Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics

Diploma Thesis

Case Study of Auto Part Assembly in the Czech Republic

Bc. Jan Váně

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Jan Váně

Economics and Management

Thesis title

Case Study of Auto Part Assembly in the Czech Republic

Objectives of thesis

The main aim of the diploma thesis is to perform a financial evaluation of an auto part assembling by a selected company (XYZ). The automotive part is a vehicle cockpit that will be assembled by the supplier (XYZ) and the customer of the final component is Škoda Auto.
The first objective of the diploma thesis is to evaluate the case study through capital budgeting techniques and profitability calculations. In order to estimate the results several other calculataions will be performed, such as project's cash flow, initial investment, variable and fixed costs.
The second objective is to compare the generated results with criterions of the applied techniques. This will help the author decide whether the automotive part assembly could be adopted or rejected by the company (XYZ).

Methodology

The thesis will be divided into two parts – theoretical and analytical.

The theoretical foundation uses the research methods induction and deduction. The analytical part uses the following capital budgeting techniques: payback period, net present value and internal rate of return. The profitability calculations will include EBITDA and EBITDA margin.

The proposed extent of the thesis

60 pages

Keywords

EBITDA, Payback, Car manufacturer, CAPEX, automotive industry, auto parts

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Recommended information sources

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The Diploma Thesis Supervisor

Ing. Petr Procházka, Ph.D., MSc

Supervising department

Department of Economics

Electronic approval: 20. 11. 2015

prof. Ing. Miroslav Svatoš, CSc.

Head of department

Electronic approval: 20. 11. 2015

Ing. Martin Pelikán, Ph.D.

Dean

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Declaration

I declare that I have worked on my diploma thesis titled "Case Study of Auto Part Assembly in the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on 23.03.2016

Jan Váně

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I would like to express my sincere gratitude to my supervisor Ing. Petr Procházka, Ph.D., MSc for his useful advice and suggestions. Furthermore I would like to thank the management of the company XYZ for the opportunity to do this diploma thesis and for providing me with valuable information during my research. Last but not the least, I would like to thank my parents Ing. Jana Váňová and Pavel Váně who supported me during my work.

Případová studie montáže autodílu v České republice

Souhrn

Hlavním cílem diplomové práce bylo provést finanční hodnocení montáže automobilového dílu, která je provedena vybraným podnikem (XYZ) a učinit konečné rozhodnutí, zda by navrhovaný projekt mohl být podnikem přijat. Kromě uvedeného, práce také uvádí směry vývoje automobilového průmyslu. Výzkum byl především zaměřen na automobilový průmysl v České republice a to na předního výrobce osobních automobilů (Škoda Auto). Výzkum byl proveden pomocí metod hodnocení investic a výpočtů ziskovosti. Pro hodnocení investic byly využity běžně používané techniky zkoumání jako: doba návratnosti, čistá současná hodnota a vnitřní výnosové procento. Tyto metody umožnily určit požadovanou dobu, za kterou se peněžní příjmy z investice vyrovnají nákladům na počáteční investici a zároveň určily současnou hodnotu cash flow projektu. Metody výpočtů ziskovosti určily náklady projektu spojené s montáží dílu a zároveň finanční přínos projektu. Ukazatelem finanční výkonnosti projektu byl zvolen zisk před úroky, zdaněním, odpisy a amortizací a zároveň byl použit jako poměrový ukazatel měřící provozní výkonnost projektu. Na základě porovnání získaných výsledků s kritérii použitých metod, autor navrhuje přijmutí projektu.

Klíčová slova: Automobilový průmysl, montáž, autodíl, metody hodnocení investic, doba návratnosti, čistá současná hodnota, vnitřní výnosové procento, ziskovost, EBITDA, ukazatel rentability.

Case Study of Auto Part Assembly in the Czech Republic

Summary

The main objective of the thesis was to carry out a financial evaluation of a vehicle part assembling performed by a selected company (XYZ) and to make a final decision whether the proposed project could be adopted by the company. Additionally, the paper presented trends and developments in the automotive industry. The research was primarily focused on the automotive industry in the Czech Republic and its leading vehicle manufacturer (Škoda Auto). The methodological tools applied in the research were capital budgeting techniques and profitability calculations. Capital budgeting approaches included commonly used techniques such as: payback period, net present value and internal rate of return. The capital budgeting techniques identified the project’s required length of time to recoup the initial investment and the present value of the project’s cash flow. The profitability calculations were used to reflect the project’s cost related to the assembly and measured the financial benefit. The selected indicators of the project’s financial performance were EBITDA and EBITDA margin ratio that measured the operating efficiency of the project. Based on the comparison between the generated results and the criterions of the applied techniques, the author proposes the project to be accepted.

Keywords: Automotive industry, assembly, car part, capital budgeting, payback period, net present value, internal rate of return, profitability, EBITDA, profitability ratio.

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1 Introduction

The automotive industry in the Czech Republic has a long-standing tradition that goes back for more than a century. At present it accounts for a quarter share of the total industrial production in the country. Several decades have passed since the Czech vehicle production counted hundreds of vehicles annually and these days vehicle manufacturers are recording production of more than million vehicles per year. The process of vehicle production is no longer performed by vehicle manufacturers only. This is due to the fact that the majority of required vehicle components are now manufactured by suppliers. The Czech Republic has advantages that make it the preferred country where many automotive firms choose to do their businesses. Some of the advantages are its location in Central Europe and its cheap labour force.

The research of this diploma thesis deals with a potential business opportunity that arises for a selected company that is in the position of a vehicle component supplier for a leading vehicle manufacturer in the Czech Republic.

The first chapter of this thesis presents the research approaches and the methodology that will be used in the analytical part of the paper. The methodological tools are divided into capital budgeting techniques and profitability calculations. The chapter includes formulas, assumptions, advantages and disadvantages of each selected method.

In the second chapter the author provides an overview of the automotive abbreviations that are related to the proposed project. It also includes an introduction of the automotive industry and its participants in the Czech Republic. In the second part of the chapter the vehicle manufacturer and the vehicle component supplier are introduced.

The third chapter of this diploma thesis is focussed on the analytical part. It includes a description of the proposed vehicle component and a location where the vehicle component could be assembled. After the required data are gathered and processed through the selected methodology, the results will be generated and compared with the criterions of the methodological tools. Based on that, the final decision will be made whether this business opportunity is profitable and whether the project should be accepted or rejected by the vehicle component supplier.

2 Paper Objectives and Methodology

2.1 Objectives

This diploma thesis focuses on the automotive industry in the Czech Republic; specifically on a financial evaluation of a vehicle part assembling performed by a selected company (XYZ). The proposed vehicle part is a vehicle cockpit that is assembled by the company XYZ and the customer of the final vehicle component is Škoda Auto.

The first partial objective of the thesis is to evaluate the case study through capital budgeting techniques and profitability calculations. Additionally, other calculations such as estimated project's cash flows, estimated initial investment, variable and fixed costs will be performed as they are required to generate the final results. The capital budgeting techniques that are used in the paper are: payback period, net present value and internal rate of return. Profitability of the project will be evaluated according to EBITDA and EBITDA margin ratio methods.

The second partial objective of the diploma thesis is a comparison of the generated results with the criterions of the applied techniques. The comparison will help to decide whether the proposed vehicle part assembly could be adopted or rejected by the supplier company XYZ.

The main research question of the diploma thesis is as follows: *"Based on the required initial investment, customer's planned amount of production, customer's time frame of production, the expected results should verify the profitability of the project".*

2.2 Methodology

2.2.1 Data Confidentiality Statement

This diploma thesis includes confidential information. Data inputs were provided for the purposes of this research only and the company does not wish to be named. Instead, the alias XYZ will be used.

2.2.2 Research Approaches

The research approaches that are applied in the theoretical part of this diploma thesis are deduction and induction.

Deduction

"In logic, deduction is a process used to derive particular statements from general statements" (Lewis-Beck, Bryman, Liao, 2004, pg. 243). The research method uses existing theory that is followed by setting a research strategy in order to examine a given hypothesis. In other words, the deductive research approach is based on firstly collecting data and then theory is developed as an analysis. If the obtained results do not meet the hypothesis, the theory is rejected. When the obtained results meet the hypothesis, the theory can be accepted (Saunders, Lewis, Thornhill, 2009, pg. 124).

Induction

"In logic, induction is a process for moving from particular statements to general statements" (Lewis-Beck, Bryman, Liao, 2004, pg. 486). A researcher that is using an induction approach starts with data collection and based on his/her data analysis, a theory is developed. In other words, induction produces theory that is derived from the generalization of a particular data observation (Saunders, Lewis, Thornhill, 2009, pg. 129).

2.2.3 **Capital Budgeting Techniques**

Authors Peterson, Fabozzi (2002, pg. 5) state that *"capital budgeting is the process of identifying and selecting investments in long-lived assets, or assets expected to produce benefits over more than one year".* Before capital budgeting is evaluated, the management collects project proposals that each department has suggested. This is followed by a committee, responsible for capital budgeting decisions, that recommends worthy projects. The company representatives select projects that will be funded and the board of directors approves a required capital budget. In capital budgeting, there is a higher stress on values of estimated cash inflows and outflows while values of accrual–accounting numbers are not key indicators (Weygandt, Kieso, Kimmel, 2010, pg. 564).

There are two types of capital budgeting decisions (screening and preference) that the responsible committee must be familiar with before making a decision.

Screening decisions

Screening decisions refer to the minimum criterions (standards) that need to be met before a particular project can be accepted. A project that does not meet the company's criterions (e.g. payback period > 2.5 years, net present value > €1,000,000) will be omitted.

Preference decisions

Preference decisions determine projects according to the company's targets and their impact on business (Kinney, Raiborn, 2011, pg. 666).

The three capital budgeting techniques selected for the research are: payback period, net present value and internal rate of return.

1) Payback Period (PP)

According to Kinney, Raiborn (2011, pg. 654) payback period method *"measures the time required for a project's cash inflows to equal the original investment. The payback for a project is complete when the organization has recouped its investment".* If a project's initial investment is set up to be recouped by three years the latest, then all the projects that can meet this deadline are accepted and all other investments are rejected. When there are several projects that meet the payback method conditions, there is an option for firms to prioritize projects. This is done by selecting the project whose payback can reach faster initial investment. The prioritizing of projects can be an effective criterion for management as well. The shorter the payback period is, the sooner the received cash flow can be used either in debt repayment or in other potential investments. Generally, there is no optimal length of payback period since every project differs (Megginson, Smart, Lucey, 2008, pg. 257). Additionally, authors Needles, Powers, Crosson (2010, pg. 1166) note *"in computing the payback period, depreciation is omitted because it is a noncash expense".*

Advantages and disadvantages

Payback method is the simplest capital budgeting technique used by firms and its main focus is on the timing of cash flows. Due to the fact that payback method mainly determines a project in the *short run and time value of money is not considered*, it is mostly used for screening decisions. A disadvantage of the payback period calculation is that this capital budgeting technique is a judgemental choice. It is basically not linked to maximization of shareholder value. Managers cannot be sure if accepting the project with a payback period of 2.75 years will maximize shareholder wealth any more than adopting the project with payback period of two years or even four years. The payback period method also finds its utilization in highly uncertain situations and international investments where unstable economic situation prevails. In these cases the payback period is the primary decision making method (Megginson, Smart, Lucey, 2008, pg. 257-259).

Assumptions

A significant criterion related to a project's investment is the speed of the initial investment recovery. Additionally, timing and figures of cash flows generated during the project's existence can be forecasted. Another assumption is that the shorter the payback period is, the lower the risk for the project. This is important because the faster the capital investment is returned, the sooner it can be reinvested in new projects (Kinney, Raiborn, 2011, pg. 676). According to authors Weygandt, Kieso, Kimmel (2010, pg. 547) a shorter period is better as *"the risk of loss from obsolescence and changed economic conditions is less in a shorter payback period"*.

Cumulative Cash Flow

Cumulative cash flow represents the sum of the project's cash flows at a point in time. In other words, it is the total cash flow of the project's accumulated flows for all previous years at a particular year. In a typical scenario, the cumulative cash flow shows negative figures during the first years of the project due to the fact that the initial investment and set-up costs are reflected. As soon as the project starts generating cash inflows, the cumulative cash flow gradually becomes less negative until it records positive figures. Payback period occurs at the time where cumulative cash flow reaches zero figure (Crundwell, 2008, pg. 8).

Formula 1 Payback Period

$$\textbf{Payback Period} = \frac{\text{Initial Investment}}{\text{Annual Net Cash Inflows}}$$

Source: Crosson, Needles, 2010, pg. 449, author's adaptation

Initial Investment

According to Gallagher, Andrew (2007, pg. 308) initial investment refers to the cash outflows necessary to purchase an asset or materials to produce an asset. Initial investment also accounts for a company's start-up costs such as installation and delivery costs or any other initial investment related to the proposed project.

Other authors such as Cunningham, Nikolai (2014, pg. 492-493) state that the initial investment is the firm's expected cash outflow required for putting the proposed project into operation. They also continue to explain that the initial cost includes expenditures such as the equipment that is used in the production, employees training and the cost of construction related to the project.

Determination of this cost varies from the specifics of each company and therefore estimations may differ. Initial outlay usually occurs at the time the investment's lifetime starts. In other words, the initial investment occurs before the firm generates its first cash inflow after the end of the first year. For this reason this investment is said to occur in "time period zero".

Annual Net Cash Inflows

Annual net cash inflow of a potential investment consists of two types of cash flows. Firstly, annual cash *inflows* that represent money received by an organization from customers as a result of operation or financing activities. Secondly, annual cash *outflows* that are related to costs associated with the project. After the cash outflows are deducted from cash inflows, the annual net cash inflow is determined (Crosson, Needles, 2010, pg. 449; Peterson, Fabozzi, 2002, pg. 30).

Cash accounting has disadvantages in contrast to accrual accounting. However, for capital budgeting decisions estimated cash flow values are preferred. Occasionally cash flow information cannot be precisely determined. In such case the estimation of cash flow is based on adjustments to accrual accounting numbers *(*Weygandt, Kieso, Kimmel, 2010, pg. 545-546).

2) Net Present Value (NPV)

There are several ways to define the net present value method. One of them is *"the net present value method compares the present value of future cash inflows with the capital investment to determine net present value"* (Weygandt, Kieso, Kimmel, 2010, pg. 564). Authors Gallagher, Andrew (2007, pg. 266) state that *"the net present value (NPV) of a capital budgeting project is the dollar amount of the change in the value of the firm as a result of undertaking the project".*

The main decision rule in order for a project to be accepted is either zero or positive net present value. If the project has a negative net present value it should be rejected. An exception to the rule (accepting a negative net present value) can be done only in the case when the intangible benefits are at least equal the amount of the negative present value. It is difficult to measure intangible benefits; therefore they are mostly omitted in capital budgeting calculations (Weygandt, Kieso, Kimmel, 2010, pg. 564). If a new project that generates a positive net present value is accepted, then the firm's value will increase because the estimated project's return surpasses the firm's necessary rate of return. Vice versa, if a project with a negative net present value is accepted, it will decrease the firm’s value (Gallagher, Andrew, 2007, pg. 266).

