the process and over the lifetime. Moreover, it had to be clarified how the costs would be affected once the outsourced service was turned insourced.
- **How to compare old and the new system and other necessary aspects to take into account in order to control the costs?**
  Since the old system was an outsourced service, the detailed cost structure of the old model could not be expected to be exact, but since we had the information how much it had cost in total and what services had been provided, the new model was given a target which it should reach in order to be profitable. The following model I have visualizes the step by step process of how the study was conducted.

Research process

The following process chart describes the content of the thesis



Research method

This study was best conducted with a case study method where components of quantitative and qualitative research method were involved because the topic concerns only one company that had their own key figures and because it was studied as an individual entity (University of Jyväskylä, 2015). A quantitative method generally answers to questions “how often” or “how many” and the end results are presented

in numerical form (Vilkka, 2007). A quantitative study leads to a deductive analysis where a generalized idea is applied to an individual instance, so that is approached by theory testing (Patzelt n.d.; Tampereen ammattikorkeakoulu, 2017). A qualitative method is included in this research because some of the features on the investments needed to be analyzed and their practicality and usefulness considered although most of the source material and data were processed with mathematical models. The outcome of the calculations are considered as the desired information. (RajatOn, 2015.)

Theory

The theory part was built to support the financial analysis and decision making regarding the investments. The principles behind the factors of the calculation models are explained, what information they were expected to produce and how it should be interpreted. The theory also assisted the author in recognizing the essential factors for the material part where the data from the company was needed. Some investing models are also provided to give an example of what the end result of this research was expected to look like.

Material

The background material in the project consisted of the financial numbers of the case company and an interview of the entrepreneur who presented his expectations and desired features for the investment proposals that were studied. The current state analysis provided a comparison of what was changed and how the numbers are affected. The numerical data of the company was collected and filtered according to the calculation models presented in the theory part, meaning that only the numbers that are connected with the future investments were used.

Implication

As an outcome of the research, a calculation model is presented in the thesis where the economic factors are taken into account and how the investments as a whole can

be carried out in a way that the company is able to maintain its financial capacity and operational performance. As the calculation is still an estimation, keeping track of the operational costs is vital so that other unnoticed cost factors can be taken into account.

Conclusion

The last part the research gives a final overview of how the produced information meets the needs of the company and what factors they should consider when weighing different investment options. Further development ideas and views on the investment are presented and how they could be developed if the company wanted to consider investing in the equipment even if the final numbers would not seem to permit it at first.

2 Cost accounting and Investments

2.1 Investments and bookkeeping

Keeping track of costs is vital for every organization. The information provided by cost accounting gives the management and experts crucial information about how to develop production or production related decision making. The Costs can also be about customer profitability. By using the matching principle, the purpose of cost accounting is to determine costs for products and services, cost centers, processes and activities, clients and projects. Since costs are to be tracked constantly during the accounting period, the company needs to have a system to provide up-to-date financial information of the enterprise. (Laskentatoimi 2015, 196.)

Proctor (2002, 141) suggests that the decisive factor depends on the variable costs of the product. If the price is below the variable costs for producing it, then buying is a viable option. Another point of view is that the company should consider in the decision making instead of only the price is supply reliability, quality, price development

in the future and changes in the business environment, such as contracts and how troublesome it would be to go back to previous production method.

2.2 The Matching Principle

In order to receive specified and precise data of the costs of the company activities, especially from an individual product or some other expenses caused by the object under accounting, the expenditures are categorized based on matching principle (Eklund & Kekkonen 2011, 42). The matching principle means that the accounting object is directed only the costs that are caused by it. According to this definition, only the costs related to a product or service can be accounted for in the total costs of the company. Direct costs can clearly be connected to a product or service, but the matching principle needs to be taken into consideration with indirect costs. Furthermore, the costs are classified based on whether they are common with all the other company activities or only caused by a specific object. The shared costs remain the same despite varying production, but the costs of a specific object will change with the production rate. (Eklund & Kekkonen 2011, 42.) Correctly done accounting beforehand helps adjusting production rates to match with the costs (Tenhunen Tilisanomat 2013).

2.3 Variable, fixed and total costs

All the costs of the company's activities are variable or fixed costs. They are categorized using this principle. (Eklund & Kekkonen 2011, 42-44.) The Fixed costs remain the same despite having production or not. The Variable costs change according to activity rate and volume. The more production, the greater the variable costs. The following figure presents the increase in total costs in relation to the production while the fixed costs remain constant.

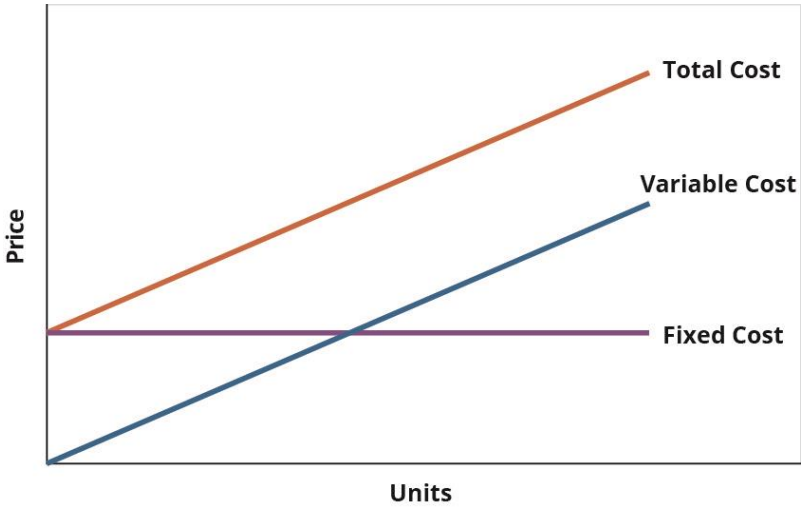


Figure 1: Variable, fixed and total costs (Graybeal;Franklin;& Cooper)

In cost accounting, the expenses are always calculated without value added tax, they are estimations and generally cover one year. The pricing of transports is usually based on cost accounting, experience, preset prices or market prices. With the bookkeeping, one can check retrospectively if the activity is profitable or cost efficient. The core purpose is to calculate costs per unit. In transportation, they can be for one kilometer, an hour, per pallet and so on. This information is then used in calculating profitability and in operation planning, such as route optimization or comparing working methods to determine optimal performance. (Tavaraliikenneyrittäjä 2019, 178.)

