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Systematical creation of localization concepts

Dislocation of added value on the basis of a specific contract from a Russian rail vehicle manufacturer

ausgeführt zum Zwecke der Erlangung des akademischen Grades eines

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Ich habe zur Kenntnis genommen, dass ich zur Drucklegung meiner Arbeit unter der Bezeichnung

Diplomarbeit

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David Högl

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Kurzfassung

Im Kontext der steigenden wirtschaftlichen Globalisierung stehen immer häufiger auch Kleine- und mittlere Unternehmen (KMU) vor der Herausforderung, Wertschöpfung ins Ausland zu verlagern. Oftmals basiert der Bedarf dazu auf möglichen Kosteneinsparungspotentialen, jedoch können auch Kundenanforderungen an lokale Wertschöpfung dazu führen, Teile der Wertschöpfungskette ins Ausland zu verlagern. Wie jedoch kann ein solches Lokalisierungsprojekt strukturiert, konzeptioniert und implementiert werden? Diese Arbeit hat das Ziel, ein universell anwendbares Lokalisierungskonzept anhand eines konkreten Auftrages aus der russischen Schienenfahrzeugindustrie an einen österreichischen Hersteller von Pantographen zu formulieren. Basierend auf der Erstellung von Strategien zur Erfüllung dieses Vertrages, welcher bestimmte Anteile an lokaler russischer Wertschöpfung fordert, wird ein allgemein gültiges Konzept für die Verlagerung von Wertschöpfungsaktivitäten abgeleitet.

Dazu werden zunächst notwendige respektive hilfreiche Strategien und Werkzeuge erläutert sowie die Ausgangslage, Rahmenbedingungen und Zielsetzungen des konkreten Lokalisierungsprojekts bestimmt. Anschließend erfolgt die Konzeption von Lokalisierungsstrategien, wobei die fundierte Berechnung eines Business Case ein zentrales Element für die Umsetzung darstellt. Besonders für KMU ist auch die Auswahl eines kompetenten lokalen Geschäftspartners, welche aufgrund häufig begrenzter Ressourcen und fehlendem Know-How oftmals vorteilhaft ist, essentiell für eine langfristig erfolgreiche Geschäftstätigkeit.

Die Erstellung eines Lokalisierungskonzepts sowie dessen Implementierung ist ein Projekt, das eine umfangreiche Planung sowie gewöhnlich große Ressourcen erfordert. Aufgrund der Vielfältigkeit der zu bewältigenden Aufgaben ist es sinnvoll, diese in Arbeitspakete strukturiert auf die jeweiligen Fachabteilungen aufzuteilen, was das Ergebnis dieser Arbeit in einem Projektstrukturplan darstellt.

Abstract

In context of the increasing economic globalization also small and medium sized enterprises (SMEs) frequently face the challenge to dislocate added value abroad. The demand is often based on possible cost reductions, but also customer requirements regarding local content can cause a compulsory dislocation for parts of the supply chain to a foreign country. How can such a localization project be structured, developed and implemented? This thesis' target is to formulate a universally applicable localization concept based on a specific contract from Russian railway industries to an Austrian producer of pantographs. Based on the compilation of strategies for the compliance with this contract, which requires certain percentage of local Russian content, a general valid concept for the dislocation of added value activities is derived.

For that purpose first of all necessary respectively adjuvant strategies and tools are elucidated as well as the initial position, frame conditions and objective targets for the concrete localization project are determined. Afterwards a conception of localization strategies is conducted, at which a consolidated business case calculation constitutes a central element for the implementation. Particularly for SMEs the selection of an appropriate local business partner, which is often adjuvant due to limited resources and a lack of knowhow, is essential for a long-term successful business activity abroad.

The compilation of a localization concept as well as its implementation constitutes a project that requires extensive planning and resources. Because of the variety of tasks it is reasonable to split them to the particular operating departments structured into work packages. The outcome of this thesis shows the general workload and items for a localization project in a hybrid project structure plan with all involved departments.