Advantages and disadvantages

Net present value is among the most preferred capital budgeting criterions for project selection due to the fact that it takes into the consideration discounted cash flows at a particular rate as well as opportunity cost. In many cases it is used for screening decisions.

Although it assists in the selection of the right project that adds the most value to the company, NPV method comes along with two practical problems. The first issue arises in the explanation of net present value to individuals who are not educated or trained in finance. Not many people outside the financial world understand terms such as “the change in a firm’s value given its required rate of return“ or “the present value of future cash flows“. This results into difficulties in interpreting net present value analysis. The second and more significant issue of NPV method are the results that are determined in currency and not in percentage. Results are usually preferred in percentage than in currency among financial managers for the main reason that percentage is easily comparable to other alternatives (Bible, Bivins, 2001, pg. 152; Gallagher, Andrew, 2007, pg. 271).

Assumptions

Net present value reflects all cash flows at the end of each year (exceptionally at the beginning), despite of the fact that in reality cash flows come irregularly during the year. Another assumption regarding NPV is the reinvestment of cash flows in other projects that have alike return. Companies receive a cash flow every year during a project’s lifetime, and the cash flow that is received in a particular year is usually reinvested in other projects throughout the same year (Weygandt, Kieso, Kimmel, 2010, pg. 551).

NPV profile

Net present value profile represents the relationship between the obtained NPV and different discount rates. The higher a discount rate is, the lower the estimated NPV is. Conversely, the lower a discount rate is, the higher the estimated NPV is. Because the relationship between a project’s NPV and the discount rate is inverse it is important to know how different variations of discount rate will influence changes in NPV. This is where the profile is useful because it shows graphically just how sensitive the NPV value is to changes in discount rate. It is important to note that discount rates are often based on the firm's management judgement (Besley, Brigham, 2015, pg. 514; Gallagher, Andrew, 2007, pg. 270).

Formula 2 Net Present Value, Algebraic Method

$$\mathbf{NPV} = \left(\frac{CF_1}{(1+k)^1}\right) + \left(\frac{CF_2}{1+k)^2}\right) + \ \dots \ + \left(\frac{CF_n}{1+k)^n}\right) - \text{ Initial Investment}$$

Source: Gallagher, Andrew, 2007, pg. 267

Where: **CF** is cash flow at the indicated times

k is discount rate, or required rate of return for the project

n is life of the project measured in the number of time periods

Calculation of net present value is done in the following way: the present values of the projected cash flows are summed and the amount of initial investment is subtracted afterwards. Another way how to obtain NPV is using financial tables (Gallagher, Andrew, 2007, pg. 267).

Formula 3 Net Present Value, Table Method

$$\mathbf{NPV} = CF_1\left(PVIF_{k,1}\right) + CF_2\left(PVIF_{k,2}\right) + \ \dots \ + CF_n\left(PVIF_{k,n}\right) \ - \ \text{Initial Investment}$$

Source: Gallagher, Andrew, 2007, pg. 267

Where: **PVIF** is present value interest factor

k is discount rate, or required rate of return for the project

n is life of the project measured in the number of time periods

In most cases firms set discount rate at the equilibrium of their cost of capital. The cost of capital is essentially the cost of funds that is needed to run a business. Using higher discount rate is usually done in cases where potential projects are riskier than the firm's line of business. This is why it is important to use a proper discount rate because often it leads to underestimating the net present value and consequently to making a wrong capital budgeting decision (Weygandt, Kieso, Kimmel, 2010, pg. 551).

3) Internal Rate of Return (IRR)

Another capital budgeting technique that will be used for the purposes of this research is the internal rate of return. IRR is based on the project's cash flows estimated rate of return for a particular project and it generates a zero net present value. Therefore, the internal rate of return IRR is an arithmetic result of the previously mentioned capital budgeting method, net present value. The IRR method takes into consideration all cash flows and the time value of money during the lifetime of the project, same as NPV does. There is a difference between the two methods in the fact that IRR results are stated in percentage while the results of NPV are presented as a numerical figure.

The obtained IRR result of a proposed project is compared with the firm's requirements on the rate of return and this enables the management to make a decision of either accepting or rejecting a project. The required firm's rate of return is often called a *hurdle rate*. When the internal rate of return of a proposed project is equal or greater than the value of the hurdle rate, the project should be adopted (Gallagher, Andrew, 2007, pg. 272).

Advantages and disadvantages

The main advantage of the internal rate of return method is that it takes into consideration the time value of money. The value of a euro received in the second year of the project's lifetime is less than the value of a euro received in the first year. The minimum rate of return is chosen more objectively than in other analytical methods because it is based on market returns. These market returns are usually acquired from comparable investments. In this way, managers are able to define differences in risks among projects based on quantitative information. Due to the fact that the rate of return is an outcome of the IRR analysis, the acquired results are also understandable by individuals without any financial background. Finally, this capital budgeting technique takes into consideration cash flow rather than accounting value of income.

There are some disadvantages of using the IRR technique. The first issue is that occasionally a project might generate either more than one IRR or no IRR result at all. Additionally, since the result of the internal rate of return is described as a percentage number, it does not reflect how much the value of the firm will change if the project is adopted. For instance, a small project might have a high IRR result, but an insignificant influence on the value of the firm. In cases when the primary goal is to maximize the value of the firm, the IRR method is not considered as a key measurement. In such situations the preferred indicator is the net present value due to the fact that the NPV shows the value by which the firm's wealth will change (Graham, Smart, 2012, pg. 257-258; Gallagher, Andrew, 2007, pg. 275).

Assumptions

The basic IRR assumption is to accept a project in the case when IRR exceeds the required rate of return. As long as the internal rate of return exceeds the required rate of return, the net present value is greater than zero (Besley, Brigham, 2015, pg. 516).

Author Drury (2008, pg. 298) says that *"the internal rate of return can be described as the maximum cost of capital that can be applied to finance a project without causing harm to the shareholders"*. In terms of reinvestment assumptions, Drury (2008, pg. 302) says that "*IRR assumes that all the proceeds from a project can be reinvested immediately to earn a return equal to the IRR of the original project"*. He also states that *"this assumption is likely to be unrealistic because a firm should have accepted all projects which offer a return in excess of the cost of capital"*.

Formula 4 Internal Rate of Return

$$\mathbf{NPV} = \mathbf{0} = \left(\frac{CF_1}{(1+k)^1}\right) + \left(\frac{CF_2}{(1+k)^2}\right) + \ldots + \left(\frac{CF_n}{(1+k)^n}\right) - \text{Initial Investment}$$

Source: Gallagher, Andrew, 2007, pg. 272

The formula for calculating IRR is essentially an adjusted NPV formula where the discount rate (*k*) results into zero NPV. After filling in the estimated cash flow values, the time period values (*n*) and the initial investment, the discount rate value can be solved. By using different percentages of discount rate, an approximate IRR can be found by a trial and error method. Different discount rates will lead to various NPVs but only the discount rate that will lead to a zero NPV is the IRR (Gallagher, Andrew, 2007, pg. 272).

In cases when the future cash flows of the project are identical, the IRR can be isolated from the formula above and determined more accurately with various approximation procedures. In this paper, the author will apply the interpolation procedure by deriving a formula that is based on the theorem of intersecting lines:

Formula 5 IRR Linear Interpolation

$$\mathbf{IRR} = \mathrm{i}_1 + \frac{\mathrm{NPV}_1}{\mathrm{NPV}_1 - \mathrm{NPV}_2} * (\mathrm{i}_2 - \mathrm{i}_1)$$

Source: Götze, Northcott, Schuster, 2015, pg. 66, author's adaptation

For this formula, the NPV_1 is estimated for a discount rate i_1 (chosen arbitrarily). If the value is positive (negative), then a second higher (lower) discount rate (i_2) is selected and a corresponding NPV_2 is calculated. These two discount rates and their NPVs are then plotted on a graph and the IRR point is estimated by drawing a straight line between the two determined NPV points and their matching discount rates (Götze, Northcott, Schuster, 2015, pg. 66).

Comparing of Cash Flow Methods

The illustration in Table 1 compares the two cash flow methods net present value and internal rate of return. This comparison should be taken into consideration before making capital budgeting decisions.

Table 1 Comparison of Discounted Cash Flow Methods

Comparison of Discounted Cash Flow Methods		
Item	Net Present Value	Internal Rate of Return
Objective	Compute net present value (**a euro amount**).	Compute internal rate of return (**a percentage**).
Decision rule	If net present value is equal to zero or a positive number, accept the project. If net present value is a negative value, reject the project.	If internal rate of return is equal to or greater than the company's hurdle rate, accept the project. If internal rate of return is less than the company's hurdle rate, reject the project.

Source: Weygandt, Kieso, Kimmel, 2010, pg. 561, author's adaptation

In most cases, the obtained results by using the net present value and the internal rate of return will lead to the same decision regarding the project (acceptance/rejection). From a mathematical point of view, the results that are obtained via the IRR and NPV methods always lead to the same capital budgeting decision, either adopt or reject the project (Besley, Brigham, 2015, pg. 515–516). *"However, there are also situations where the IRR method may lead to different decisions being made from those that would follow the adaptation of the NPV procedure"* (Drury, 2008, pg. 301).

According to authors Kinney, Raiborn (2011, pg. 662–663) managers should be aware of the pros and cons of each capital budgeting technique. If the company wants to maximize the benefits of a particular project, then a combination of multiple techniques is necessary for a proper evaluation of the project. Additionally, limitations and differences of each capital budgeting technique must also be considered. Each of the mentioned capital budgeting methods uses deterministic measures without respect to probabilities. In other words, every variable is explained. If estimations of cash flows are taken into the consideration, these restraints might be reduced. Kinney, Raiborn say (2011, pg. 662) *"none of the methods provides a mechanism to include management preferences with regard to the timing of cash flows. This limitation can be partially overcome by discounting cash flows occurring further in the future at higher rates than those in earlier years, assuming that earlier cash flows are preferred".*

2.2.4 **Profitability Calculations**

Earnings Before Interest, Taxes, Depreciation and Amortization

In comparison to capital budgeting techniques, EBITDA reflects all costs that are related to production and is therefore considered as a *measure of operating income.* Operating income is calculated as a reduction of the income revenue by expenses. The operating income does not take into account investment activities (e.g. securities or minority interests in other firms). This profitability indicator does not refer to a complete measure of operating cash flow, as a matter of fact, the working capital requirements on cash flows are excluded from EBITDA calculations (Moles, Parrino, Kidwell, 2011, pg. 459).

EBITDA belongs to the most commonly used valuation methods. Its value is obtained by determining a firm's accounting earnings before interest, taxes, depreciation and amortization. EBITDA became very popular in the 1980s when leverage ratios found their utilization in acquiring companies (Rawley, Gup, 2010, pg. 526-527). Cahill (2003, pg. 97) states that *"EBITDA developed as a performance number partly because it strips out the effect of different depreciation and amortization policies that companies may have"*. Different policies regarding depreciation are present in each country of the world and might even apply to companies within the same country and sector. Therefore, through the omission of accounting policies that differ globally; the comparison of financial performance can be done on a worldwide level.

Authors Rawley, Gup (2010, pg. 526) say that EBITDA is a *non - GAAP* (Generally Accepted Accounting Principle) *measure* and this profitability indicator is still popular in Europe, while it lost its significant ground in the United States.

Advantages and disadvantages

The main advantage of EBITDA is the fact that it allows for a comparison of international companies that use different accounting policies. Secondly, this profitability indicator takes into consideration the whole financial structure of the company and it is also a cash flow-based measure. On the other hand, the EBITDA indicator also exhibits some disadvantages. Although the figures are globally comparable, earnings can still be controlled and manipulated. In some cases, the obtained value might be misleading. For example, even if EBITDA is a higher value, it might not indicate the actual liquidity of the company. Finally, the amount of reinvestment that is required for fixed assets is not taken into consideration (Cahill, 2003, pg. 100; Mulford, 2005, pg. 70).

EBITDA can be a very relevant indicator when it comes to accessing a company's performance. For many obvious reasons however, it is not recommended to rely on a single measure only. This is why it is important to compare several different measures in order to get a full picture of the company's overall financial health (Rawley, Gup, 2010, pg. 540).

There are two ways how to determine the value of EBITDA. The first way begins with net income and interest, taxes, depreciation and amortization expenses are added back. The second way deducts the operating expenses (variable and fixed costs) from revenue (Moles, Parrino, Kidwell, 2011, pg. 459). This is the method that will be used in the theoretical foundation of this paper.

Formula 6 EBITDA

$$\mathbf{EBITDA} = \text{Revenue} - \text{Variable Costs} - \text{Fixed Costs}$$

Source: Moles, Parrino, Kidwell, 2011, pg. 459, author's adaptation

Revenue (REVs) represents income from sale of goods or services. It is calculated by multiplying the price at which goods or services are sold to the customers by the number of units.

Variable costs (VC) are costs that vary with the change of volume production. The more a company produces, the more variable costs it will have. As company's production decreases the variable costs will decrease too. Variable costs typically include labour, raw material and packaging.

Fixed costs (FC) are costs that do not vary with the change of volume production, at least not in the short run. They represent the expenses that company has to pay independently on business operation. Fixed costs typically include office rent, insurance and energy (Heisinger, 2010, pg. 13).

Profitability Ratios

There are several financial ratios that enable the evaluation of a firm's financial condition based on the values in the firm's financial statements. One type of financial ratios is *profitability ratios.* Profitability represents the firm's operation results. The profitability ratios can be divided into two groups: rate of return ratios and profit margin ratios.

Rate of return ratios take into consideration the relationship between profit and investment that are generated and associated with a project. The most commonly used rate of return ratios are: earning power, return on assets, return on equity and return on capital employed.

Profit margin ratios reflect the relationship between profit and sales of a particular project. Since profit can be determined at several levels, there are numerous profit margin ratios. The most commonly used profit margin ratios: net profit margin, gross profit margin and EBITDA margin (Chandra, 2008, pg. 77).