Tavaraliikenneyrittäjä (2019, 179) presented 3 essential factors to be considered in cost accounting:

- **Capacity** meaning the maximum amount of deliveries or production over a period of time
- **Activity rate** meaning actual delivery amounts or production over a period
- **Activity ratio** meaning actual deliveries or production compared to the capacity, shown as percentage, 100 % meaning all the capacity is in use.

Fluctuations in the activity ratio have a great impact on unit costs especially in case where the fixed costs cover a major part of the overall costs. In order to maximize profitability, it is vital to use all the carrying capacity of the equipment, maximize truck and machine usage and keep non-active days to minimum. (Tavaraliikenneyrittäjä 2019, 179.)

When a company seeks cost reduction for services or products, it needs to either invest more efficiently in acquisitions or boost activity rate and furthermore, the activity ratio. Once the activity rate is increased, more production volume is added while the capacity remains unchanged. This causes increase in the variable costs, but fixed costs are the same. Should the demand go down, the activity rate needs to be lowered, resulting in less variable costs. All the realized fixed costs are shared along the production, meaning that the production volume will affect the fixed pricing unit. The higher the production rate, the lower the cost per unit. (Eklund & Kekkonen, 2011, 46.)

The Fixed unit costs are calculated by dividing total fixed costs with the production volume. The unit costs can also be divided into fixed unit costs and variable unit costs. The production volume is divided with either the total variable or total fixed costs based on whichever needs to be determined. (Eklund & Kekkonen 2011, 48.)

2.4 Break-even

Higher sales are directly proportional to increases in total contribution, and less costs remain to be covered as shown in figure 2. The break-even is the point where a company has covered the costs of its activities but has not yet produced any profit. After this critical milestone, the company starts making profit from the sales. (Proctor 2002, 112.)

The company's results and management are evaluated with contribution accounting. Short term decisions can also be supported by this method. (Laskentatoimi 2015, 151.) For contribution calculation, the costs are divided in fixed and variable costs.

First a **gross margin** needs to be determined. Gross margin is the difference between the sales revenue and variable costs. This number tells how much is left (contribution) when the variable costs have been deducted. It also needs to cover the fixed costs and the desired profit. (Laskentatoimi, 2015, 152.)

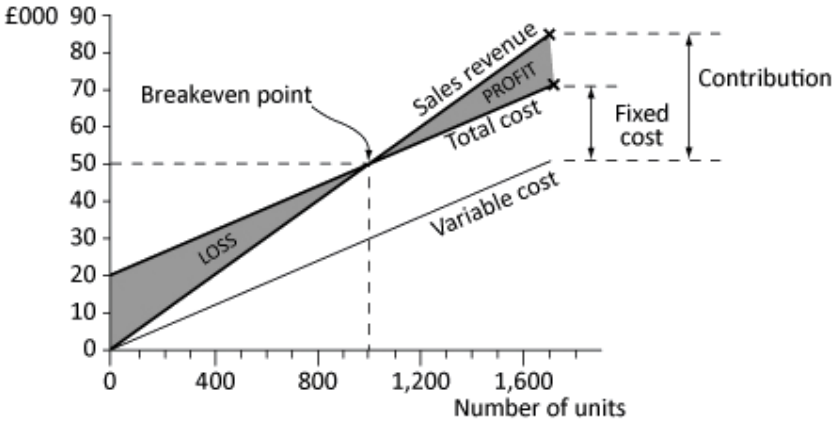


Figure 2: Break-even and total contribution chart (Kaplan)

The gross margin is

$$Gross\ margin\ (GM) = sales\ revenue - variable\ costs$$

With this result the gross margin or contribution ratio can be calculated

$$GM\% = \frac{GM}{sales\ revenue} * 100$$

Gross margin ratio tells how much sales revenue is left after all the variable expenses have been deducted. This number should also cover the fixed costs and the desired profit.

The point where the amount of sales revenue breaks even is called the **Critical Point**. This factor can be calculated in two different ways:

$$Critical\ point\ (CP) = \frac{fixed\ costs}{GM\%} * 100$$

Where the result is the number of euros.

$$Unit\ sale\ price * X - Variable\ unit\ costs * X\ - Fixed\ costs = 0$$

Where X is the critical point or the amount of sales.

The critical point is a useful figure in decision making, for instance, in estimating risks. Should the sales reach this level, the risk for loss is low. In other words, higher sales after the critical point equals better profitability of the company. (Laskentatoimi 2015, 153; Toiminnan Kannattavuus 2011, 68-69.) Finally, an important factor that the entrepreneur needs to be aware of is the **safety margin**. This figure tells how much the realized sales have exceeded the critical point. A safety margin percent has the same meaning in percentages.

$$Safety\ margin\ (SM) = Actual\ sales\ revenue - Critical\ Point\ (CP)$$

$$SM\% = \frac{SM}{Actual\ sales\ revenue} * 100$$

2.5 Defining the need for investments

Planning the investment carefully is vital because they will affect the profit of the company for several years ahead. Once a company decides to acquire something in its possession, such as land, equipment or licenses, they are recorded in bookkeeping as tangible or intangible assets and bind company's capital for long time. Bookkeeping legislation and regulation require specified calculations and records for fixed investments, which are referred to as "fixed asset bookkeeping". Detailed annual fixed

assets, acquisitions, sales, depreciations, and scrapping values are logged in this part of bookkeeping. (Eklund & Kekkonen, 2011, p. 113.)