Directory

A   Introduction

Dislocation of added value is an important issue when planning to internationalize a company in the economic trend of globalization. The backgrounds of localization are cost reasons or the closeness to the customer on the one hand, but on the other hand frequency as well as the scope of requirements by enterprises or governments to their suppliers regarding local content of added value in the target country is increasing.

Especially requirements of governments regarding localization of added value concern more and more internationally active companies in several branches of trade, why this thesis should assist in complying with such challenges. For a successful realization dislocation has to be executed systematically with regard to existing laws and regulations in the target country.

So, the main problem is: How can the implementation of dislocation respectively localization of added value be realized systematically without disregarding any relevant conditions?

The concrete demand of issuing this thesis is a precise contract in railway industries between a Russian rail vehicle manufacturer and an Austrian producer of current collectors, wherein particular parts of added value are required to be local content in the Russian Federation.

The actually available literature is basically focused on specific topics concerning localization respectively internationalization, like company foundation in the Russian Federation, internationalization of small and medium-sized enterprises (SMEs) or sourcing strategies in general, but is neither giving a general abridgement of the range of necessary operations regarding localization and is nor providing a general applicable framework. Therefore this thesis connects the most important factors of all conditions concerning localization, which occurred during execution and implementation of the concrete localization project in Russia, and finally combines them to a general valid project structure plan as a framework with all issues related to dislocation or localization of added value.

In this context, first of all the required basic tools and strategies for localization, like market entry strategies, make or buy or ABC analysis, are described in chapter B, Theory and basics. In chapter C, Development localization framework for Russia, the initial position of the concrete localization project in Russia is conducted prior the frame conditions in view of the product as well as the target country are analyzed. After that, the implementation of localization concepts is executed. Chapter D, Résumé, summarizes the main points and provides a general valid project structure plan for the implementation of localization.

B   Theory and basics

This chapter gives a general survey of commonly used methods as well as instruments in the practical part. Furthermore necessary basic information for a localization of small and medium-sized enterprises (SMEs) is worked out in this section.

First, some general background information about internationalization of SMEs as well as the definition of SMEs by the European Commission is taken into account, before some market entry strategies and influencing factors are conducted. After that some definitions for local content are following.

Concluding, the subject matters concerning make or buy decisions, existing sourcing strategies as well as criteria that have to be considered for the selection of partners and suppliers are elaborated, which are partially linked together.

1   Internationalization of SMEs

"Micro, small and medium-sized enterprises (SMEs) play a central role in the European economy. (…) some 23 million SMEs provide around 75 million jobs and represent 99% of all enterprises." (European Commission, 2006, p. 5) These SMEs are a key driver for innovation, economic growth, social integration and employment. (European Commission, 2014)

The internationalization of markets is one of the most urgent matters enterprises are confronted nowadays. Due to expansion of worldwide trade competition is intensifying, and in fact not only in the foreign, but also in the domestic markets. Markets are growing together and are incremental going to be interdependent. Furthermore, also international division of labor is increasing. That occurs also an increasing internationalization of knowledge flow among to the increasing internationalization of exchange of goods. (von Behr & Semlinger, 2004, p. 7)

SMEs are not inevitable going international alone, but are often reliant on cooperation with other enterprises due to restrictions of resources. Cooperation constitutes a possibility for bundling of skills and prospects, which increases the possibility of target achievement. (Kabst, 2004, p. III)

The analysis of von Behr and Semlinger clearly indicated that the critical problems, apart from funding shortfalls, at internationalization of SMEs are particularly based on two fields: on the organization of work, which is no longer adaptable, and on the internal available

knowledge, which is often used only inadequately and in addition more or less insufficient. (von Behr & Semlinger, 2004, p. 8) Also Leick, Leßmann and Nußbaum came to the conclusion that limited resources and market-based, cultural or political-technical barriers are the most challenging aspects for SMEs going abroad. These factors have a much lower percipience in the view of large-scale enterprises and multinational enterprises (MNE). Pursuant to Leick, Leßmann and Nußbaum SMEs notice mainly knowledge- and information deficits as well as limited resources as barriers for activities abroad. (Leick, et al., 2014, p. 9)

As SMEs are often faced with difficulties in obtaining capital or credit, especially in the early phase of start-up, the European Union tries to support SMEs. (European Commission, 2006, p. 5) The support programme for SMEs contains basically: (European Commission, 2009, p. 3ff.)