The last ratio (EBITDA margin) will be calculated in the analytical part of this thesis in order to analyse the operating efficiency of the selected project. The formula is defined as follows:

Formula 7 EBITDA Margin Ratio

$$\textbf{EBITDA Margin} = \frac{\text{EBITDA}}{\text{Sales}}$$

Source: Palepu et al., 2007, pg. 207, author's adaptation

Author Chandra (2008, pg. 77) states that *"this ratio shows the margin left after meeting manufacturing expenses, selling, general and administration expenses (SG&A). It reflects the operating efficiency of the firm".* Authors Palepu et al. (2007, pg. 207) note that EBITDA margin omits important noncash operating expense that is represented by depreciation and amortization expense and further add that *"analysts prefer to use EBITDA margin because they believe that it focus on "cash" operating items".*

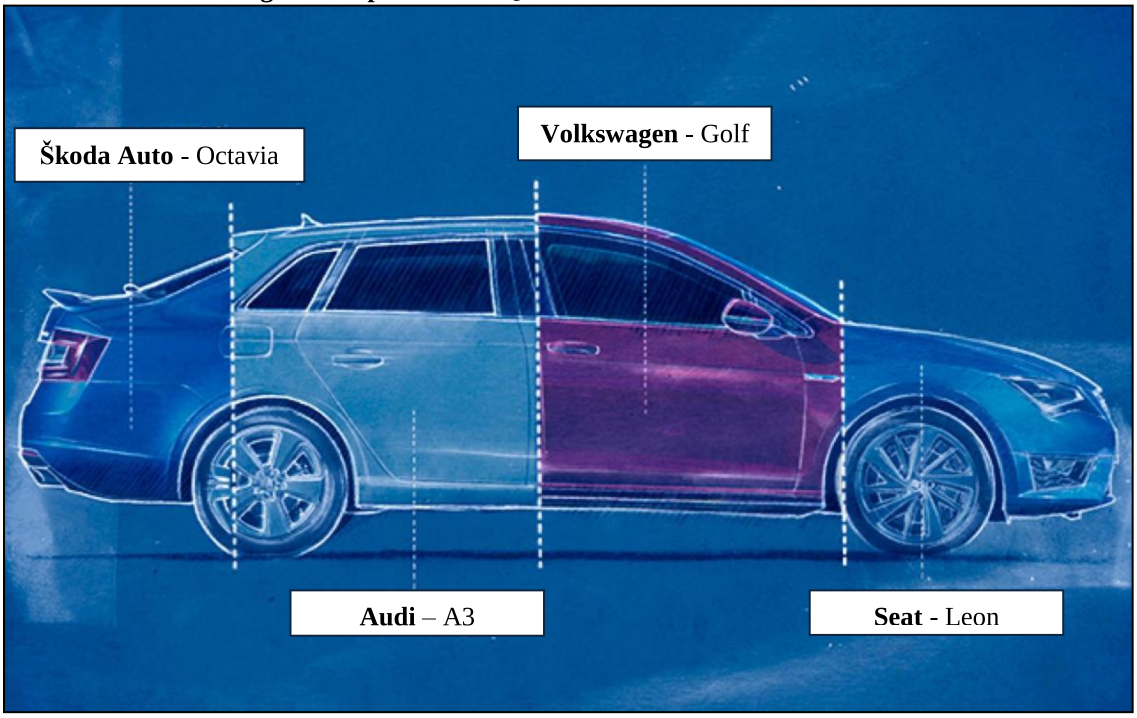
3 Theoretical Foundation

3.1 Automotive Abbreviations

JIT (Just-in-time) is a logistics concept that refers to the system of delivering vehicle parts by suppliers to the vehicle manufacturers. A vehicle manufacturer that is using the *JIT* concept stores smaller inventories of parts, as the parts are delivered to the assembly line only when they are needed and in the needed volume. *JIT* deliveries lead to a significant cost savings on inventory needs and it decreases the requirements for floor space in the production plant (Crolla et al., 2015, pg. 3001).

MTT Platform (Modular Transverse Toolkit), translated from the German acronym MQB (Modularer Querbaukasten), is the abbreviation used by vehicle manufacturers within the Volkswagen Group. Modular Transverse Toolkit *"is a modular toolbox, which aims at increasing the number of common parts across different models by using standardized components"* (Wäldchen, 2014, pg. 7).

Illustration 1 Volkswagen Group's MTT/MQB Platform



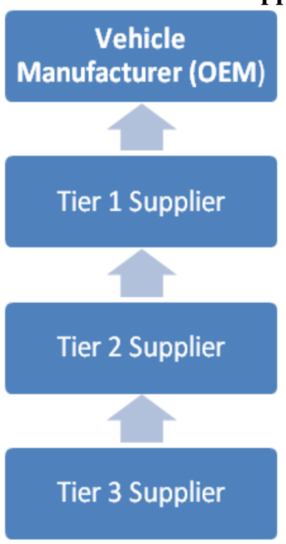
Source: Horrell, 2014, author's adaptation

The illustration above shows the currently manufactured vehicle models by the Volkswagen Group using the shared modular construction, namely engine that is mounted in a transverse arrangement (Volkswagen, 2015).

OEM (Original Equipment Manufacturer) refers to the vehicle or truck parts that are produced by vehicle manufacturers. At present, the vehicle manufacturers outsource the production of vehicle components but originally they were almost fully vertically integrated and produced the required components by themselves. Therefore the term *Original Equipment Manufacturer* is commonly used as a synonym for a *vehicle manufacturer* (Matheus, Königseder, 2015, pg. 51).

Multi-Tier Supply Chain Management is mainly used in automotive and aerospace industries where the final product consists of many components that require high quality and material standards. In the automotive industry, *Tiered Supply Chain* is mainly divided into the three categories as shown in Illustration 2. Tier one supplier is the key element of the supply chain management because it supplies components directly to the *vehicle manufacturer*. In a typical scenario the tier two supplier delivers the production to tier one supplier that delivers the final component to the vehicle manufacturer. A single company might be a tier one supplier for a particular company and tier two supplier to another company and the same applies to components. Other tier suppliers refer to the providers of raw materials to upper levels in the hierarchy. In some cases *"tier one companies provide a manufacturing service for the OEM, leaving the OEM to concentrate on final assembly or marketing"* (Linton, 2015; Sarokin, 2015).

Illustration 2 Multi-Tier Supply Chain



Source: author's computation

3.2 Automotive Industry

According to Diehlmann, Häcker (2013, pg. 44) the automotive industry can be divided into vehicle manufacturers and automotive suppliers. While manufacturers are linked with vehicle purchasers, suppliers are only in contact with manufacturers.

Since mass production of vehicles was introduced by Henry Ford in 1913, the automotive industry has faced a process of innovations along with standardization and integration. For instance, Volkswagen's *Modular Transverse Matrix* is a key factor in cost savings in terms of standardization and modularization. Vehicle manufacturers today use these concepts to manufacture same or similar parts across different vehicle models. This gives them the opportunity to achieve higher *economies of scale*. The relationship between manufacturers and suppliers has rapidly changed from the 1980s. Suppliers have produced a higher range of components and also had responsibilities in the development process of new models. That makes them a significant business partner in the car manufacturing industry (Wäldchen, 2014, pg. 7-9).

Authors Diehlmann, Häcker (2013, pg. 1) state there are three stages of value chain that arise once a vehicle is manufactured and sold to a customer. All three stages take into consideration only the financial activities that are related to the automotive industry. The first stage refers to the leasing, financing, insurance and services. The second stage refers to activities connected to sales, maintenance and repairs and the last stage of the value chain focuses on the disposal of vehicles.

The automotive industry plays an important economic role in Europe and it belongs to the top industries in the 'Old Continent'. The industry is constantly moving forward and implementing new technology in production, even though technology is not its core business. Due to this fact, car manufacturers have an almost *20%* share of all R&D in manufacturing. Among other manufacturing sectors that are directly linked to car manufacturers are plastics, chemicals, electrical and electronic parts. If total household expenditure is taken into consideration, expenses for vehicle production represent the *second largest investment* next to housing (Heneric, Licht, Sofka, 2005, pg. 5-6).

Nieuwenhuis, Wells (2015, pg. 1) state that *“around the turn of the millennium, this was a sunset industry characterized by over – capacity, plant closures, job losses, declining profitability and a product that seemed unsuited to meeting the environmental and social challenges arising“.*

The automotive industry had been slightly declining until the economic crisis of 2007-2008 that affected the globe. This was followed by a decrease in new cars sales and reaching market saturation in Japan, Korea, United States and European Union.

This industrial recession gradually turned upwards and it was manifested with growth of sales recorded on Chinese and Indian markets, development of new technologies and boost in car sales in the United States. During the last decade, China became one of the top three car manufacturers in the world and a vehicle market leader and this trend will most likely continue. Nevertheless, this accelerated growth has its cost not only in China, but all over the world in terms of environmental pollution.

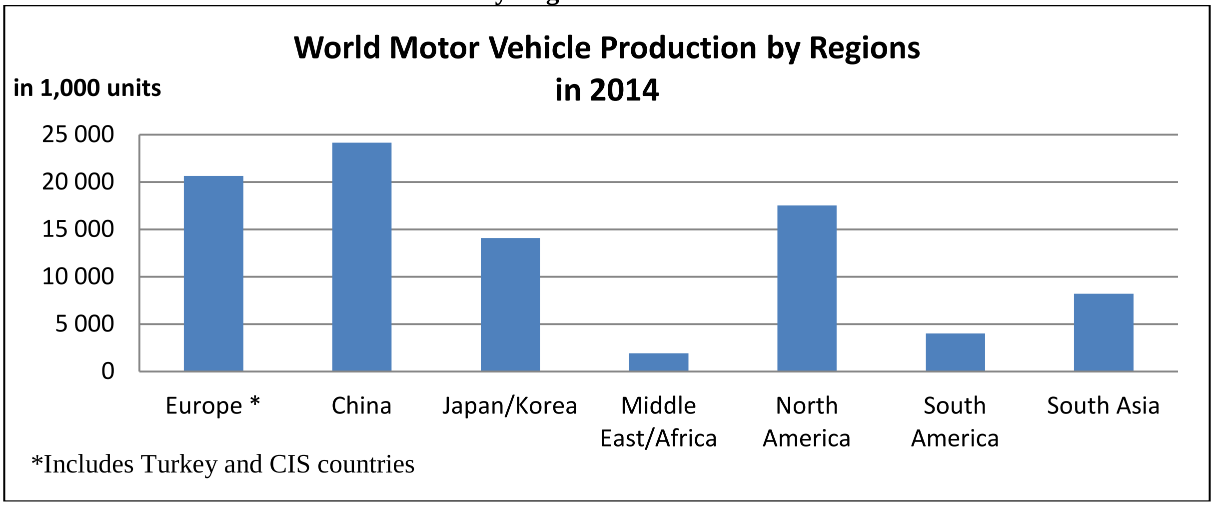
Governments have passed limits on emissions and fuel consumption in an attempt to reduce the air pollution that is caused by car manufacturers. At the same time, manufacturers have been promoting “new energy” cars to decrease the significant impact on pollution (Nieuwenhuis, Wells, 2015, pg. 34). Diehlmann, Häcker (2013, pg. 43) state a reason for the success of these vehicles by stating that “*the increasing scarcity of crude oil and the related price increases of gasoline are major drivers for the development efforts in the field of electric drives“.*

According to a European Commission forecast in 2011, traditional vehicles will be replaced by new energy vehicles (hybrid, electric) by the year 2050. Unfortunately, there is a lack of public demand for electric cars as a result of their high selling price. Moreover, limitations in new technologies as well as lack of infrastructure for electric vehicles make it unlikely that the European policy target will be reached by 2050 (Nieuwenhuis, Wells, 2015, pg. 1, 124; Diehlmann, Häcker, 2013, pg. 43).

3.2.1 Vehicle Production

The following chapter provides insight into the global automotive industry and in the Czech Republic. Firstly, it compares the global vehicle production by regions. Secondly, it presents information related to the production in the European Union and its key contributors. The last part of this subchapter presents some key figures of the automotive industry and the vehicle manufacturing production in the Czech Republic.

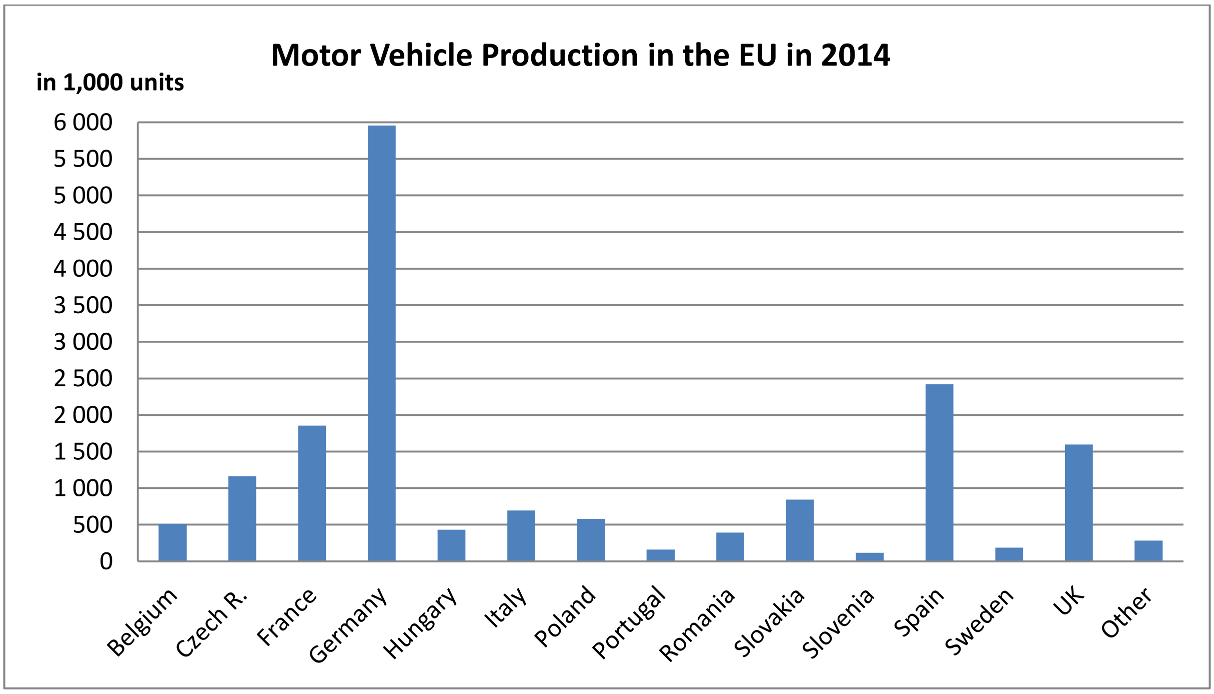
Chart 1 World Motor Vehicle Production by Regions in 2014



Source: EAMA, 2015, pg. 19, author's adaptation

In 2014, *90.6 million* motor vehicles were produced globally. In comparison to the previous year, an increase of 2.5 million vehicles was recorded. The highest production was in China that manufactured 24 million vehicles. As previously mentioned, China became a leader in car manufacturing during the last five years when it surpassed Europe in production. China's growth is clearly visible in the percentage share in production that had increased from 4.3% in 2000 to *26.7%* in 2014. The second region by produced volume (20.6 million vehicles) was Europe that recorded an annual increase of 3%. Other regions also recorded an increasing percentage in production when compared to year 2013, except for South America and South Asia (EAMA, 2015, pg. 19).

Chart 2 Motor Vehicle Production in the EU in 2014



Source: EAMA, 2015, pg. 22, author's adaptation

In the European Union 17.2 million vehicles were manufactured in 2014. Germany accounted for one third of the total produced volume. The Czech Republic was the fifth largest manufacturer in the EU with 1.2 million vehicles and it was next to Spain, France and the United Kingdom.

According to the figures provided by the European Automotive Manufacturers Association, the automotive industry represented *5.6%* of the employed EU citizens in 2012, or in other words, it generated *12.1 million direct and indirect jobs.*

Czech Republic

The Czech Republic is among the top fifteen largest passenger car producers by volume in the world. In 2015, more than 155,000 people were employed in the automotive industry. Nearly 25% of the industrial production and 23% of the total Czech export was generated by the automotive sector. The automotive industry also accounted for approximately 7.4% of the gross domestic product in the Czech Republic (Kozelský, Novák, 2015, pg. 3).

The year 2015 was a *record breaking* in vehicle manufacturing. During this period *1,329,000* vehicles were manufactured in the Czech Republic. The country's position within the automotive sector is significant not only in Europe but it plays a key role on a global scale too (Auto SAP, 2016).