The purpose of investments is to produce more sales income or to improve cost reductions. Investment calculations are supposed to ensure the profitability of the investment before they are acquired. For the investment to be profitable the revenue needs to be greater than costs. (Eklund & Kekkonen 2011, 113-114.)

The long-term profitability information is provided by investment calculations. It is crucial to estimate the initial data as precisely and realistically as possible, but since they are estimations, the end results are directional. (Laskentatoimi 2015, 230)

2.6 Funding the investment

Sometimes the cash flow from the sales is not enough to fund the investments. For the company to be able to invest in developing their business, the capital for the investment can be from the existing or new owners of the company. New owners can be investors who expect revenues according to the amount they have placed in the company. The resources of the company are increased when the owners add capital to the company and when the owners are being paid their share of profits, the resources decrease. (Eklund & Kekkonen 2011, 113.)

2.7 Interest Rate And The Cost of Capital

In many cases the investment needs to be funded with company's own capital and/or borrowed capital (Laskentatoimi 2015, 230-231). The factor known as the imputed rate of interest is used in investment calculations to find out the weighted average cost of capital. Corporate tax rate is usually included calculating the cost of

capital because the deductible interests have a significant impact on the result. The Weighted Average Cost of Capital (WACC) is calculated with the following formula:

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - T)$$

Where

E	=	Equity (own capital)
D	=	Debt (liability, borrowed capital)
V	=	Total market value of the capital (E + D)
Re	=	Equity profit expectation %
Rd	=	Liability profit expectation %
T	=	Corporate tax rate

Since there is always some uncertainty in the calculations, it can be worked around by using a higher interest rate with investments that have a greater risk (Laskentatoimi, 2015, 231).

2.8 Present Value, Net Present Value and Payback Period Methods

Eklund & Kekkonen (2011, 113-115) presented two methods for calculating investments which are the payback period (PP) and the present value (PV). The result of the PV formula is the future net revenues converted to the value of money today.

The following factors need to be considered when calculating profitability of the investment.

Acquisition cost is a one-time expense, which is generally created before the acquired equipment has been taken in use. Acquisition cost include all direct costs

caused by the acquired product, such as the price of the investment, possible transport, insurances and training costs.

The economic lifetime of the investment is the period which the acquisition is expected to serve. The time is affected by, for instance, how long the equipment is supposed to function, when the technology needs to be upgraded or how quickly the acquisition cost is expected to be pay itself back in terms of net income or cost savings.

Running gross revenues of the investment are annually counted as the increase of income sales revenue for the whole duration of the investment. The sale volumes and prices determine the sales revenue. Growth of the sales revenue might be challenging to estimate due to demand fluctuations, competition, and general development of the economy.

Running costs of the investment are caused by the usage and maintenance of the investments, such as salaries, service, parts and financing costs.

Net revenue of the investment is the difference between gross revenues and costs. Net revenue can also be a cost saving and then the term to be used is a **net saving.**

The residual value of the investment is the estimated value after the useful lifetime of the investment has passed.

The time value of money and expected revenues are considered as **internal interest rate**. This actor is used to transform the future earnings to present value by discounting. Interest rate is generally decided by the company, as desired expected earnings.

Formula for PV is presented as following:

$$PV = \sum_{i=1}^{n} \frac{CF_i}{(1+r)^i} = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \cdots + \frac{CF_n}{(1+r)^n}$$

Where

CF	=	Cash flow (annual net revenue)
r	=	interest rate
n	=	economical lifetime

On calculating the present value of the investment, the net savings or the net revenues earned during the lifetime of the equipment are being discounted to match today's value and the result is being compared with the acquisition cost. Thus, the total discounted net earnings or savings must be above zero to cover the investment costs. In budget calculations, discounting can be replaced with an annual cost level and a sale price increase when annual profits and costs are expected to rise a certain amount. (Eklund & Kekkonen 2011, 116-119.)

More simple method to calculate time for the investment pay itself back is to use the Payback Period formula which is the following:

$$PP = \frac{Acquisition\ cost\ of\ the\ investment}{annual\ net\ income}$$

The result from this equation is the time after which the investment starts producing profit. Should the payback period be more than the initial desired or expected lifetime, the investment will create losses. Due to the fact that the formula ignores the inflation, generally this is the first computation done when planning the investment and is suitable for short term acquisitions. Every company is obliged to bookkeeping and, thus, have to create a balance sheet to present the financial status of the fiscal year. (Eklund & Kekkonen, 2011, 120-121.)

Net Present Value (NPV) (Laskentatoimi, 2015, 234) is the most recommended method to calculate investment profitability by its theory. It is also applicable in situations where annual cashflows alternate. Compared to the PV method, the NPV formula tells the difference of the present value of the expected net cash flows and the acquisition cost for the investment.

The formula for NPV is:

$$NPV = \sum_{t=1}^{n} \frac{NCF_t}{(1+r)^t} + \frac{I_n}{(1+r)^n} - I_0$$

Where

NPV	=	Net Present Value
NCF	=	Net cash flow
I_0	=	Acquisition cost (initial investment)
I_n	=	Residual value of the investment
n	=	Economical lifetime of the investment, in years
t	=	time
r	=	discounting interest

Should the present value of future net cash flow provided by the investment be greater than the acquisition cost, the investment is worth considering carrying out (Laskentatoimi 2015, 235).