- Funding opportunities
- Structural funds
- Financial instruments and
- Support for the internationalization of SMEs

A common definition for the measurement in favor of SMEs is essential in a single market with no internal frontiers (European Commission, 2006, p. 6) to distribute the support programme only to qualified companies.

To get verified as an SME by the European Commission, an enterprise has to establish data according to the following criteria:

- Headcount
- Annual turnover or
- Annual balance sheet total

Figure 1 (European Commission, 2006, p. 14) shows the actual thresholds for being verified as an SME by the European Commission:

Enterprise category	Headcount: Annual Work Unit (AWU)	Annual turnover	or	Annual balance sheet total
Medium-sized	< 250	≤ €50 million (in 1996 € 40 million)	or	≤ €43 million (in 1996 € 27 million)
Small	< 50	≤ €10 million (in 1996 € 7 million)	or	≤ €10 million (in 1996 €5 million)
Micro	< 10	≤ €2 million (previously not defined)	or	≤ €2 million (previously not defined)

Figure 1: Thresholds SMEs

For an SME it is not necessary to satisfy both the annual turnover and the annual balance sheet total, so it can choose to comply one of them. (European Commission, 2006, p. 12f.)

2 Market entry strategies for internationalization

Selection of a market entrance strategy is one of the most important decisions in the context of internationalization. The choice is enormously manifold and hardly manageable in the meantime. Among others the strategy influences the organizational structure, the type and intensity of control, the extent of company resources that have to be transferred to the foreign market and the risk. (Morschett, et al., 2008, p. 509f.)

2.1 Influencing factors for the choice of a strategy

There is a multiplicity of approaches in literature, which can be consulted for an explanation for the choice of a market entrance strategy, whereat the transaction cost approach (TCA) respectively the hereon based internalization theory (Buckley/Canson 1976 and Williamson 1985) are the predominant approaches. Both act on the assumption that the costs of a transaction, which are accrued for example by the search for appropriate transaction partners and the contract negotiation, -observation and -implementation, are the constitutive

factors for the choice of the form of coordination. (Morschett, et al., 2008, p. 510f.) The basic assumptions are opportunistic behavior and limited rationality. (Williamson, 1985)

The resources theory is another commonly utilized theory in addition to the transaction cost approach to explain corporate boundaries and forms of institutionalizations. Advantages in competition are generated by resources (assets and skills) that are available for a company. The optimal input of existing resources when entering a foreign market, the possibility of an expansion of own resources and if applicable the access to complementary resources of cooperation partners are influencing factors for the choice of the favored form of market entrance. (Ekeledo & Sivakumar, 2004)

Morschett, Swoboda and Schramm-Klein analyzed the influencing factors for the selection of a market entrance strategy focused on a selection between subsidiary company and cooperation. On the basis of 61 empiric analysis they analyzed which influencing factors were considered for the decision and which of them constitute a significant influence. Summarized, **significant influence factors** are:

- Headcount of the company
- Power distance index (PDI) in the home country
- Country-specific international experience
- Advertising- and export intensity
- International product diversification
- Market growth
- Intensity of resources of the foreign establishment
- Market size
- Governmental restrictions
- Country-specific risk

Non-significant influence factors are for example:

- Intensity of R&D
- Size of the subsidiary company
- Assets and revenue of the company

2.2   Forms of international business activities

There is a choice of strategic variants for an international operating enterprise to be active in foreign markets. Internationalization means every kind of first or additional cross-border activities on the part of the company. (Dülfer, 1982, p. 50)

2.2.1 Categorization of market entry strategies

A categorization of market entry strategies on the basis of two criteria is illustrated in Table 1. The two criteria are the 'grade of autonomy' (axis of ordinate) and 'investment and capital' (axis of abscissa), what generates a 4-field-matrix: (Okech, 2011, p. 380f.)