There are three main car manufacturers in the Czech Republic: Škoda Auto (member of Volkswagen Group), TPCA Czech (Toyota Peugeot Citroën Automobile) and HMMC (Hyundai Motor Manufacturing Czech). All of the mentioned carmakers provide excellent business opportunities for the strong base suppliers in the country. The Czech Republic has numerous advantages that make it a highly preferred location among auto manufacturing companies. The country has a strategic location in Central Europe and its transport and telecommunications infrastructure are highly developed. Based on the long-lasting automotive tradition and experience, the Czech Republic is very well integrated into the European automotive value chain (Czech Invest, 2015, pg. 1).

Table 2 Motor Vehicle Production in the Czech Republic in 2015

Motor Vehicle Production in the Czech Republic in 2015		
Vehicle Category	**Manufacturers**	**Production**
Cars, Light Commercial Vehicles	Škoda Auto, HMMC, TPCA	1,298,236
Trucks	TATRA	850
Buses	Iveco, SOR	4,517
Motorcycles	JAWA	1,727
Semitrailers	PANAV, SCHWARZMŮULLER	1,790
Small Trailers	AGADOS	21,668
Total vehicle production in year 2015		**1,328,788**

Source: Auto SAP, 2016, author's adaptation

In 2015, Škoda Auto was the major participant in the production of cars and light commercial vehicles in the Czech Republic. Their production accounted for 56.8% of the total manufactured cars, followed by Hyundai Motor Manufacturing Czech with 26.4% and Toyota Peugeot Citroën Automobile that had 16.8% share of the total production.

Another historical record in production was broken in the manufacturing of buses when for the first time in history of the Czech Republic more than 4,000 pieces were produced. The manufacturers of semitrailers also increased their production and reached the highest yearly production recorded in the past seven years. Overall, 2015 marked another successful year in vehicle production, apart from the small trailers category. Each category of manufacturers managed to increase their yearly production. It is difficult to predict whether this growing trend will continue in 2016. Oil prices, developments in the exchange rate or the situation in Ukraine are only some of the factors that could potentially have an influence over production (Rok průmyslu a technického vzdělávání, 2016; Kozelský, Novák, 2015, pg. 3).

3.2.2 **Škoda Auto**

Škoda Auto, based in Mladá Boleslav, is one of the most significant industrial companies in the Czech Republic. The company was established by Václav Laurin and Václav Klement in 1895 and it is one of the oldest vehicle manufacturers in the world. At present, more than 24,600 people are employed in Škoda Auto. Since 1991 when it became a part of the Volkswagen Group, the company has expanded its product portfolio and increased its production. There are two Škoda Auto production plants in the Czech Republic that manufacture for the European market. Besides the plant in Mladá Boleslav that plays a key role in the production, Škoda Auto owns a second production plant located in the East Bohemian city Kvasiny. In addition to manufacturing vehicles in the Czech Republic, Škoda brand vehicles are produced also in China, India, Kazakhstan, Russia, Slovakia and Ukraine.

According to the Škoda Auto growth strategy, the company plans to increase its sales to more than 1.5 million vehicles per year. To meet this goal, Škoda Auto will launch either a new or an updated model twice a year. The year 2015 was a record breaking in selling Škoda brand cars - 1,055,501 vehicles were delivered globally. In comparison to the previous year there was an increase in the vehicle deliveries by 2%. It is also the second year in a row since the company has recorded over one million deliveries in a single calendar year. The considerable success in vehicle sales was already recorded in 2014 when the company made large investments in its production both, domestically and globally.

In order to be environmental friendly, Škoda Auto takes into consideration the protection of nature and it focuses on sustainable development. The company also follows the latest developments in alternative fuel vehicles and it plans to utilize specific hybrid technologies in its future models. Currently, the Škoda Auto product portfolio offers seven models; some of the models are available in combi version too. The year 2016 was a long awaited year for Škoda Auto because the company is going to release a new SUV model. It will be for the first time that a model of this category will be manufactured by the company (Škoda Auto, 2016, pg. 14; Škoda Auto, 2015, pg. 8, 19).

The company's business performance in the last three years is as follows:

Table 3 Škoda Auto Profit and Loss Account

Škoda Auto Profit and Loss Account (CZK million) (selected figures & years)			
Item	**2015**	**2014**	**2013**
Sales revenue	314,897	299,318	243,624
Cost of sales	268,184	254,944	209,538
Gross profit	46,713	44,374	34,086
Profit before income tax	34,238	21,349	12,950
Profit after income tax	**30,816**	**18,421**	**11,386**

Source: Škoda Auto, 2016, pg. 42; Škoda Auto, 2015, pg. 17, author's adaptation

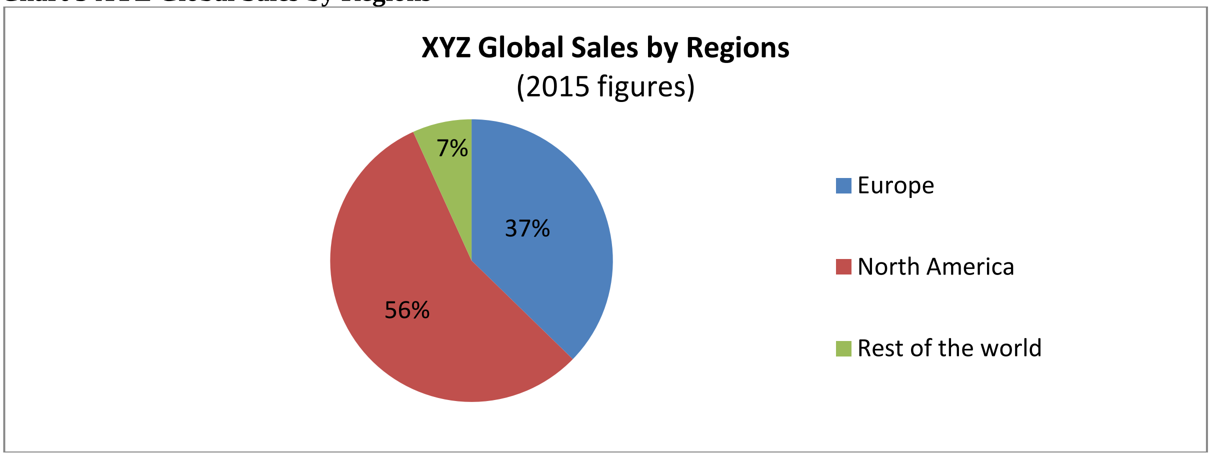
Record sales, profit, net cash flow and liquidity were achieved in 2015 and this demonstrates Škoda Auto's success and strong position among other *original equipment manufacturers*. As it can be seen from the table above, there is a growth in sales revenue during the last three years. In 2014 an increase of 23% was recorded and the next year the company's sales revenue increased again by 5%. In summary, the company registered sales revenue of CZK 314,897 million in 2015.

3.2.3 Company XYZ

The company XYZ belongs to the leading *Tier 1 supplier* companies across the globe. It is also among the largest interior components supplier in the automotive industry by market share. The company's headquarters are located in Luxembourg. Globally, the company operates within 22 countries around the world, in more than 100 locations and it employs around 30,000 people. The vehicle parts are manufactured in 83 facilities while commercial, technical and design centres count 28 facilities globally. More than 300 vehicle nameplates of major multinational automotive *OEMs* are made with the components that are manufactured in the facilities of XYZ company. The core business of the company is the manufacturing of vehicle components that are categorized in the following product groups: door & trim systems, headliner & overhead systems, flooring & acoustic systems, interior & exterior components and instrument panels & cockpits.

In 2015, the company XYZ recorded annual worldwide sales in the value of US$5.9 billion. If compared to the previous year when US$4.7 billion in global sales were recorded, a significant sales growth of 25% is visible. Based on the company's current and future booked business with *OEM* customers, the growing annual sales are also expected to continue in the future (undisclosed information, February 10, 2016).

Chart 3 XYZ Global Sales by Regions



Source: undisclosed information, February 10, 2016, author's adaptation

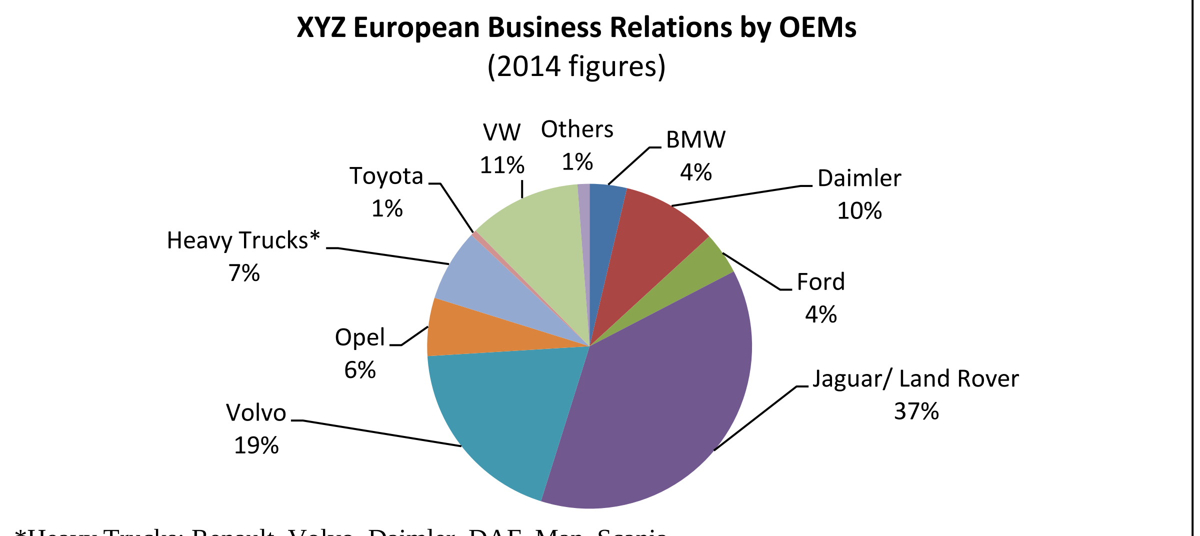
As it can be seen in the chart, North America is the most important region for the company in terms of sales. In 2015, this region recorded US$3.3 billion sales, followed by the European share of US$2.2 billion. The smallest percentage share in sales was recorded in Africa, Asia and South America that achieved a total of US$0.4 billion sales.

XYZ in Europe

The European headquarters of XYZ are located in Germany and the company employs approximately 10,000 people in the EU countries. There are 26 facilities where vehicle components are manufactured for the major European *OEM*s. Facilities are located in Germany, Belgium, Romania, Spain, Sweden, Poland, Slovakia and the Czech Republic. In the Czech Republic there are three production plants and a commercial centre. The company's main European *OEM* business partners are VW Group, Opel, Daimler, Hyundai/Kia, BMW, Jaguar/Land Rover, Ford, Volvo Track, Daimler Truck and DAF (undisclosed information, November 16, 2015).

The XYZ business relations with its most significant European *OEM*s are illustrated as follows:

Chart 4 XYZ European Business Relations by OEMs



*Heavy Trucks: Renault, Volvo, Daimler, DAF, Man, Scania

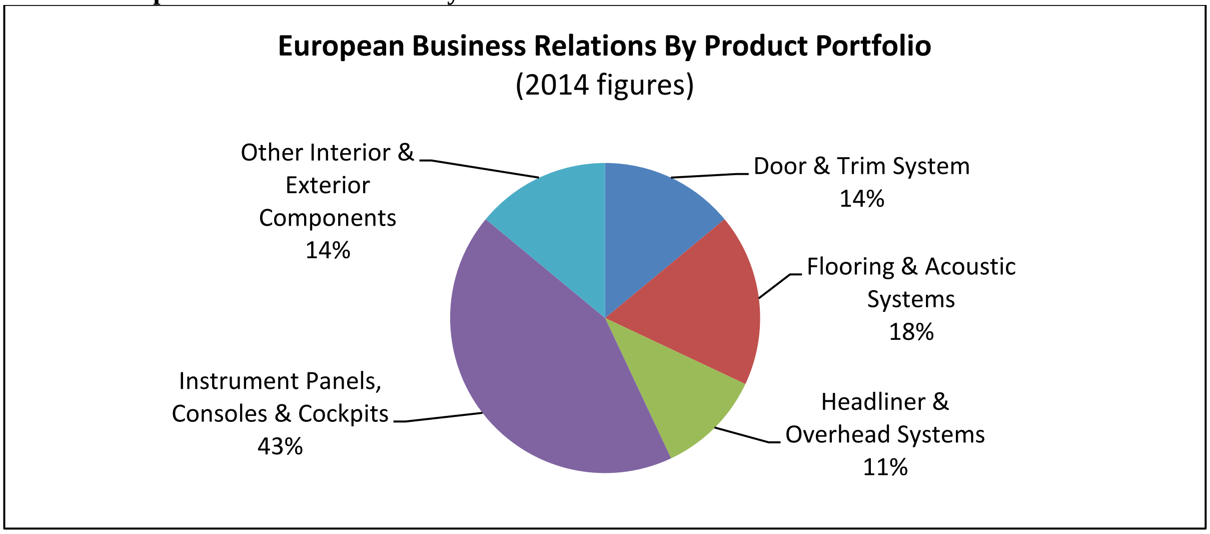
Source: undisclosed information, November 16, 2015

In 2014, XYZ recorded the highest share in terms of business relations with Jaguar/ Land Rover that accounted for 37% of the total XYZ business transactions with the European

*OEM*s. The second most important vehicle manufacturer for the company was Volvo that accounted for 19% of the total business relations. The third significant *OEM* manufacturer was VW Group with 11%.