The basic idea behind the NPV is that the value of upcoming earnings and expenses is smaller today than in the future. In case of having generated the profit earlier, the cash could have been invested again. Should the expenses have been produced today, the company might have had to take a loan and pay interest charges. (Laskentatoimi 2015, 235.) According to Tomperi (2018) the profit or savings can then be used either to improve company's profit margin or invest in other business areas.

2.9 Internal Rate of Return

The internal rate of return, IRR, is a figure that tells the profitability of the investment as a percentage number, which is easy to compare with the interest rate defined by

the company or the loan interest. The IRR can be calculated with the NPV formula by setting the target of the NPV as zero. (Laskentatoimi 2015, 237.)

$$\sum_{t=1}^{n} \frac{NCF_t}{(1+IRR)^t} + \frac{I_n}{(1+IRR)^n} - I_0 = 0$$

If the company wants to compare several investment options, the most profitable is the one with the greatest internal interest rate (Laskentatoimi 2015, 235).

2.10 Cash flow

The cash flows for the investments are accounted as the remainder of the cash inflow and the cash outflow created by the investment. The cost savings or increased revenues from the sales generally create cash inflow. On the opposite, cash outflows are costs of raw materials, salaries and other various fixed costs. (Laskentatoimi 2015, 240.)

According to Jormakka, Koivusalo, Lappalainen and Niskanen (2015, 240), the net cash flow of the investment is determined by subtracting the following factors from the annual cash inflow of the investment:

– Annual cash outflow of the investment
– Taxes
+ Tax benefits from amortizations
– Initial investment
– Investment in working capital

The difference of cash inflow and outflow determine the amount of taxes, which again is compensated with the benefits of amortizations.

Working capital consists of receivables (sales), inventory and liabilities (purchases). According to Tomperi (2018) liquidity and the cash reserve should also be added in working capitals. The company must be able to cover costs, such as the rent, salaries and so on, worth of one or two months due to the reason that they usually need to be paid before the company gets its receivables from the clients. Should the customers pay their liabilities as soon as possible, the company would have less need for working capital; the best option for the entrepreneur is to receive the payments in cash rather than selling with credit. On the opposite, long payment terms and credits for the company itself are beneficial. Capital is also tied in the inventory, thus aiming for as small inventory as possible is recommended. These factors are categorized in table 1.

Working Capital	Cash inflow	Cash outflow
Receivables Liabilities Inventory Liquidity	Tax benefits Receivables	Initial investment Annuities Interest charges Taxes Liabilities

Table 1: WC, cash in- and outflows

3 Factors to consider before investing

In this chapter I will go through what factors the investor should consider when planning of investing capital in new assets. The most challenging part to get correct in the beginning of the project are the value estimations that determine the profitability of the investment (Tyni, 2007). Due to this, **a sensitivity analysis** is recommended to have in order to inspect how strongly the profitability of the investment is connected to its initial values.

Once a company makes an investment into a new equipment, it is given an estimation of how many years it can be used and what is the **annual depreciation value**.

This value again is used for amortization in taxation, which again affects the net income and the annual cash flows of the company. The higher the initial costs for the investments the longer the company would naturally like to use the equipment for its operations. According to Antikainen (2018), the deduction in taxation can be done at once if the economic lifetime of the investment is no more than 3 years. Since 1st of January 2016 the current bookkeeping law allows maximum of 10 years for amortizations instead of the previous 20 years unless the lifetime can reliably be estimated to be longer. The **scrap value** of the investment is the sale value after the useful lifetime. Should this number be negative, the disposal generates costs (Tenhunen, 2013).

In transportation sector, the **energy costs** have the biggest impact on how efficient the operation is. According to SKAL (2017), the price of diesel contributes to approximately 21% of all operational costs.

In case the investment requires hiring new personnel, depending on the nature of the job, the **training** can take up some time before the worker can be viewed as productive. Well planned training lowers the risk for work related accidents when the worker to has been taught properly to use the equipment and how to operate them on the field (Työturvallisuuskeskus).

Scheduling the maintenance for the equipment is vital to plan ahead as well as possible. With a preventative maintenance the risk for unnecessary and unexpected breaks can be lowered and keep the equipment in production. (Promaint, 2017; Opetushallitus.) Vuorenmaa (2015) explains in his thesis from 2015, referring to Mikkonen (2009) that **maintenance costs** are generally evaluated by the costs and the length of the outage in the company, which leads to thinking that maintenance is only an expenditure that should be avoided. A proper maintenance on the opposite helps to keep the upkeeping costs low and the operation itself reliable.

Petriina Luukkonen (2013) presented the importance of the **warranty** for new investments and how it is vital to have clearly stated conditions; when the warranty will cover the damages for the investment. In cases where the conditions are unclear

a supplier may show lack of experience and knowledge they have of their product, and due to this, they might drop out of the selection process. Furthermore, it is not useful to have warranty longer than the planned useful **life time** of the equipment, because then the investment is already decided to be replaced or scrapped.

The **initial price** of the investment, where the forementioned factors are taken into account, is determined by how much of it is covered with debt and interest charges. Here, it is important for the company to estimate a plausible internal rate of return that covers the costs and liabilities owed to the creditors. (BusinessOulu.)

Examples of investing models

Investments are a common topic in various researches, where the profitability, or the lack of it, is being mathematically determined before any capital is being actually invested. Erholm & Keränen (2012) made a model for a case company and presented their outcome in Table 2. The model itself included several pages of data where the sales, personnel costs, purchased services etc, were examined and as a result, a profitability analysis was provided.

Profitability analysis			
Project description	New product launch		
Total investment	-800 000		
Expected return on equity	15 %		
inspection time	8		
amortization time	8		
Counting date	1.1.2013		
Net present value (NPV)	111 999,44	0	Profitable
Internal rate of return (IRR)	18,66 %	15,00 %	Profitable
Profitability index (PI)	1,137	1	Profitable
Payback time (years)	3,94		
Discounted payback time	6,68		
Return on investment % (ROI)	61,72		
Economic value added (EVA)	100 509,23		

Table 2: Investment model by Erholm % Keränen, original table translated to English

Aki Taanila (2012) presented several ways in his funding models how to calculate profitability with Microsoft Excel. On Table 3 the PV method is being used. This method is used for calculating present values of future revenues and costs.