	Market entry strategies with own capital transfer	Market entry strategies without own capital transfer
Autonomous market entry strategies	Acquisition, new foundation of an establishment	Direct export
Cooperative strategies of market entry	Joint Venture	Enterprise networks, bilateral cooperation correlation, licensing, franchising

Table 1: Categorization market entry strategies

The market entry strategies acquisition, new foundation and direct export can be allocated to the autonomous strategies, whereat direct export is a strategy without a transfer of one's own capital but the others require investments to the foreign markets and include property as well as management control. Direct export in this case means an autonomous execution of an assignment abroad without a cooperation partner or a foreign office. (Okech, 2011, p. 381)

A joint venture is a corporate enterprise of several partners which contains a transfer of their own capital. Aside there are numerous additional cooperative market entry strategies without an own capital transfer, such as bilateral cooperation, enterprise networks, licensing or franchising. (Okech, 2011, p. 381) In cooperative strategies the particular enterprises use the competencies of partner companies. In comparison to the autonomous strategies the cooperative strategies feature the opportunity to use resources of local partners and to reduce risks, but simultaneously higher efforts for coordination and reduced control possibilities are coherent. (Chang & Rosenzweig, 2001, p. 748)

According to Wührer, systematizations of the several possibilities are usually geared to the following criteria: (Wührer, 1995, p. 34f.)

- Controlling over the international activities
- Entrepreneurial risk
- Extent of resource transfer and
- Duration of the foreign commitment

Another systematization of the diverse existing market entry strategies is shown in Figure 2 (Wührer, 1995, p. 34)[1], which considers the capital and managements efforts in both home and host country.

Figure 2: Systematization market entry strategies

2.2.2 Paradigm change in forms of cooperation

The potentials by optimizing added value distribution can only be exploited maximally by cooperation of all participants. The forms of cooperation will have to be changed basically, see FIG. (Bullinger, et al., 2009, p. 348)

Paradigm	Today	Future
Innovation	• Predominant bilateral problem solving • No special incentive for innovation • Company specific improvement	• Networked problem solving • Incentives for innovations • Company comprehensive improvement

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[1] In dependence on Rath, 1990, p. 35, Meissner & Gerber, 1980, p. 224 and Dülfer, 1985, p. 493.

Leadership and communication	• Company specific added value strategies • Very individual processes • Communication affected by commitment • Hierarchic collaboration	• Integrated added value strategies, combined and complementary competences • Integrated processes • Intensive communication based on confidence • Total integration and networking of special knowledge
Access	• Local resp. company specific standards • Independent company strategy and control • Independent resources and investments • Loose cooperation	• Corporate target agreement and escalation processes based on consistent standards • Integrated company strategy and control • Corporate resources and investments • Intensive cooperation
Risk	• Short-term profit maximization • Simple contractual arrangements for information exchange	• Corporate profit- and risk dissemination • Contracts for protection of intellectual property

Table 2: Paradigm change in forms of cooperation

3 Definition of 'local content'

Basically local content means consideration of domestic vendors in export markets. (Krummer, et al., 2009, p. 128) A definition of local content by Financial Times is *"When a foreign company makes products in a country, the materials, parts etc [!] that have been made in that country rather than imported. A minimum level of local content is sometimes a requirement under trade laws when giving foreign companies the right to manufacture in a particular place."* (Financial Times, 2014)

"The term 'Local content' refers to use of local labour[!]*, supplies and services (…). In general, this can be seen as investments made on site, linked to the project or not, to achieve certain goals for the project or simply for the generation of externalities to benefit the territory."* (De Falco, et al., 2012, p. 213)