The company is diversified by geography, customers and the manufactured components. The following chart provides an overview of the XYZ product portfolio in Europe:

Chart 5 European Business Relations by Product Portfolio



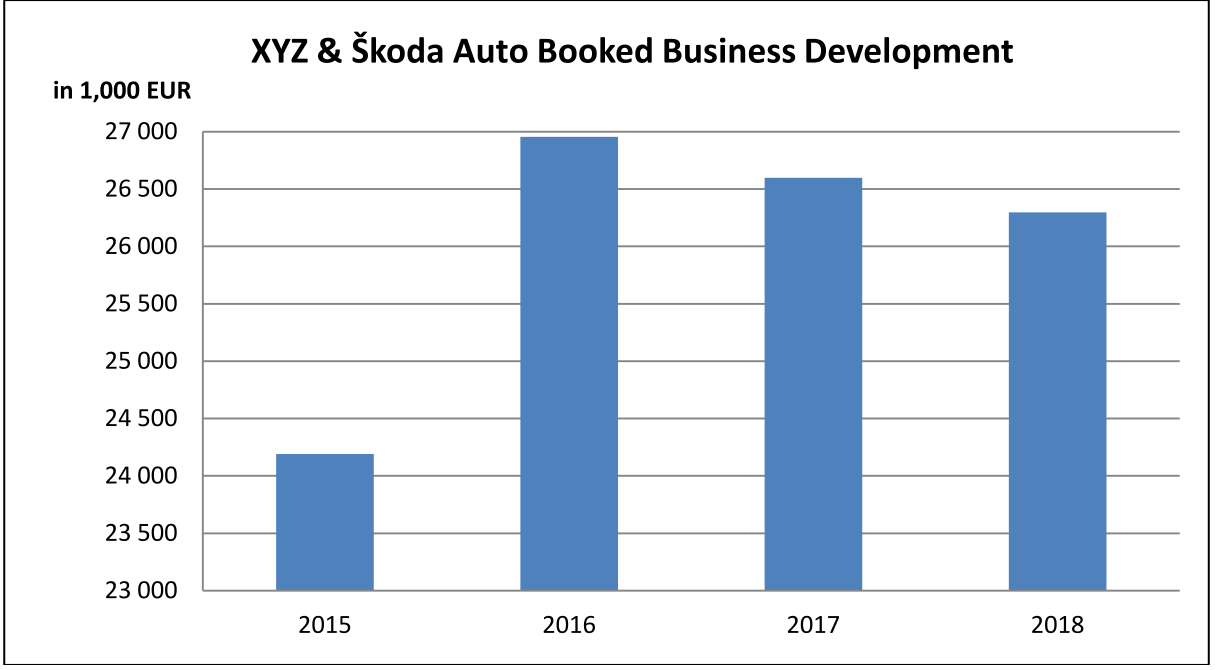
Source: undisclosed information, November 16, 2015

In 2014, the group Instrument panels, consoles & cockpits accounted for the highest percentage share of 43% in the European product portfolio. This was followed by the product group Flooring & acoustic systems that represented 18%. The research of the proposed project in this diploma thesis takes into consideration a vehicle part called cockpit. If the proposed business case is adopted by the company, it would account for a share in the product group Instrument panels, consoles & cockpits.

3.2.4 **XYZ and Škoda Auto Business Relations**

The company XYZ has been cooperating with Škoda Auto for almost a decade. The cooperation began when XYZ became the headliner supplier of a new released Škoda car model. As more and more vehicle components were being manufactured by XYZ, the year-on-year sales have increased. Due to the fact that the expected vehicle production of vehicle manufacturers is planned in advance, it is possible to estimate the future annual sales according to the length of the projects sales (undisclosed information, January 5, 2016).

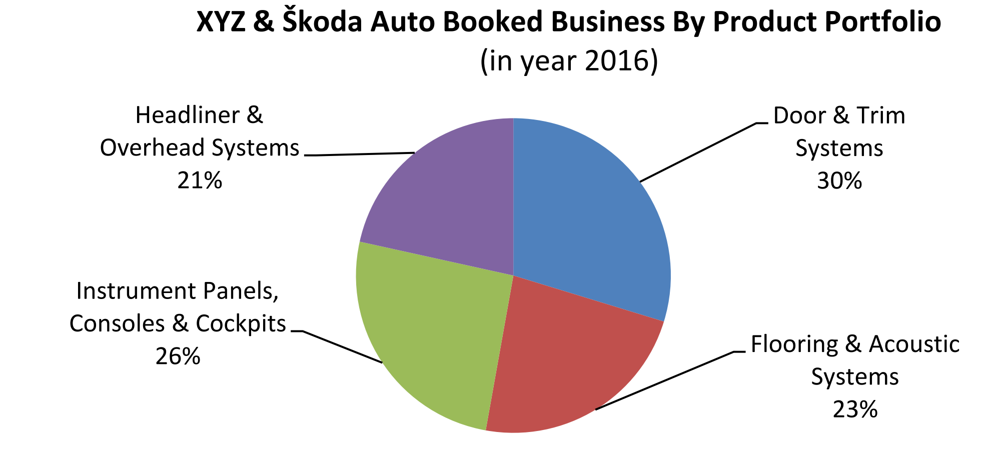
Chart 6 XYZ & Škoda Auto Booked Business Development



Source: undisclosed information, January 5, 2016, author's adaptation

In 2015, XYZ recorded total sales of more than €24 million which is a significant increase if compared the annual sales of €0.2 million that the company achieved during the first year of its mutual cooperation with Škoda Auto. The year 2016 should be another successful year for the company since Škoda Auto released an updated model that contains XYZ components. The future year-on-year sales are going to decrease by a small proportion due to the fact that the production of some components will be terminated.

Chart 7 XYZ & Škoda Auto Booked Business By Product Portfolio



* In the booked business the group Other Interior & Exterior Components equals **0%**.

Source: undisclosed information, January 5, 2016, author's adaptation

Currently, the components that are manufactured by company XYZ for Škoda Auto are divided into four main groups, as illustrated in Chart 7. In 2016, the group Door & trim systems represented the highest percentage share with 30%, followed by the product group Instrument panels, consoles & cockpits with 26%. The last two groups, Headliner & overhead systems (21%) and Flooring & acoustic systems (23%) account for a similar percentage share. As visible in the chart, there is no booked business related to the product group Other interior & exterior components in year 2016.

4 Analytical Part

As discussed in chapter 3.2, the automotive industry has changed considerably since the 1980^{s}. Suppliers today produce a much higher range of components than they did in the past. In many cases, they also have a responsibility in the development process regarding new models. This closer relationship between the vehicle manufacturers and the component suppliers creates a business opportunity for the suppliers. The following case study takes into account the company Škoda Auto as the vehicle manufacturer and the company XYZ in the position of its *tier one supplier*. The business opportunity that arises from the relationship between the mentioned companies is the assembly of a vehicle cockpit.

4.1 Cockpit Assembly

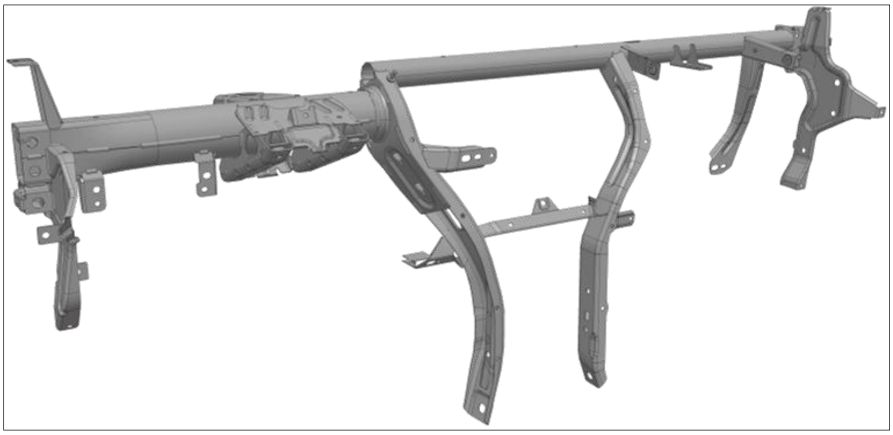
Before continuing with the analytical research of this case study, it is necessary to describe the specific vehicle part and propose the location where the part could be assembled by the supplier XYZ.

4.1.1 Car Part Description

The cockpit is a panel that is placed below the windshield of the vehicle and it extends in front of the driver and the front seat passenger seats. It includes controls and instruments that enable the operation of the vehicle. The cockpit and its functions differ according to vehicle brands and vehicle models. Each type of cockpit consists of particular number of components that are required to build the automotive part. After the cockpit is assembled, it is inserted by a handling device into the vehicle.

The cockpit of the proposed project consists of 24 components and there are up to 300 different versions of each component. The following illustrations show the selected components that are needed to assemble the proposed cockpit.

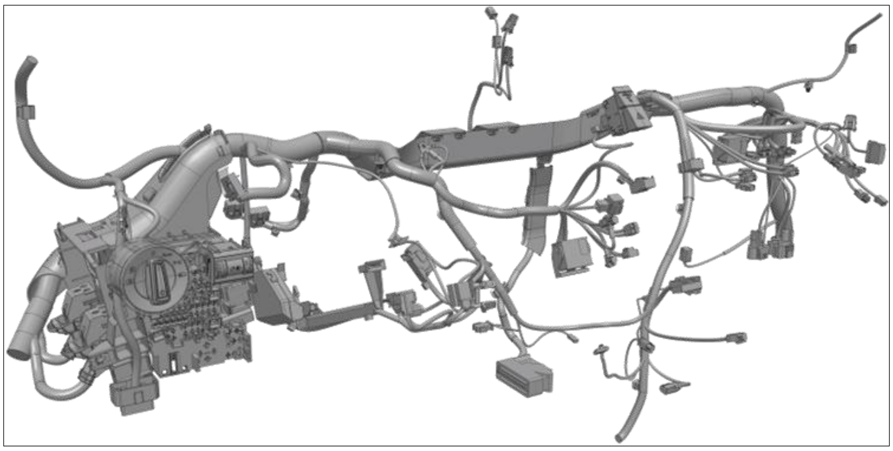
Illustration 3 Instrument Panel Crossmember



Source: undisclosed information, November 22, 2015

The crossmember shown in Illustration 3 is used as a pre–assembly frame for the required components. It is also used later as a support for lifting up by the handling device during the cockpit installation in the vehicle. It consists of two sections: *a base section* and *two legs section*. The base section is located in the centre of the crossmember and each leg section is placed at both ends of the crossmember. The legs sections are linked to the front pillars of the vehicle (WIPO, 2015).

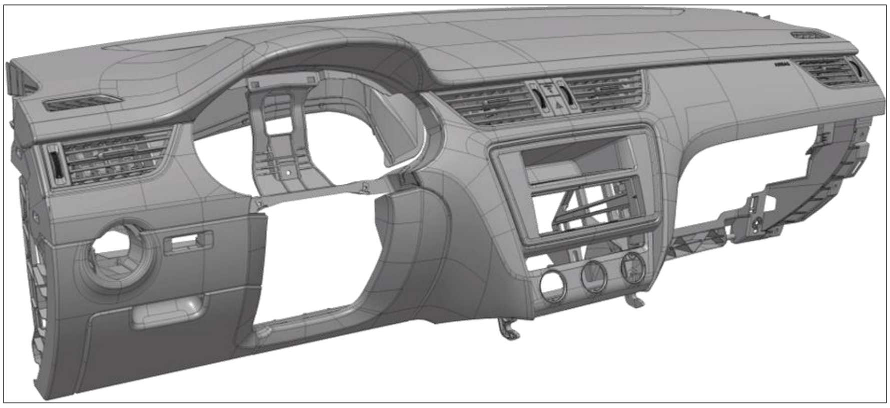
Illustration 4 Electronics



Source: undisclosed information, November 22, 2015

Illustration 4 demonstrates the electronics network in the cockpit. The electronics have to be wired properly in order to provide the desired functions of the vehicle. The network usually contains: air conditioning controls, lighters, navigation systems, radio, airbags, instrument panel displays and other electronic devices. All the electronic devices must be electrically interrelated and powered. Power distribution of these devices is typically placed in the cockpit (Glovatsky et al., 2004).

Illustration 5 Instrument Panel



Source: undisclosed information, November 22, 2015

Illustration 5 shows the instrument panel (also called dashboard) that creates the main component of the passenger's cockpit. The electronic devices are inserted in the instrument panel and connected to the electronics. The remaining components are then assembled to the instrument panel.

Illustration 6 Vehicle Cockpit

Source: undisclosed information, November 22, 2015

The last illustration presents the completed vehicle part after all the required components of the cockpit are assembled. As a fully assembled vehicle part, the cockpit is ready to be delivered to the customer's production plant.

4.1.2 Proposed Cockpit Assembly Location

Due to the fact that these days Škoda Auto releases either a new model or an updated model more frequently than it did in the past, the company needs to have the necessary capacity in order to be able to produce in higher volumes. Currently, two models of Škoda's portfolio are produced in the production plant Kvasiny. The upcoming new SUV model is going to be produced in this plant also. Because the company is involved in the production of high volume of vehicles, it is forced to focus only on vehicle assembly while the production of several parts is being outsourced.

At present, the cockpits of the current two models are assembled directly by Škoda Auto in the plant Kvasiny. The cockpits of the remaining models are done by an external company in Škoda's second plant in Mladá Boleslav. Outsourcing the cockpit assembly would therefore lead to a competitive environment between the current external company operating in Mladá Boleslav and the potential company operating close to the production plant Kvasiny.

Škoda Auto needs an external company that is capable of assembling three cockpits at the same time and deliver the required vehicle parts via the logistics concept *just in time* to the production plant in Kvasiny. Due to the fact that this logistics concept is based on the prompt and timely delivery of a precise volume of parts, the potential external company has to be located close to the production line in Kvasiny.

There are few competitors in the Czech Republic that are able to fulfil this criterion. The company XYZ is among the preferred suppliers in assembling the vehicle part for the three models of Škoda Auto.

A business of this size is only appealing for the company if it is able to find a suitable production hall for leasing in close distance to Kvasiny. In case that the company purchases a land and starts building a production plant from scratch, the cost of the project would drastically increase and it would not have a beneficial effect on the company's value. There are several reasons why leasing is a better alternative than purchasing new assets. The biggest advantage of the lease is that cash outflow related to the lease cost is spread over years, while purchasing a new asset, in this case a production plant, involves a significant initial investment. Additionally, there is an opportunity to invest the capital in other projects.

Therefore, the case study of vehicle assembly takes into consideration only the possibility of a lease. In order to launch the assembly for the three models at the same time, the company requires approximately 10,500 square meters of production plant and a storage space. Out of this plant 9,750 square meters are needed for a machine shop and 750 square meters for office space. The area estimations are derived from similar ongoing projects of company XYZ (undisclosed information, October 8, 2015).

Illustration 7 Proposed Location

Source: Google maps, 2015, author's adaptation

There are few companies that provide the lease of production halls in the range of 10 kilometres from the production plant Škoda Auto Kvasiny. They are mostly located close to the city Rychnov nad Kněžnou. In 2015 when the research was performed, the most suitable choice was a lease at the price €5.20 per month for the shop machine space and €10.50 per month for the office space[1]. These price quotations will be used in the proposed project.

4.2 Assumptions and Limitations

One of the main limitations of the cockpit assembly business is the customer's requirements regarding component suppliers and component prices. The cockpit supplier will lose its complete purchasing responsibility in terms of components because the majority of component suppliers and prices will be both, sourced and negotiated by Škoda Auto. In other words, the cockpit assembler can influence neither the selection of the component suppliers nor the component prices. The payment terms are stated contractually on 25th day of the month following invoice date. The same payment terms will be applied for both, the component suppliers and Škoda Auto.

The second limitation is connected to the logistics of the proposed project. Since the project takes into account the logistics concept *just in time*, the cockpit assembler is required

[1] The price quotation of the lease is confidential information and the company that provides a leasing space wishes to remain anonymous.

to keep a safety stock at minimum quantity of three inventory days. The safety stock at such quantity will have a significant impact on the company's cash flow. This amount is constantly frozen in the company's stock and the company cannot use this amount in financing other activities.

The next limitation is a result of capital requirements. Due to the fact that this business requires high capital expenditure on purchasing new equipments followed by cost associated with launching the project, there is a low chance of equipment reuse after the project is over. Additionally, there are requirements set by Škoda Auto regarding the cockpit assembly - the location needs to be close to the production plant Kvasiny and to be able to manufacture three vehicle models.

In the subchapter *Proposed cockpit assembly location*, it is indicated that the company XYZ could perform this project on the lease location. In most cases the cockpit assembly plants are *only* dedicated to the activity of cockpit assembly. Considering the fact that the proposed project consists of assembling three models for one customer, XYZ would avoid a higher risk investment if the assembly plant is leased instead of purchased (undisclosed information, October 10, 2015).