Investment calculation - difference of present value between revenues and costs					
Imputed rate of interest	12 %				
Investment holding time in years	5				
		Present value			
Initial costs	1 500 000	1 500 000	=B7		
Annual costs	-120 000	423 573	=PV(B3; B4;B8)		(FV)
Annual revenues	-500 000	1 802 388	=PV(B3;B4;B9)		
Depreciation value	-300 000	170 228	=PV(B3;B4;;B10)		
Present value of revenues		1 972 616	=C9+C10		
Present value of costs		1 923 573	=C7+C8		
Difference		49 043	=C12-C13		

Table 3: Investment model example by Aki Taanila, original table translated to English

Investment model example in savings perspective shows how much savings can be acquired with an initial investment in table 4 (Nettivalo).

Investment Calculation for LED lights, 3 years						
	Total lamps					
	10	100	200	500	700	1000
LED-light (tube) 60 cm, 10W						
Initial cost	81 €	806 €	1 612 €	4 030 €	5 642 €	8 060 €
Electricity payments (3 years)	184 €	1 840 €	3 679 €	9 198 €	12 877 €	18 396 €
Fluorescent lamp						
Initail cost	20 €	200 €	400 €	1 000 €	1 400 €	2 000 €
Electricity payments (3 years)	331 €	3 311 €	6 623 €	16 556 €	23 179 €	33 113 €
TOTAL SAVINGS WITH LED-lights	**87 €**	**866 €**	**1 731 €**	**7 328 €**	**6 060 €**	**8 657 €**

Table 4: LED light savings model by Nettivalo, original table translated to English

The example tables above do not break down the cost factors behind the calculations, except in Table 2. They are more directional and created to give a quick look of the profits the investments could produce.

4 Building an accounting model

This chapter will introduce the construction of the accounting model, what is the impact of each factor that are included, and how they are defined. The starting point is to inspect the current situation and how the total costs are divided into smaller pieces according to the statistics. Afterwards, I headed towards the initial costs by opening the technical requirements and the reasons behind them. This again is followed by the fixed and variable costs tables, where the annual upkeeping costs, running costs, loan amortizations and salaries are presented. Finally, the cost of hiring an employee is split into detailed parts. All of these add up to the total costs that must be noted when investing capital on a new equipment.

4.1 Equipment transportation to and on the sites

The company had approximately 25 work sites in 2019, and their average duration was from 2 to 3 months, depending on the project. This would mean that in total there were 50 round trips only for the purpose of transporting the machinery. The balance sheet from 2019 of the case company states that a total of 68 880 euros were spent on outsourced services, and in 2018, the figure was 32 772 euros. In one year, the costs jumped by 111%. This, however, did not indicate, that the costs would increase linearly every year. The industry is vulnerable to changes in the market, and in the upcoming years there is a risk that the situation will turn upside down or a possibility that no changes will occur compared to previous years. Statistics Finland (Tilastokeskus) gathered data of **transportation costs** between 2010 and 2014, the index year being 2010, where the total costs were divided into factors presented in table 5.

Cost factor , %	Drivers ' wages (28,5)	Indirect wages (17,7)	Daily allowances (1,2)	Fuel (20,6)	Repair & Maintenance (6,3)	Tyres (3,1)	Amortization (10,8)	Interest rates(1,2)	Insurances (4,3)	Operating costs (1,4)	Administration (3,4)	Upkeep (1,6)	**Total index**(100,0)
2010	100	100	100	100	100	100	100	100	100	100	100	100	**100**
2011	101,2	102,4	98,3	117	102,5	113	102,7	130,7	106,4	100,4	102,1	103,7	**105,9**
2012	105,2	107,7	100,6	135,1	105,5	118	104,5	108,1	114,3	69,3	104,7	107,5	**112,1**
2013	107,1	109,5	105,7	129,7	107	121	107	108	123,9	70,7	106	110,2	**112,8**
2014	108,1	110	109,3	125,8	108,9	121	108,9	116,2	132,9	71,7	107,5	111,3	**113,4**

Table 5: Transport cost index 2010-2014, original table translated to English. (Tilastokeskus, 2015)

As shown by Table 5, the **drivers' wages** accounted for 28.5% of all costs of the transportation industry, followed by **fuel costs** 20.6% and **indirect wages** 17.7% (work indirectly connected to the operations). Together these three factors alone contributed to 66.8% or approximately 2/3 of all the costs. Table 6 presents the change of labour costs in 2018 and 2019 in the transportation and warehousing field. In 2018, labour costs rose by 2.3% and in 2019 by 1.3% compared to the index year 2016. By inspecting the historical data of the wages on average, they can be estimated to rise 1.5-2.0% annually.