Local content prescriptions, which are issued by governments general or occasionally, also serve to support industrialization of a country, to create workplace as well as to constitute technical and commercial personnel as a result. Furthermore know how transfer, a substitution of imports and an improvement of infrastructure appear. Insofar local content requirements are also an instrument of economical- and socio-political, in particular trade

policy, controls and are a corresponding influence factor to the internationalization strategy of a company. (Wirtschaftslexikon24, 2014c)

So, local content is a regional share of value that is added up by adduction of local respectively national vendor parts and accordingly service provision at the assembling facility. Regulations in terms of generating local content are addressed to third country companies in frame of international market cultivation of free trade zones and should instruct them to comply with the national economy policy. Local content conditions constitute trade related investment constraints and are partially violating effective world trade laws. (Gabler Wirtschaftslexikon, 2014)

Local content, which is the local adduced percentage share of total added value at a certain national location, plays a role concerning the actual origin of goods, such as in frame of protectionist arrangements, at trade statistics or at issuing the certificate of origin. Because of significant international cost- and price differences for diverse items of work, partial performances and pre-products determination of real allocable attainments generate extensive charging problems. The percentage of domestic added value of a product is an indicator when a manufacturer is allowed to claim a seal of approval for its products (e.g. "Made in Austria"). (Wirtschaftslexikon24, 2014c)

4   Determination of make or buy decisions

Complexity occurs, if all or much is done in a company itself. A concentration on the core competencies respectively on a few important value-added steps and the reduction of less important activities can expose high potentials for cost reduction. Additionally, the complexity of business as well as investments in the company can be reduced essentially. (Bullinger, et al., 2009, p. 1015)

Make or buy (MoB) decisions concern the work-sharing between supplier and consumer and are always done for particular goods, even if the trend is valid for whole branches. The trend is to reduce in-house production depth but to increase the ratio of purchased parts, so to outsource to a specialist. As the make or buy-decision has a very high potential to reduce costs, to increase quality and as a result to gain advantage in competition, it is an important strategically decision.

If activities, that usually were done in-house, are permanently relocated to a supplier, it comes to outsourcing, i.e. outsourcing is an outcome of a make or buy-decision. (Krummer, et al., 2009, p. 124)

4.1 Variants of make or buy decisions

Make or buy decisions can be sub-classified in several variants, which result of different causes (initial or subsequent decision), objects (all kinds of goods and services) or the extent of the MoB decision (total in-house production, total external procurement as well as a mix of both forms). (Krummer, et al., 2009, p. 125f.)

Causes for a make or buy decision

The origination of the requirement for a make or buy decision can be caused by either an initial or a subsequent decision. Initial MoB-decisions are usually caused by a new demand of input factors. That kind of decision has to be done also at a foundation of a company diversification or dislocation of production sites of the customer in the course of internationalization or globalization.

A former done decision on in-house production or external procurement has to be revaluated among others at following scenarios, what represents a subsequent decision:

- Change in employment situation at the sourcing market or at the customer's site.
- Aggravation of supply reliability (e.g. quality defects or missed deadlines).
- Changed quality or flexibility requirements.
- Change of costs of in-house production or external procurement.
- Phase-out of delivery contracts.
- Market entrance of new or exit of present suppliers.

Objects of make or buy decisions

Objects are all kinds of goods and services a company requires for executing its total range of business. Goods include raw-, auxiliary- and operating products as well as parts or assembly groups. Especially in services there are big outsourcing potentials, such as in following sectors:

- IT
- Human resources
- Engineering
- Logistic
- Distribution
- Facility management
- Procurement

Particular small and medium sized enterprises usually do not have the resources respectively the know how to execute the above mentioned activities efficiently with a high quality. Therefore it is a practicable way to outsource these activities to a specialized service provider.

Extent of external procurement respectively in-house production

When considering the extent of the two forms of material acquisition make or buy there are the possibilities of total external procurement, total in-house production or a mixed form of both.

In total external procurement certain products and/or services are supplied exclusively by third parties. In total in-house production there are no external suppliers for certain products and/or services. A company-wide viewing will usually always show a mixed form of both external procurement and in-house production, as no company will decide for a total in-house production for all goods and services because of missing possibilities, cost reasons as well as knowhow.