Finally, the volatility of the automotive market can be considered as a general limitation. As in any market, consumer's behaviour cannot be precisely predicted and might influence the overall vehicle sales. That might lead to less volume of production than initially estimated and can jeopardize the XYZ involvement in the project.

4.3 **Data Inputs**

Škoda Auto plans to manufacture 200,000 vehicles on average per year in the production plant Kvasiny. This amounts to 800 vehicles per day when considering 250 working days in a calendar year. This figure is important for the determination of results by using the selected indicators.

Despite of the fact that the project consists of assembling three cockpit types, the value of the material cost (€988/pc.) used in the calculations is an average of all three models. As discussed in the subchapter *Assumptions and limitations*, the cockpit supplier is required to keep a safety stock at minimum quantity of three inventory days. If the daily cockpit production (800 pcs.) and material cost per piece (€988) are taken into account, the rounded three days inventory equals a safety stock worth €2.40 million.

This is followed by a high capital expenditure related to the completely new assembly line system for three models as well as installation costs of €8.60 million. The project lifetime is set up by the customer for seven consecutive years and this value will be also used in the computations.

Although the manufacturer's planned volume is 200,000 vehicles per year, the capital budgeting calculations and the profitability indicators will take into account the figure of only 180,000 vehicles per year. The reduction of 10% (20,000 vehicles in the case study of the cockpit assembly) between the customers' planned volume and the applied volume is done on the grounds of an internal rule of company XYZ that is used for financial calculations. According to this internal rule, the reduction accounts for the potential uncertainty in selling new vehicles.

As building new production halls would lead to a significant increase of the initial investment, the proposed project considers the leasing option. The required production area is approximately 10,500 square meters. Based on the provided monthly lease (€5.20 for the shop machine space and €10.50 for the office space) the annual lease cost will be determined.

In order to obtain the relevant results by using capital budgeting techniques and profitability indicators, it is required to set a selling price of one cockpit. The selling price of the part will be used later on to determine the estimated annual cash revenues for the project. The expected selling price of the cockpit (€1,020) is derived according to the customer's price expectation and the benchmark analysis of similar cockpit assembly projects (undisclosed information, October 19, 2015).

In the capital budgeting calculations (NPV, IRR) a discount rate of 10% is selected as a best fit that represents the estimated risk for the selected project. This discount rate was selected due to the fact that the initial investment of €11.70 million is a rather high sum and the discount rate should therefore adequately represent the risk involved in the potential investment.

4.4 Capital Budgeting Calculations

The following part will practically examine the proposed project through the use of capital budgeting calculations. In order to determine the results, three capital budgeting techniques will be used: payback period, net present value and internal rate of return.

4.4.1 Payback Period (PP)

The calculation of the payback period is divided into two parts. In the first part, it is necessary to determine the cost of the initial investment. The figure of the initial investment will be used as the value of the numerator. Annual net cash inflows will be also calculated and used as the value of the denominator.

Initial Investment

The estimated figure of the initial investment for the proposed project is €11.70 million. This is a high capital expenditure considering that the project will require the assembly of three models. The amount represents the investment in the assembly line system, new equipments and other initial expenditures. Due to the fact that the project involves an option of lease, there is no capital expenditure on premises. Therefore, lease cost is excluded from the cost of capital investment and will not affect the initial investment. The estimated initial investment is summarized as follows:

Table 4 Initial Investment

Initial Investment (based on 2015 figures)	
Item	**EUR million**
Assembly line system	7.05
Packaging	0.70
Start-up cost	1.55
Safety stock cost	2.40
Total cost of initial investment	**11.70**

Source: XYZ internal source, October 19, 2015, author's computation

Assembly line system refers to tooling and fixtures expenditures. It also represents the software and technology investment that are needed for assembling the vehicle components in sequence. Each type of vehicle model requires a specific assembly line.

Packaging includes the cost of capital for the transportation of racks in a complete logistic chain. The cost also involves the expenditure on the necessary packaging of all individual components. The cockpit consists of 24 components and each component has up to 300 different versions of it. Therefore, the cost includes the packaging of all 24 components and the packaging of each component version too. Since it is required to keep a safety stock at minimum quantity of three inventory days, the total figure of packaging amounts to €0.70 million.

Start-up cost is all cost that is related to launching the project before the serial production starts. It is also the cost that cannot be specifically categorized. For instance, expenditure on staff training for the new assembly lines is part of the start-up cost. Additionally, start–up cost also includes expenditure on various problems that might arise during the launching phase. Problems that might occur are: higher scrape rate, higher cycle time per cockpit assembly or insufficient quality than it was calculated and expected. Such problems could affect the daily planned production and the supplier might not meet the customer's requirements. Therefore, all problems should be eliminated during the launching phase.

Safety stock cost includes cost related to the required minimum quantity of three days inventory. Due to the fact that both, component suppliers and the cockpit supplier are paid according to the same payment terms (on the 25th day of the month following invoice date), the coverage of the safety stock cost is a responsibility of company XYZ (undisclosed information, October 19, 2015).

Annual Net Cash Inflows

The annual net cash inflow is calculated by subtracting the annual cash outflows from the annual cash inflows. Values of labour cost, variable cost and material cost are the company's cash outflows while the selling price determines the cash inflows of the project. Table 5 presents labour cost calculations per part.

Table 5 Labour Cost Per Part

Labour Cost Per Part (based on 2015 figures)		
Item	**Value**	**Unit**
Assembly cycle time	114	sec
Direct operators (working stations)	22	workers
Direct labour	12.00	EUR/hour
Total direct labour cost	**8.36**	**EUR**
Indirect operators	12	workers
Indirect labour	15.50	EUR/hour
Total indirect labour cost	**5.89**	**EUR**
Total labour costs per part	**14.25**	**EUR**

Source: XYZ internal source, October 21, 2015, author's computation

Assembly cycle time is a time necessary to assemble a cockpit.

Direct operators are direct workers that will handle 22 working stations required for the cockpit assembly line.

Direct labour refers to the hourly wage of direct operators.

Indirect operators are other individuals, typically workers in warehouse or maintenance (quantity is derived as a ratio 54% of direct workers).

Indirect labour refers to the hourly wage of indirect operators.

Table 6 Variable Cost Per Part

Variable Cost Per Part (based on 2015 figures)		
Item	**Value**	**Unit**
Variable cost	2.71	EUR

Source: XYZ internal source, October 21, 2015

Variable cost is another cost that cannot be directly allocated. It includes mostly the maintenance of work equipment, utilities and freight. The value of the variable cost is a percentage that is derived from the total value of the labour cost. In the proposed project, a percentage rate of 19% will be used. This percentage rate is used in one of the XYZ production plants.

Another important cost that needs to be added to the cash outflows of the company is the material cost. Material cost is related to the components expenditure of the cockpit assembly. The required components are a purchasing responsibility of Škoda Auto and therefore their value cannot be influenced by company XYZ. By adding these three items together, the cash outflows are estimated.

Table 7 Estimated Cash Outflows Per Part

Estimated Cash Outflows Per Part (based on 2015 figures)	
Item	**EUR/1 pc.**
Labour cost	14.25
Variable cost	2.71
Material cost	988.00
Total estimated cash outflows per part	**1,004.96**

Source: XYZ internal source, October 21, 2015, author’s computation

Unlike the cash outflows, the estimated cash inflows are dependent on only one item – the selling price per part. The selling price of the cockpit is set up according to benchmark analysis of other ongoing cockpit projects as well as the expected target price by Škoda Auto.

Table 8 Estimated Cash Inflows Per Part

Estimated Cash Inflows Per Part (based on 2015 figures)	
Item	**EUR/1 pc.**
Selling Price	1,020
Total estimated cash inflows per part	**1,020**

Source: XYZ internal source, October 21, 2015

After cash outflows and inflows are estimated, it is possible to calculate the net cash inflow for a single part and the annual net cash inflow for the planned volume of production.

Table 9 Estimated Net Cash Inflows

Estimated Net Cash Inflows (based on 2015 figures)		
Item	**EUR/1 pc.**	**EUR/180,000 pcs.**
Labour cost	14.25	2,565,000
Variable cost	2.71	487,800
Material cost	988.00	177,840,000
Estimated cash outflows	**1,004.96**	**180,892,800**
Selling price	1,020.00	183,600,000
Estimated cash inflows	**1,020.00**	**183,600,000**
Estimated net cash inflows	**15.04**	**2,707,200**

Source: XYZ internal source, October 21, 2015, author's computation

As seen from the calculations, the project generates the estimated net cash inflow of €15.04 per piece. Considering a production of 180,000 vehicles per year, the overall annual net cash inflow is €2.71 million. This is the estimated net annual cash inflow that the project will generate throughout seven years.

Payback Period Calculation

By estimating the figures of the initial investment and the annual net cash inflows, a cumulative cash flow projection can be determined. The investment break-even is at the point in time when the cumulative cash flow changes from a negative to a positive figure.

Table 10 Cumulative Cash Flow Projection

Cumulative Cash Flow Projection (EUR)		
Period	Annual Cash Flow	Cumulative Cash Flow
Now	-11,700,000	-11,700,000
End of year 1	2,707,200	-8,992,800
End of year 2	2,707,200	-6,285,600
End of year 3	2,707,200	-3,578,400
End of year 4	2,707,200	-871,200
End of year 5	2,707,200	1,836,000
End of year 6	2,707,200	4,543,200
End of year 7	2,707,200	7,250,400

Source: author's computation

Based on the cumulative cash flow projection it is visible that the investment break-even will occur by the end of the fifth year of the project. The payback occurs in the fifth year because the cumulative cash flow at the end of year four is negative while the cash flow at the end of year five is positive.

After all inputs are estimated, the exact payback period of the project can be estimated by using Formula 1, as defined in subchapter 2.2.3

$$\textbf{Payback Period} = \frac{\text{Initial Investment}}{\text{Annual Net Cash Inflows}}$$

Source: Crosson, Needles, 2010, pg. 449, author's adaptation

As previously calculated, the figure of the initial investment for the project is €11.70 million and the estimated annual net cash inflow is €2.71 million.

Table 11 Payback Period Calculation

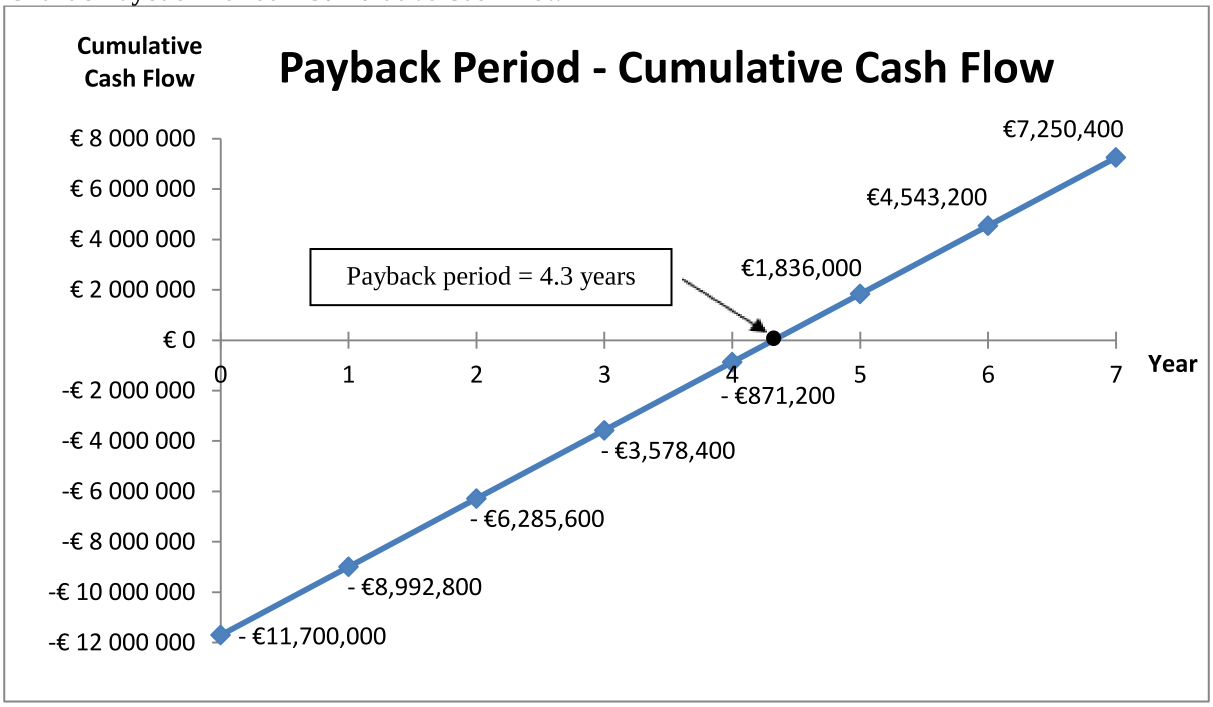
Payback Period Calculation (based on 2015 figures)		
EUR million		Years
11.70 / 2.71	=	4.32

Source: author's computation

The result of the payback period calculation is **4.32 years** (or 4 years and 3.8 months). It is the required length of time that is needed for the project's cash inflow to equal the initial investment. The result is an important factor that influences the decision making regarding the project. The reason for this is that the longer the period of the payback - the longer time is required to cover the initial investment.

The cumulative cash flows at the end of each year are shown in the following chart:

Chart 8 Payback Period - Cumulative Cash Flow



Source: author's computation

The figures show the initial investment and the cumulative cash flows at the end of each year that the project will operate. For example, the cumulative value at the end of the third year is -€3,578,400. This is the sum of the estimated annual net cash inflows for the first three years and the initial investment. The payback period occurs at the point in time when the cumulative cash flow of the project changes from a negative to a positive value.

4.4.2 **Net Present Value (NPV)**

To determine the net present value of a proposed project, an algebraic method or a table method can be used. In case of the cockpit assembly project, only the algebraic equation will be utilized. To construct the NPV equation, it is necessary to know the initial investment, the lifetime of the project, the cash flow at the end of each year that the project generates and the discount rate.

Since both, the initial investment (€11,700,000) and the annual value of cash flow (€2,707,200) were generated via the payback period, it is possible to set a cash flow projection for the expected project's lifetime.

Table 12 Cash Flow Projection of the Project

Cash Flows Projection of the Project	
Cash Flow	EUR
Initial investment	-11,700,000
End of year 1	2,707,200
End of year 2	2,707,200
End of year 3	2,707,200
End of year 4	2,707,200
End of year 5	2,707,200
End of year 6	2,707,200
End of year 7	2,707,200

Source: author's computation

As seen from the table of cash flows projection, the project is expected to last for seven years. During this length of time, the anticipated annual cash flows are estimated at €2,707,200 per year.

Finally, the discount rate of 10% is taken for this calculation in order to account for the higher risk and the opportunity cost of the project.