	2018/1*	2018/2*	2018/3*	2018/4*	Change 2018/ 2017*	2019/1*	2019/2*	2019/3*	2019/4*	Change 2019/ 2018*
Standard Industrial Classification										
Total,private sector	1,1	2,4	1,7	1,1	1,6	1,6	0,1	0,6	1,5	1,0
Industry	-0,2	1,0	1,9	1,4	1,0	1,2	0,5	1,1	1,4	1,0
Manufacturing	-0,2	1,0	1,8	1,3	0,9	0,8	0,4	1,0	1,4	0,9
Food industry	1,6	3,9	1,9	1,9	2,3	-0,0	-3,5	2,5	0,9	-0,1
Forest industry	2,6	3,2	2,2	1,7	2,4	1,1	0,6	0,8	1,8	1,0
Chemical industry	-0,3	1,0	2,0	1,5	1,1	4,4	1,0	2,2	2,1	2,4
Metal industry	-1,2	-0,5	1,0	1,0	0,0	-0,9	1,6	0,7	2,2	0,9
Construction	2,4	2,0	3,3	4,7	3,1	2,5	1,0	1,9	-0,0	1,3
Services of the business economy	2,6	1,5	1,2	0,1	1,3	0,7	0,5	-0,2	1,3	0,6
Wholesale and retail trade	1,9	1,5	2,8	2,3	2,1	1,4	2,2	-1,4	0,4	0,6
Transportation and storage	5,4	1,9	3,1	0,3	2,6	-1,6	1,3	0,9	4,5	1,3

Table 6: Change of labour costs in 2018 and 2019. (Tilastokeskus, 2020)

The Finnish Information Centre of Automobile Sector published the latest figures of gasoline and diesel **fuel prices** in early April 2020. The original data was provided by Statistics Finland. In Figure 3 it can be noted that the price of oil can increase or decrease in a very short time although in the long run, the price is expected to constantly rise. Figure 3 indicates that the transport costs can also vary greatly in short term, as it was earlier noted that fuel costs account for approximately 20% of the total costs. For a 1000-kilometre travel with an average consumption of 40 litres per 100 kilometres, the fuel cost is affected by 4 euros for every 1 cent increase or decrease in the fuel prices.

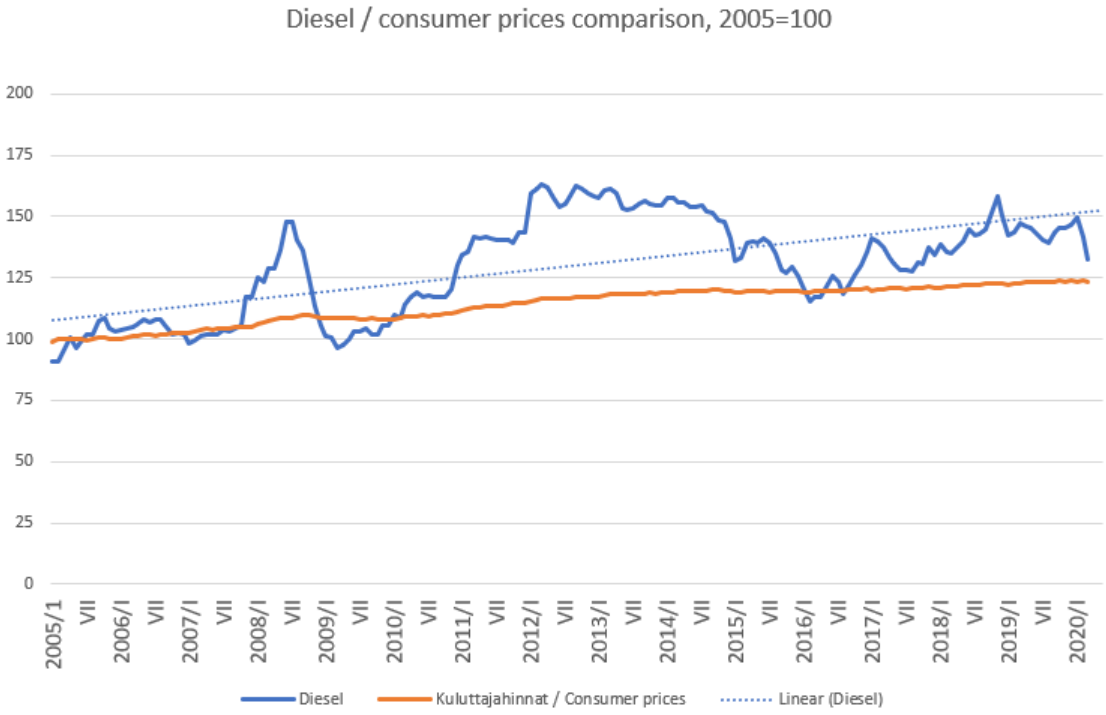


Figure 3: Development of diesel price compared to consumer prices (Autoalan tiedotuskeskus, 2020)

4.2 Initial investments for the truck and equipment

Buying a new truck would mean high initial cost, and there are plenty of options to choose from. Depending on the features that the buyer wants for the truck, the prices for truck chassis alone can start from 100 000€ and end up to 200 000€. The price range is immense because there are several manufacturers on the market providing several models with their own technical solutions. Volvo, for example, also overhauls and sales used trucks providing an alternative for buying a new one and guaranteeing secure operations with one year of warranty. The price range for used trucks varies greatly depending on their age, usage, technical features and what requirements it is expected to meet.

The truck would also be equipped with a crane that should be able to lift a load of 2,5 tons horizontally from 25 meters away. In technical specifications the lifting capacity is mentioned as ton-meters, meaning that a 90-ton-meter crane can lift 3,6 tons at 25 meters. The price for this type of crane is estimated to be 100 000 – 120 000€ when bought new. The crane also needs to be inspected annually and approved for safe usage. In Table 7, the truck, the crane and the possible trailer are separated as their own entities. The tyres are typically sold separately for the trucks and trailers. Accessories such as cargo straps and other tools are also disconnected from the main equipment as all of these are quickly replaceable parts and serve different work-related purposes.

	Truck		Crane		Trailer
Initial					
Price	160 000,00 €		120 000,00 €		50 000,00 €
Useful lifetime	6		12		8
Annual depreciation %	20 %		15 %		20 %
Annual depreciation	19 676,16 €		8 577,58 €		5 201,42 €
Scrap value	41 943,04 €		17 069,01 €		8 388,61 €
Accessories	1 500,00 €				800,00 €
Useful lifetime	8				8
Annual amortization	25 %				25 %
Annual depreciation	168,73 €				89,99 €
Scrap value	150,17 €				80,09 €
Summer tyres	350,00 €	pc			350,00 €
# of tyres	12				16
Total	4 200,00 €				5 600,00 €
Winter tyres	450,00 €	pc			450,00 €
# of tyres	12				16
Total	5 400,00 €				7 200,00 €

Table 7: Initial capital for the investments.