4.2   Criteria for make or buy decisions

There are several criteria to consider when doing MoB-decisions, which are both qualitative as well as quantitative ones. The final make or buy decision has to be based on a consideration of all criteria, whereas it can be adjuvant to set up a case-related importance for the several criteria. (Krummer, et al., 2009, p. 128)

Core competencies and corporate strategy of a company

Core competencies are unique, inimitable resources of companies, which ensure permanent advantage in competition. Activities in correlation with core competencies should be done in-house, while other, non-core competencies, should be sourced out to suppliers, which causes a concentration on core competencies.

Strategic programs like Lean Production caused a significant reduction of vertical range of manufacture and therefore the percentage of external procurement rose. Requirements by customers to consider domestic suppliers in export markets (local content) also increase external procurement.

Comparison of cost factors

The two different types of material sourcing strategies in-house production and external procurement have to be analyzed by their costs they accrue each. In the case of in-house production the costs are basically based on material, depreciation, salaries and wages, while the general costs of external procurement are the contract price for an object, costs for the goods' receipt and control as well as the placement of outside supplied parts.

Amount and regularity of demand

Another criterion for a make or buy decision is the amount and regularity of demand, whereas the long-term constant basis demand generally is covered by in-house production, while intermittent demands are usually covered by external suppliers.

Differences of autonomy

In-house production often is justified by avoiding unintended know-how transfer, as external procurement often requires abandonment of know-how, e.g. because of the necessity of providing construction files to the supplier. That can also cause a dependency of a supplier or the accidental creation of a new rival in business.

Tender and market power

An adequate tender by the possible providers for goods and services in view of quality and amount is required for external procurement. Particularly the case of a little number of suppliers and therefore a small market power of the consumer is often an argument for in-house production.

Capital demand

Finally also the demand of capital is a criterion for the decision of make or buy. An expansion of external procurement reduces the capital demand for replacement or widening investments, which are necessary for in-house production.

4.3 Decision instruments for make or buy decisions

Commonly used instruments for the execution respectively assessment of a make or buy decision are the make or buy-portfolio, break even-analysis, capital budgeting, utility value analysis and check lists. (Krummer, et al., 2009, p. 129ff.)

4.3.1   Make or buy portfolio matrix

The classification of strategically options can be carried out with the portfolio method. This method is influenced by the strategic importance and the availability of products or services at the market. The nine possible fields are packed into the three options in-house production, external procurement and selective decision[2], see Figure 3 (Krummer, et al., 2009, p. 130):
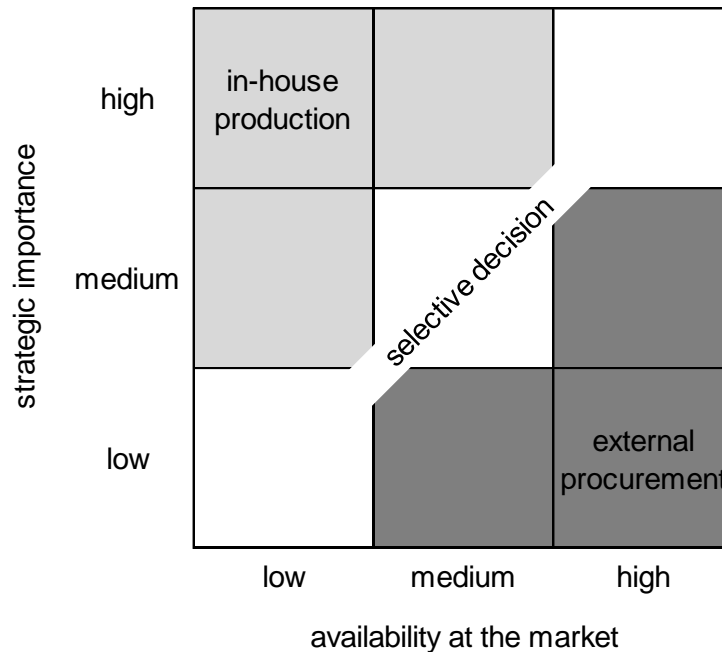
Figure 3: Make or buy portfolio

The axis of abscissa can also be seen as particular know-how in comparison to the best external sources, where low means lower, medium means equal and high means higher.