The formula for calculating net present value was defined as Formula 2 in subchapter 2.3.2

Net Present Value Formula, Algebraic Method

$$\mathbf{NPV} = \left(\frac{CF_1}{(1+k)^1}\right) + \left(\frac{CF_2}{1+k)^2}\right) + \ \dots \ + \ \left(\frac{CF_n}{1+k)^n}\right) - \text{ Initial Investment}$$

Source: Gallagher, Andrew, 2007, pg. 267

Based on the given algebraic formula for NPV, the estimated cash flows for the seven years (€2,707,200) will be substituted instead of CF_1, CF_2 ... $CF_{n.}$ The discount rate of 10% is substituted for the value of *k*. The number of years (1,2 ... 7) are substituted accordingly for the values of *n*. Finally, the amount of the initial investment (€11,700,000) will be subtracted.

After all data is inserted into the equation, NPV formula can be solved as follows:

$$\text{NPV} = \left(\frac{€2{,}707{,}200}{(1+0.10)^1}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^2}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^3}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^4}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^5}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^6}\right) + \left(\frac{€2{,}707{,}200}{(1+0.10)^7}\right) - €11{,}700{,}000$$

$$\text{NPV} = €2{,}461{,}090.91 + €2{,}237{,}355.37 + €2{,}033{,}959.43 + €1{,}849{,}054.03 + €1{,}680{,}958.21 + €1{,}528{,}143.82 + €1{,}389{,}221.66 - €11{,}700{,}000$$

$$\text{NPV} = \mathbf{€1,479,783.43}$$

The calculations show that at a discount rate of 10%, initial investment of €11,700,000 and an estimated cash flow of €2,707,200 at the end of each year, the net present value of the project is €1,479,783.43.

However, it is important to note that the discount rate has a significant impact over the final NPV value. Due to the fact that the relationship between the net present value and the discount rate is inverse, the higher the discount rate - the lower the NPV and vice versa. The following table and graph illustrate that as the discount rate increases from 0 to 20%, the value of NPV decreases.

Table 13 NPV and Different Discount Rate

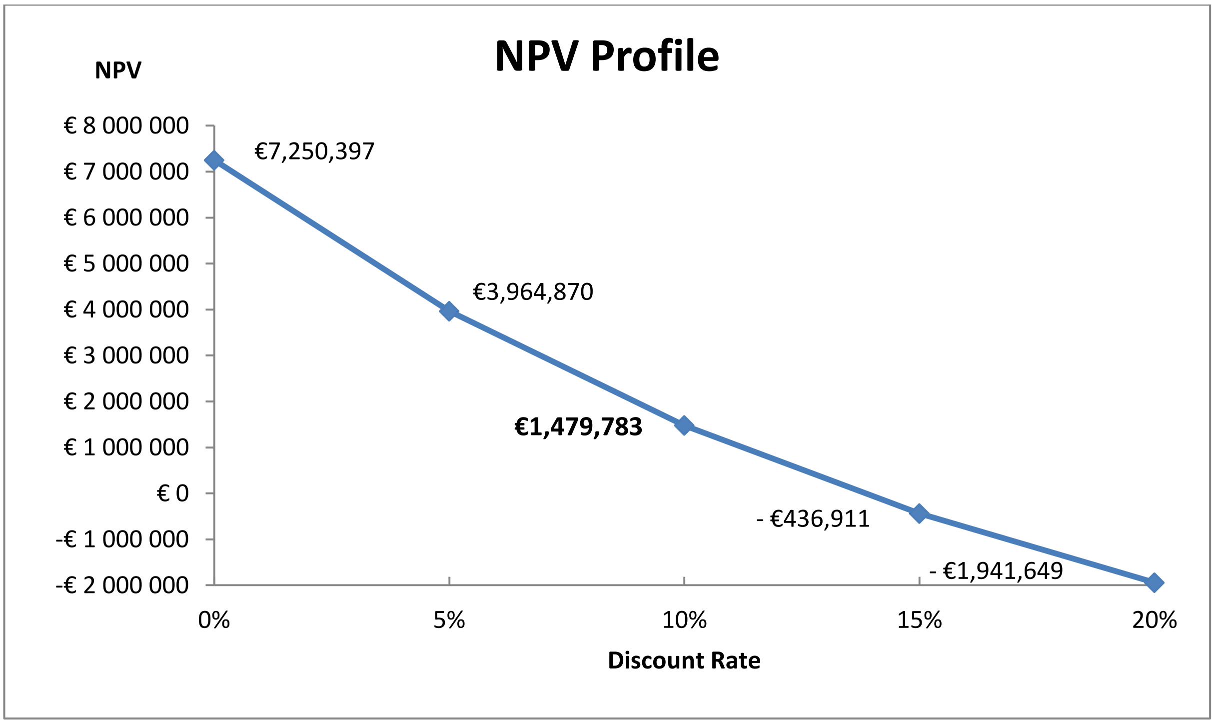
NPV and Different Discount Rate	
Discount Rate (in %)	**Project NPV** (in EUR)
0	7,250,397.00
5	3,964,870.06
10	**1,479,783.43**
15	-436,911.69
20	-1,941,649.18

Source: author’s computation

As it can be seen in Table 13, if a discount rate of 0% was used, the NPV would record a result five times greater than the obtained result at 10% rate. On the other hand, if a discount rate of 20% was used, the NPV would be negative. This comparison shows how sensitive NPV is to the discount rate changes.

Many analysts who use NPV as a capital budgeting technique often create an NPV profile in the form of a graph. The discount rates are selected arbitrarily and based on the firm’s opportunity costs. The NPV profile allows to observe the sensitivity of NPV when different discount rates are taken.

Chart 9 NPV Profile



Source: author’s computation

Net Present Value profile in Chart 9 shows how the value of NPV varies inversely with the discount rate. The illustration enables the detection of the highest NPV value of the project, if the discount rate was zero (€7,250,397). The lowest NPV (-€1,941,649) occurs when the discount rate is 20%.

4.4.3 Internal Rate of Return (IRR)

As discussed in subchapter 2.2.3, the method of internal rate of return uses the same formula as NPV does, however its goal is to determine the discount rate at which the NPV is equal zero. Another difference is that the obtained results are expressed as percentage. The determined result of the internal rate of return should exceed the firm's hurdle rate in order for the project to be accepted.

Since the IRR formula is based on the NPV formula, it is possible to use the same cash flow values that were applied in the NPV calculation. Cash flow figures associated with the proposed project are as follows:

Table 14 Cash Flows Projection of the Project

Cash Flows Projection of the Project	
Cash Flow	**EUR**
Initial investment	-11,700,000
End of year 1	2,707,200
End of year 2	2,707,200
End of year 3	2,707,200
End of year 4	2,707,200
End of year 5	2,707,200
End of year 6	2,707,200
End of year 7	2,707,200

Source: author's computation

The calculation of the internal rate of return will be performed via *the interpolation method* where two arbitrary discount rates that produce one positive and one negative NPV result are selected. The NPVs are determined by selecting the arbitrary values of *k,* in the following equation, adjusted from original IRR Formula 4, subchapter 2.3.3

Internal Rate of Return

$$\textbf{NPV} = \textbf{Initial Investment} = \left(\frac{CF_1}{(1+k)^1}\right) + \left(\frac{CF_2}{(1+k)^2}\right) + \ldots + \left(\frac{CF_n}{(1+k)^n}\right)$$

Source: Gallagher, Andrew, 2007, pg. 272, author's adaptation

In order to find the two NPV values, all the values that are already known need to be filled in the equation. Firstly, the estimated yearly cash flow value that the project will generate (€2,707,200) will be substituted for CF_1, CF_2 ... CF_n. Secondly, the arbitrary discount rate *k* is entered. Thirdly, expected lifetime of the project (1,2 ... 7) will be substituted in accordance with the values of *n*. The last known item is the value of the initial investment (€11,700,000) that is inserted on the left side of the equation. After all numbers are filled in the equation, the value of NPV can be solved.

The first selected discount rate is 10%.

NPV at 10%

$$\textbf{€11,700,000} \neq \left(\frac{€2,707,200}{(1+0.10)^1}\right) + \left(\frac{€2,707,200}{(1+0.10)^2}\right) + \left(\frac{€2,707,200}{(1+0.10)^3}\right) + \left(\frac{€2,707,200}{(1+0.10)^4}\right) + \left(\frac{€2,707,200}{(1+0.10)^5}\right) + \left(\frac{€2,707,200}{(1+0.10)^6}\right) + \left(\frac{€2,707,200}{(1+0.10)^7}\right)$$

$$\textbf{€11,700,000} \neq €2,461,090.91 + €2,237,355.37 + €2,033,959.43 + €1,849,054.03 + €1,680,958.21 + €1,528,143.82 + €1,389,221.66$$

$$\textbf{€11,700,000} \neq €13,179,783.43$$

The difference between the initial investment and the discounted yearly cash flows at 10% is equal to NPV **€1,479,783.43**. The calculation using the discount rate of 10% shows a positive NPV result. The discounted yearly cash flows are also higher than the initial investment which indicates that a higher rate should be used in order to fully discount the yearly cash flows. As a second discount rate 15% will be used.

NPV at 15%

$$\mathbf{€11,700,000} \neq \left(\frac{€2{,}707{,}200}{(1+0.15)^1}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^2}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^3}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^4}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^5}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^6}\right) + \left(\frac{€2{,}707{,}200}{(1+0.15)^7}\right)$$

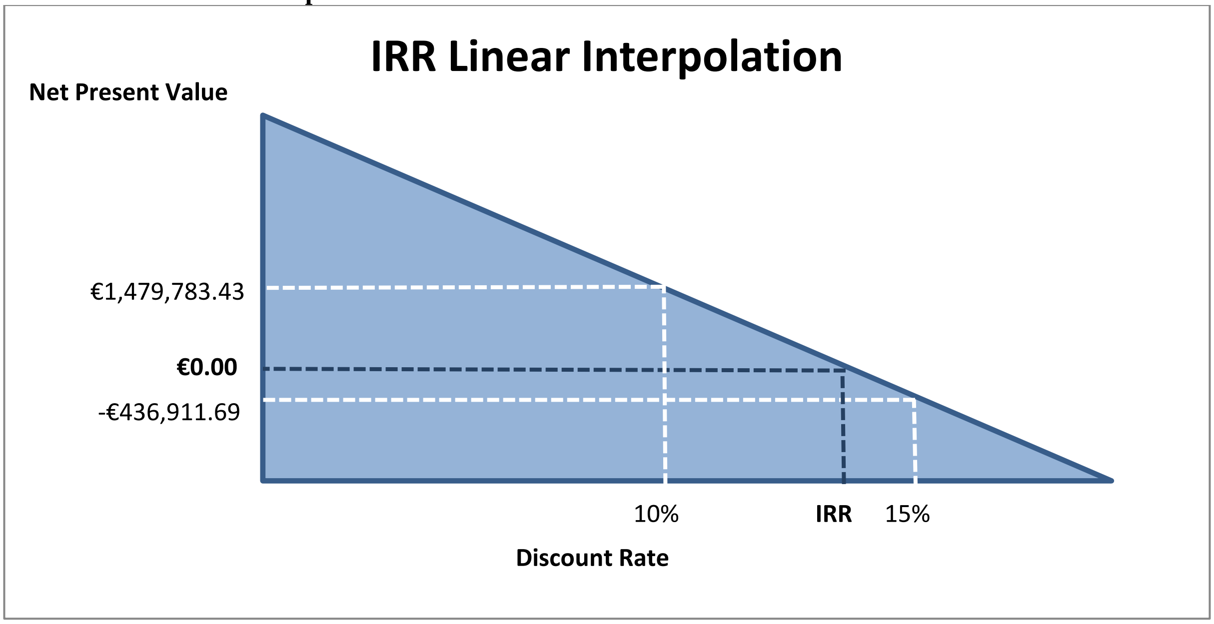
$$\mathbf{€11,700,000} \neq €2{,}354{,}086.96 + €2{,}047{,}032.14 + €1{,}780{,}027.94 + €1{,}547{,}850.39 + €1{,}345{,}956.86 + €1{,}170{,}397.27 + €1{,}017{,}736.75$$

$$\mathbf{€11,700,000} \neq €11{,}263{,}088.31$$

The difference between the initial investment and the discounted yearly cash flows at 15% is equal to NPV **-€436,911.69**. The calculation using the discount rate of 15% shows a negative NPV result. The discounted yearly cash flows are also lower than the initial investment, which indicates that IRR of the project must be a discount rate between 10 and 15%. The IRR will be closer to the figure of 15% due to the fact that its NPV figure is closer to zero.

The same relationship can be observed if the results are plotted on a basic linear interpolation graph. The IRR point can be estimated by drawing a straight line between the two determined NPV values and their discount rates.

Chart 10 IRR Linear Interpolation



Source: author’s computation

In order to estimate the exact IRR, the linear interpolation formula will be utilized as defined in chapter 2

$$\mathbf{IRR} = \mathrm{i}_1 + \frac{\mathrm{NPV}_1}{\mathrm{NPV}_1 - \mathrm{NPV}_2} * (\mathrm{i}_2 - \mathrm{i}_1)$$

Source: Götze, Northcott, Schuster, 2015, pg. 66, author's adaptation

Based on the formula, i_1 will be substituted with the first discount rate of 10% and i_2 will be substituted with the second discount rate of 15%. NPV_1 refers to the value obtained at 10% (€1,479,783.43), while NPV_2 is the value obtained at 15% (-€436,911.69).

$$\mathbf{IRR} = 10\% + \frac{€1{,}479{,}783.43}{€1{,}479{,}783.43 - (-€436{,}911.69)} * (15\% - 10\%)$$

$$\mathbf{IRR} = 13.86\%$$

Based on the linear interpolation method the project's IRR in years 1 through 7 is 13.86%. This means that at **13.86%** discount rate the project's NPV should equal zero. As a final calculation, the discount rate of 13.86% will be substituted in the equation.

$$\mathbf{NPV\ at\ 13.86}\%$$

$$\mathbf{€11,700,000} \neq \left(\frac{€2{,}707{,}200}{(1+0.1386)^1}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^2}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^3}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^4}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^5}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^6}\right) + \left(\frac{€2{,}707{,}200}{(1+0.1386)^7}\right)$$

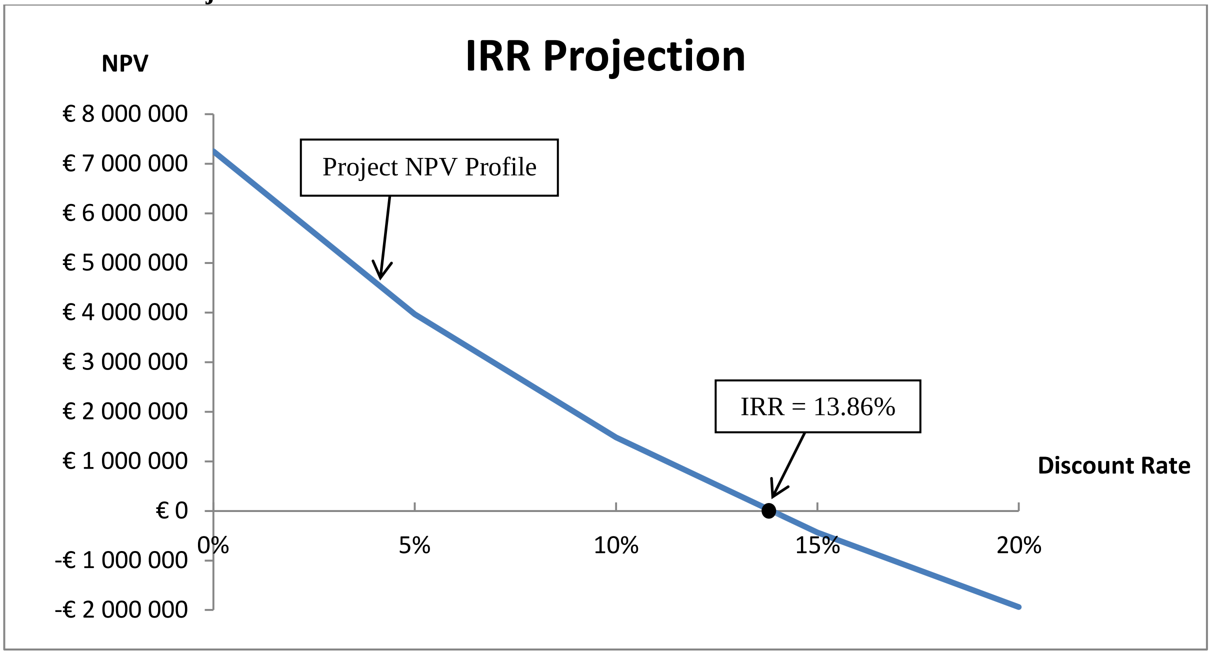
$$\mathbf{€11,700,000} \neq €2{,}377{,}656.77 + €2{,}088{,}228.33 + €1{,}834{,}031.55 + €1{,}610{,}777.76 + €1{,}414{,}700.30 + €1{,}242{,}491.04 + €1{,}091{,}244.54$$

$$\mathbf{€11,700,000} \approx €11{,}659{,}130.29$$

The calculations show that an IRR of 13.86% generates a very close fit to the initial investment of €11,700,000 and the small deviation in this case can be attributed to rounding differences.