The fixed costs in Table 8 consists of expenditures that need to be paid regardless of the utilization rate of the equipment. The amount of **loan payments** is expected to remain constant despite the chance that it may change before all has been paid back. Monthly payments and loan amounts are set as an example, and are eventually left for the company to fill.

Fixed					
Insurance	3 000,00 €				1 200,00 €
Taxes	2 500,00 €				1 000,00 €
Inspection	100,00 €		250,00 €		100,00 €
Upkeeping	1 800,00 €		200,00 €		500,00 €
Total	10 650,00 €				
Funding					
Equity	20 000,00 €				
Loan	140 000,00 €		100 000,00 €		80 000,00 €
Loan interest, a	1,50 %		1,50 %		1,50 %
Loan interest, m	0,13 %		0,13 %		0,13 %
Payback time, a	8,00		8,00		8,00
Payments, a	12		12		12
Total payments	96		96		96
Monthly annuity	-1 548,49 €		-1 106,07 €		-884,85 €
Total cost	-148 655,34 €		-106 182,38 €		-84 945,91 €
of which interest	-8 655,34 €		-6 182,38 €		-4 945,91 €
total annuity, a	42 472,95 €				

Table 8: Fixed costs of the investment

Listing **the variable costs** demands time and precision in order to have everything correct as changing one number has impact on other factors, which indicates that some of the cost factors are interconnected. Since 2017, heavy-duty vehicles have been required to have winter tyres, and they have been listed as their own category. Earlier the mandatory period for having to use winter tyres was from the beginning of November until the end of February, but nowadays due to warm winters, it is the driver's responsibility to use proper tyres when necessary. In the calculation Table 9, it is assumed that winter tyres are in the use during the calendar year for four months and summer tyres for eight months. In Table 10, fuel consumption is a rough estimation, and a proper follow-up will be needed to find out the actual consumption. Judging by the purpose of the vehicle usage, which is delivering machinery to the construction sites before the work begins and taking away in the, end explains why half of the trips are done without cargo. Driving an empty truck only creates

costs unless it can be assigned more deliveries or other work. Lastly, the salary costs are added to the total costs and they are described more in detail in the next chapter.

Variables						
Summer tyres						
# of tyres	12				16	
Useful lifetime	100 000	km			120 000	km
Retread	1				1	
Cost of retread	100,00 €	per tyre			100,00 €	per tyre
Durability	90 %				90 %	
Risk of damage	5 %				5 %	
Total cost	466,67 €	per year			518,52 €	per year
Winter tyres						
# of tyres	12				16	
useful lifetime	100 000	km			120 000	km
retread	1				1	
Cost of retread	120,00 €	per tyre			120,00 €	per tyre
Durability	90 %				90 %	
Risk of Damage	5 %				5 %	
Total cost	280,00 €	per year			311,11 €	per year
Tyre cost, truck	2 300,00 €					
Tyre cost, trailer	2 555,56 €					
Maintenance	5 000,00 €		500,00 €		1 200,00 €	

Table 9: Variable costs

Fuel	1,19 €	per litre
Consumption, full load	50	per 100 km
Consumption, empty load	30	per 100 km
Equipment transport	15 000	km
Other transport	5 000	km
Loaded km	20 000	
Unloaded km	30 000	
Tota fuel costs	22 610,00 €	
AdBlue consumption	3	liters per 100 km
AdBlue, price	1,50 €	per liter
AdBlue, total cost	2 250,00 €	
Lubrication costs	1 130,50 €	5% of fuel costs
Labour costs	36 737,39 €	
Annual costs	**122 799,86 €**	

Table 10: Variable and annual costs

4.3 Driver's salaries and sidecosts

The numbers presented in Table 11 are the mandatory fees that the employer needs to pay for the driver, the government and insurance companies, and are solely connected to the operation of the vehicle and related work. The factors such as weather conditions, faulty equipment, congestions, paperwork / administrations and waiting the customer are excluded. The researcher's view is that these hidden cost factors need to estimated and a detailed performance follow-up is a mandatory to have throughout operational period in order to learn how much resources are being put in managing issues that directly or indirectly affect the work performance itself. Another thing that the employer should bear in mind is that in case the worker gets sick, there should be an alternative way to get the equipment transported, such as hiring more than one worker or using rented labour force. Another option would be to use another transport company's services, which had been the old way. In Table 11, the salary costs are specified for one employee, who has a minimum of 5 years work experience.

Employee's salary costs				
Driving work	6,00			
Other work	2,00			
Base salary	13,99 €	Work experience	5	years
Evening, 15%	0,00	18:00-22:00		
Nightwork, 20%	0,00	22:00-06:00		
Daily subtotal	111,92 €			
50 % bonus	0,00	<12 hours exceeding 2-weeks, 80 hours work time		
100 % bonus	0,00	After 12 hours 2-weeks work time exceeded		
Daily subtotal	0,00 €			
Work on day off, 100%	0,00	Saturdays and Sundays		
Daily subtotal	0,00 €			
Specialization bonus				
ADR, 5%				
Other 5%	5 %	f.e crane truck operation		
Daily subtotal	5,60 €			
Number of 1/2 daily allowances	0			
Number of full daily allowances	0			
1/2 daily allowance	15,00 €			
Full daily allowance	41,00 €			
Annual subtotal	0,00 €			
Daily total costs	117,52 €			
Monthly costs	2 467,84 €	Work days/m	21	
Annual costs	27 146,20 €	Work months/a	11	