4.3.2   Cost comparison with break even analysis

The following exemplarily diagram in Figure 4 (Krummer, et al., 2009, p. 129) shows the total costs of in-house production and external procurement at concrete required quantities. The point of intersection of the two cost curves represents the break even-point with the corresponding quantity (2.000 in this example). At this quantity the in-house production and the external procurement accrue equal total costs. When interpreting the break even-point the degradability of the fixed costs has to be considered.

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[2] The decision for products or services, which are classified in selective decision, has to be done from case to case with the support of cost comparison methods and other decision instruments.
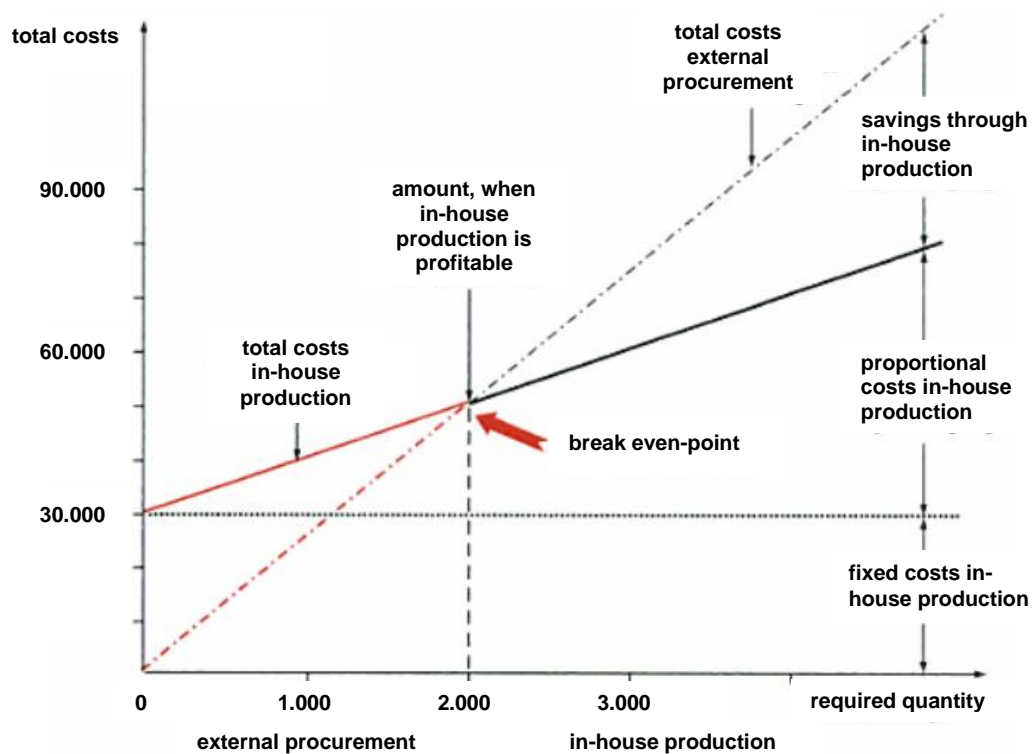
Figure 4: Break even analysis for make or buy decision

4.3.3   Capital budgeting: static and dynamic methods

This classical instrument for make or buy-decisions is separated into static and dynamic methods, but only quantifiable dimensions are considered. Static methods are one-period-comparisons, whereas dynamic methods include the factor time, as more periods are considered.

The **static method**, like cost- or profit comparison and cost-effectiveness calculation, usually causes material-, production- and administration costs that are composed of direct or indirect costs, which are considered by overhead costs (see exemplarily Table 13, page 46).