An IRR projection can be illustrated graphically by using the same NPV profile as used in the original NPV calculation. The point where the NPV profile crosses the axis of the discount rate is the figure of the internal rate of return.

Chart 11 IRR Projection



Source: author's computation

The final step is a comparison between project's IRR (13.86%) and the rate of return that firm's management requires (10%).

Table 15 IRR Decision Rule

IRR Decision Rule
13.86% > 10%

Source: author's computation

According to the IRR decision rule, the project's IRR should be higher than the firm's required rate of return. This means that the proposed project, as determined by the internal rate of return method, is acceptable.

4.5 Profitability Calculations

4.5.1 Earnings Before Interest, Taxes, Depreciation and Amortization

There are several profitability indicators that allow the determination of a project's financial performance. EBITDA is the most common indicator and it will be used for the evaluation of the project's profitability. The second part of this subchapter will focus on the determination of the project's operating efficiency by using the profitability ratio EBITDA margin.

To determine the project's EBITDA, it is necessary to calculate the project's revenue and expenses out of which interest, tax, depreciation and amortisation are excluded. In this case study, revenue is represented by only one item which is sales revenue. The project expenses consist of total variable costs, material cost, lease cost, fixed costs and general and administrative cost. All mentioned expenses are related to the production and it is required to involve them in the EBITDA calculation. Since the total variable cost and the material cost calculations were presented in the payback period method, the same values will be used.

In order to determine the total expenses for the purposes of EBITDA calculation, three additional costs need to be calculated: lease cost, fixed cost and general and administrative cost. After this, all the expenses are deducted from revenue and the remaining result demonstrates the financial performance via EBITDA.

When the EBITDA figure is calculated, it is possible to also estimate the EBITDA margin ratio. The value is determined by dividing the EBITDA figure to the project's estimated sales.

Lease Cost

The lease cost is determined based on the price list of the production halls provider. The yearly lease costs for both, production in the machine shop and operating in the offices are as follows:

Table 16 Lease Cost Calculation

Lease Cost Calculation (based on 2015 figures)			
Item	**Machine shop**	**Office area**	**Unit**
Monthly lease	5.20	10.50	EUR/m^2
Required production area	9,750.00	750.00	m^2
Yearly lease	608,400.00	94,500.00	EUR
Total lease cost per year		**702,900.00**	**EUR**

Source: undisclosed information, October 8, 2015, author's computation

Monthly lease cost is set according to the lease price of the proposed location. As it can be seen, there is a difference in the lease price by €5.30 per square meter between the machine shop and the office.

Required production area is split into the area necessary to assemble vehicle parts in the machine shop and the office area needed to perform administrative work.

By adding the yearly lease cost for the machine shop and the office area, the final lease cost per year is estimated at €702,900.

In addition to the lease cost, the firm also needs to consider the fixed costs that will influence the EBITDA calculation.

Fixed Costs

Fixed costs stand for expenses that are independent on the level of goods manufactured by a firm; they are mostly time-related. In the case study of cockpit assembly, fixed costs represent costs that are related to the production in the machine shop and the office area. Some of these costs include insurance, heating, energy cost and other expenses that are paid on a monthly basis. Expenses for fixed costs per year are as follows:

Table 17 Fixed Cost Calculation

Fixed Costs Calculation (based on 2015 figures)		
Item	**Value**	**Unit**
Fixed cost per year	55.00	EUR/m^2
Required production area	10,500.00	m^2
Fixed costs per year	**577,500.00**	**EUR**

Source: XYZ internal source, October 10, 2015, author's computation

Fixed costs are determined according to a similar XYZ production plant in the Czech Republic, where the ratio of 55€/m^2 is used to set annual fixed costs.

Required production area is estimated based on both, the machine shop and the office area requirements needed to assemble car parts.

For the fixed cost of €55 per m^2 and a required production area of 10,500m^2, the total fixed costs per year amount to €577,500.

General and Administrative Cost

The last missing item before deriving EBITDA is the determination of general and administrative cost. G&A expenses include executive and managerial salaries, administration costs and travel expenses associated with operating. These expenses are recorded in the firm's balance statement under the item operating expenses.

Table 18 General and Administrative Cost

General and Administrative Cost (based on 2015 figures)		
Item	**Value**	**Unit**
Total labour & variable costs per piece	16.96	EUR
XYZ G&A rate per piece	1.19	EUR
Planned volume of production	180,000.00	pcs.
Total G&A cost per year	**214,200.00**	**EUR**

Source: XYZ internal source, October 21, 2015, author's computation

Total variable costs were already calculated for the purpose of the payback period estimation.

XYZ G&A rate is defined according to XYZ European company's policy. According to this policy, the G&A rate is equal to 7% of the total labour & variable costs per piece.

Planned volume of production has been set since the beginning of the case study.

The total G&A cost per year is calculated by multiplying the G&A rate per piece (€1.19) with the planned volume of vehicle production (180,000). This gives the final result of €214,200 General and administrative cost per year.

EBITDA and EBITDA Margin Calculations

The sales price per piece (€1,020) was already determined for the purposes of payback period calculation. When multiplied to the annual vehicle production (180,000 pcs.), the total sales revenue for the year is generated.

After all the necessary cost items have been calculated, the project's profitability via EBITDA indicator can be estimated. To calculate the financial performance of the project, the annual sales revenue will be reduced by the total annual expenses (excluding tax, interest, depreciation and amortization values).

Table 19 EBITDA Calculation

(1) EBITDA Calculation in EUR (based on 2015 figures)	
Revenue	
Selling price	183,600,000
Total	**183,600,000**
Expenses	
Material cost	177,840,000
Total labour & variable costs	3,052,800
Lease cost	702,900
Fixed cost	577,500
General and administrative cost	214,200
Total	**182,387,400**
EBITDA per year	**1,212,600**

Source: author's computation

Based on the calculation, it is visible that the yearly value of earnings before interest, tax, depreciation and amortization is **€1.2 million**.

After the figure of EBITDA is determined, it is also possible to define another profitability ratio - the EBITDA margin. The formula for calculating EBITDA margin was defined as Formula 7 in subchapter 2.2.4

$$\textbf{EBITDA Margin} = \frac{\text{EBITDA}}{\text{Sales}}$$

Source: Palepu et al., 2007, pg. 207, author's adaptation

The EBITDA value will be substituted with the obtained value of €1,212,600 and the sales value will be substituted with the estimated project sales in the amount of €183,600,000.

Table 20 EBITDA Margin Ratio Calculation

EBITDA Margin Ratio Calculation		
1,212,600 / **183,600,000**	=	**0.0066**

Source: author's computation

The project's EBITDA margin is 0.0066 or in other words, EBITDA accounts for **0.66%** from the total sales revenue. The obtained percentage value of the EBITDA margin ratio is rather low due to the fact that the item material cost is used in the calculations. The material cost is sourced and negotiated by Škoda Auto and therefore in order to obtain an accurate percentage value of EBITDA margin is necessary to omit this item.

The table below demonstrates that if the revenue is estimated without the material cost, the amount will decrease significantly.

Table 21 Estimated Revenue - Material Cost Excluded

Estimated Revenue – Material Cost Excluded (based on 2015 figures)		
Item	**EUR/1 pc.**	**EUR/180,000 pc.**
Selling price	1,020.00	183,600,000
Material cost	988.00	177,840,000
Estimated revenue (material cost excluded)	**32.00**	**5,760,000**

Source: author's computation

If the material cost is not taken into consideration than the company's estimated revenue will be only €32 per piece or €5,760,000 for the planned volume of production.

Since the modified annual revenue is determined, it is possible to adjust the EBITDA calculation and EBITDA margin.

Table 22 EBITDA Calculation (2)

(2) EBITDA Calculation in EUR (based on 2015 figures)	
Revenue	
Selling price	5,760,000
Total	**5,760,000**
Expenses	
Total labour & variable costs	3,052,800
Lease cost	702,900
Fixed cost	577,500
General and administrative cost	214,200
Total	**4,547,400**
EBITDA per year	**1,212,600**

Source: author's computation

After the material cost is omitted from the calculation and the revenue is adjusted, the value of the EBITDA remains €1,212,600. However, the value of the EBITDA margin has increased significantly.

Table 23 EBITDA Margin Ratio Calculation (2)

(2) EBITDA Margin Ratio Calculation		
$\frac{1,212,600}{5,760,000}$	=	**0.2105**

Source: author's computation

The value of the EBITDA margin has increased from 0.66% to **21.05%**.

5 Overall Results

The gathered data was processed according to the defined methodology, namely through the use of capital budgeting calculations and profitability calculations. The estimated results that the project would generate are as follows:

Table 24 Overall Results

Overall Results (based on 2015 figures)		
Selected method	**Result**	**Unit**
Capital budgeting calculations		
Payback period	4.32	years
Net present value	1,479,783.43	EUR
Internal rate of return	13.86	percent
Profitability calculations		
EBITDA	1,212,600	EUR
EBITDA margin ratio	21.05	percent

Source: author's computation

Capital Budgeting Calculations

Payback period of the proposed project is **4.32 years** (or 4 years and 3.8 months). In other words, in the fifth year of the project lifetime the project's cash inflow will equal the initial investment.

Net present value generated by the project is **€1,479,783.43**. Since the obtained result is a positive value, the estimated earning of the project (in present euro) exceeds the project's costs (in present euro).

Internal rate of return of the proposed project is **13.86%**. The value of the internal rate of return presents the discount rate that makes the NPV of all anticipated cash flows in the project equal to zero.

Profitability Calculations

EBITDA was estimated at **€1,212,600.** The calculated result demonstrates the remaining revenue after the project's expenses are subtracted from the revenue excluding tax, interest, depreciation and amortization values.

EBITDA margin ratio generated by the project is **21.05%**. The obtained figure shows the margin that was left after all the manufacturing expenses, general and administrative expenses (G&A) were deducted. In other words, the EBITDA margin ratio reflects the operating efficiency, omitting noncash operating expenses such as depreciation and amortization.

6 Conclusion and Recommendation

The research question of this thesis is as follows:

"Based on the required initial investment, customer's planned amount of production, customer's time frame of production, the expected results should verify the profitability of the project".

The cockpit assembly business associated with the assembly of three vehicle models is connected with a high capital expenditure as the necessary equipment needs to be purchased and it is almost fully dedicated to the particular project. The equipment will be used according to the project lifetime that is set up by the customer and its planned vehicle production. However, issues may arise related to equipment reuse or transfer when the project reaches its end.

Based on the result obtained with the *payback period*, the proposed project should be *adopted*, as the required length of time to recover the initial investment is shorter than the estimated project lifetime. However, this capital budgeting technique does not take into consideration the time value of money. Therefore, it should not be used as an objective criterion in the final decision making. Since the payback period is usually used only for screening decisions, the other techniques are also necessary in order to properly assess the project.

The most preferred capital budgeting criterion is the *net present value.* Since the net present value of the project is a positive value, the project should be also *accepted* according to this evaluation method. The net present value takes into consideration the discounted cash flows at the particular rate as well as the opportunity cost. Due to the fact that the figure of the discount rate is often set according to the firm's management decision, the result of the net present value would differ with different discount rates. Finally, since the result of the net present value is interpreted in currency, this might be misleading when understanding the result. Financial managers rather compare alternatives based on the percentage values.

The method that provides results in percentage values is the *internal rate of return*. The obtained results of the internal rate of return exceeded the firm's proposed requirements on the rate of return. Because the result is greater than the firm's required rate, the proposed project should be *accepted* by the firm's management. However, since the result is a percentage, it does not reflect exactly how much value of the firm will change if the project is accepted.

Besides the capital budgeting techniques, the value of the proposed business was measured via the often used profitability indicator *EBITDA* and the profitability ratio *EBITDA margin* that reflects the operating efficiency. Acceptance or rejection of the project, based on both figures is mostly determined according to the firm's screening and preference decisions. The results of the operational performance through EBITDA are expected to be acceptable as the operating income generates a significant figure.

Since the obtained results meet the acceptance criteria, the proposed case study of the cockpit assembly could be summarized as an *attractive business opportunity* for the company XYZ.

Recommendation

A main recommendation in order to obtain better results is to start a negotiation about the different payment terms that are applied for the cockpit delivery to the customer. In the proposed project, the payment terms are stated on 25th day of the month following invoice date and are applied for both, component suppliers and the customer. If the payment terms concerning the customer were reduced to the 20th day of the month following invoice date, the safety stock at minimum quantity of three inventory days would be eliminated. In other words, the initial investment required for the project would be reduced by the expected safety stock cost of €2.40 million. Additionally, a change in the payment terms will improve the company's cash flow since the receivables would be obtained 5 days before the company's payables.

A second significant step that can lead to a reduction in the initial investment is a negotiation about the investment expenditure related to the packaging. Since the packaging is always a property of the customer, the outflow concerning the mentioned item could be in the customer's purchasing responsibility. If the customer accepts the proposed condition, the project's initial investment would be decreased by additional €0.70 million. The total initial investment of the project would be therefore €8.60 million, instead of the projected €11.70 million.

If the reductions connected to the initial investment (safety stock cost and packaging) are achieved, the results of the capital budgeting methods would significantly increase and the company would record the following figures:

The *payback period* would record the change from *4.3 years* to *3.2 years*. The *net present value* of the project would generate *€4,579,783* instead of *€1,479,783*. The *internal rate of return* would increase from *13.9%* to *24.9%*.

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