Table 11: The employee's salary costs. Example data from the AKT collective labour agreement

After the salaries, the employer is still bound to pay additional fees for the worker. **The employee's sidecosts** are listed in Table 12. On the transport field, the vacation compensation is agreed to be calculated with the preset multipliers for each day off. Despite multiplying the salary with the increase in percentages to get the total salry costs, in general, a rule of thumb by accounting agencies is to multiply the base salary with 1.5-2 since only the mandatory costs for employer are included in the calculations. Other sidecosts can include compensation for the work travel, usage of employee's own tools or costs caused by worker's sickleave. Depending on the work field, the cost of accident insurances varies from 1 to 8%, and the age of the worker affects the pension rate. In 2019, the government required employers to pay 18.45% pension fee for workers up to 52-years-old and 16.95% for 53 to 62-years-old.

Employee's sidecosts			
Annual compensated leave			
Vacation days	25		
Vacation salary multiplier	185,20		
Work time reduction 4,9%		If weekly worktime is 40 hours worker can have the reduction as a payment or days off	
Vacation salary total	2 720,50 €	10,02 %	share of annual average income
Pension costs	18,45 %		
Accident insurance	5,00 %	Sectorwise	
Health insurance	1,34 %		
Unemployment insurance	0,45 %		
Group life insurance	0,07 %		
Sidecosts, total	35,33 %		
Total costs	36 737,39 €		

Table 12: Employee's sidecosts.

4.4 Profitability

By assuming that the annual net cash inflow produced by the investment would cover the annual costs and some profit, it would mean that the annual income needs to be at least 191 809 euros in order to meet the target. In Table 13, 5% is used as an example for the expected return. If the annual income is not enough to reach 191 000 euros, the investment is not worth to execute, or more other actions are needed to increase the activity ratio.

NPV	0,12 €		
			income BE
NCF		452 160,98 €	191 809,03 €
Io		330 000,00 €	
In		52 301,16 €	
PV In		35 399,49 €	
n		8	
time period		8	years
r		5,00 %	

Table 13: Profitability analysis

By inspecting invoices of purchased transport services in 2019, it was learned that one hour of transport and lifting services combined, on average, costed 120€ per hour. With full-time work, 5 times a week and 8 hours a day, the price has potential to go as low as 66€ per hour. Using the solver addon in excel, the break-even point for the amount of work was determined to be at 1023 hours as shown in Table 14.

Full-time			**Break-even**		
Driving hours per year	1386,00		total hours:	1023,33	
Other work hours per year	462,00		Annual costs	122 799,86 €	
Subtotal	1848,00		cost:	120,00 €	h
annual costs	122 799,86 €				
costs / work hours	66,45	€/h			

Table 14: Savings with full work hours and minimum hours needed to break-even

5 Conclusion

The research questions of the study were defined in the research process part:

- What is the cost of current situation and factors behind the model?
- What cost factors need to be considered in the investment and in the future?
- How to compare old and the new system and other necessary aspects to in order to control the costs?

The company background data got a little less attention during the process than first anticipated, although they are being referred to on the results part, where the calculation model itself is represented and how the current costs would be affected. The outcome of the research concentrates on building the calculation model where the new cost factors regarding the investment are considered and what impact they have on the total costs. The difficulty of comparing the old and new systems surfaces from the fact that the transport services have been purchased from outside parties who have only charge the customer with fixed hourly prices and in some cases for the driven distances. These pieces of information only serve as a target to which compare the estimated investment costs. In the accounting model, the cost factors were categorized as initial, fixed and variable costs. During the research, the investment which consists of the truck, the crane and the trailer, last being optional, were handled as separate units but on the field, there can be chances to acquire everything on one deal. The truck was also considered as one unit, not separating the chassis, the engine and other parts.

6 Discussion

Using outsourced transportation and lifting services can appear very expensive as individual fees and add up to a hefty sum, but after having studied the situation, the expenses are far away from the point where insourcing transport and lifting services

would possibly provide savings and improve the company's profitability. The activity ratio can potentially be increased with other operations but then the investment would not have been acquired for the purpose it was originally meant to. Should this be the case, the new cost factors of new activities need to be calculated and see what kind of impact they have on the total costs. The numbers in calculation table were used as an example and under assumption that the equipment is all new or have a small number of operating hours, and the prices can vary greatly depending on the manufacturer and technical features. The acquisition costs directly affects the amount of loan and annual amortizations. In the future, development of the calculation model should include the corporate tax rate.

The goal of the thesis was to provide the case company a calculation model for potential investment and profitability analysis. During the project I got to put my skills in use that I have learned and analyse the outcome and how to improve my learning on the field.

Reliability of the research

The theory and core terms have been reviewed and stated generally accepted on the field and no new terms were defined on this project. The end results are compared with the data from the company and the statistics. Some inaccuracies in the company data can be expected to exist as only one financial year was studied and no precise data for the purchased services was available. The provided accounting model covers the major cost factors of transportation activities, but more detailed information about the structures is needed to find out the exact costs. The worker's salary costs would also be lower if he or she was offered only a part time job instead of full time and this again would affect the total costs.

Further development ideas:

In the beginning of the thesis work it was brought up by the entrepreneur that the new truck could also be used to deliver products for the construction sites. From a customers' point of view, it would mean easier project management when they

could buy as many services for one provider as possible and keep the supply chain at a manageable size. This would have a great potential in terms of growing the business and expanding to new business areas in the construction industry. Furthermore, the customers could also be sold the lifting and transport services to a certain extent, if the purpose is not to compete with other similar businesses that specifically provide these services. Studying the usage of mobile housing and their transportation can also bring up new information about the cost structure of accommodation expenditures, although previous overview of the topic showed that they are quite rarely used.

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