The present value method, which is a cash-flow-calculation that considers all expenditures periodically, represents a **dynamic method**. The final decision criterion is the resulting actual cash value.

4.3.4   Utility value analysis: scored points-evaluation

If more alternatives can be chosen, this method helps to compare them with certain criteria. The solution alternatives that do not achieve the minimum requirements are eliminated in a first step. An example for a minimum requirement for goods or services with a high strategic importance would be in-house production or selective decision, so external procurement can be eliminated.

The remaining options can be evaluated with the decision criteria mentioned in 4.2 on page 14: core competencies/corporate strategy, costs, amount and regularity of demand, autonomy, tender/market power and capital demand. This method also includes qualitative criteria like autonomy, which have to be independent and measurable. Via weighing the different criteria from the decision makers' point of view the diverse relevance is respected.

4.3.5   Support for final decision with check lists

This heuristic method is rather to create problem awareness than to support the final decision, as it is hardly possible to summarize the conclusions of the several questions. For companies that tend to procure externally, the following questions in Table 3 (Krummer, et al., 2009, p. 133) concerning demand, suppliers, market, financing and miscellaneous are relevant:

1. Demand	What quality requirements exist?
	Can a variation of products or services affect succeed better conditions for external procurement?
	What is the estimated demand of goods or services, how long will it exist and what deviations will it have?
2. Suppliers qualitative	Is the required quality already available at the market?
	Are suppliers willing to produce custom-made products?
	Is it ensured, that the suppliers will comply the quality standards?
	Is an effective quality control possible?
	What guarantees are the suppliers providing?
3. Suppliers quantitative-temporal	Are there required minimum purchase amounts by the supplier?
	If those exist, is it profitable to put them on stock for later usage?
	Can the suppliers deliver the required demand?
	Are suppliers able to handle peak demands?
	What delivery times are required?
	Can fix delivery dates and contract penalties be arranged?
	Should the demand be split up onto several suppliers?
4. Market	Was the market searched in-depth for adequate suppliers?
	Can agents make contacts to adequate suppliers?
	Have announcements in trade journals been evaluated?
	Should particular announcements been done for supplier search?

5. Financing	Have to be done advance payments?
	What time for payment is required by the supplier?
	Accrues external procurement higher financial requirements than in-house factoring and are they required for other purposes?
	Are enough financial resources available?
	What financing costs are accruing?
6. Miscellaneous	Is a changeover to external procurement controvert to the interests of the own consumers?
	Is the procurement department available to comply with the required technical demands because of external procurement?
	Is a changeover to external procurement breaching non-disclosure agreements?

Table 3: Check list requirements external procurement

4.4   Procedure of decision making in three steps

Make or buy is a clearly defined process. A procedure in three steps as follows is recommendable for a structured execution: (Bullinger, et al., 2009, p. 339)

- Step 1:   Clear definition of the analysis objects (candidates) as combination of systems, modules or components as well as single process steps.

- Step 2:   Answer of the question, which influence the single candidates have to the brand promises of the manufacturer and to what extent potential suppliers are available at the market at all.

- Step 3:   If it is not a core competence from the point of view of the brand, in a last step the possible cost advantages of a displacement have to be calculated in detail. The following consideration of the following positions is central when calculating the comparison of costs:

    o   Increased transportation and handling efforts

    o   Anticipated profit margin of the supplier and particularly the

o   Evaluation of overhead costs, which are remaining in house in face of displacement. In practice here are often made mistakes: Either it is supposed that overhead costs are omitted totally because of displacement, what leads to a lag between the actual financial outcome and the targets, or that overhead costs are unchanged despite of displacement, which also does not correspond to reality and often misleadingly leads to in-house continuance in many cases.

An exemplarily cost comparison calculation is shown in Figure 5. (Bullinger, et al., 2009, p. 340) This calculation compares the costs of in-house production (make) and the costs for external procurement (buy) with consideration of costs for material, overheads, selling, general and administrative expenses (SG&A), wages, freights, profit of the supplier and the above mentioned remaining overhead costs for outsourcing.
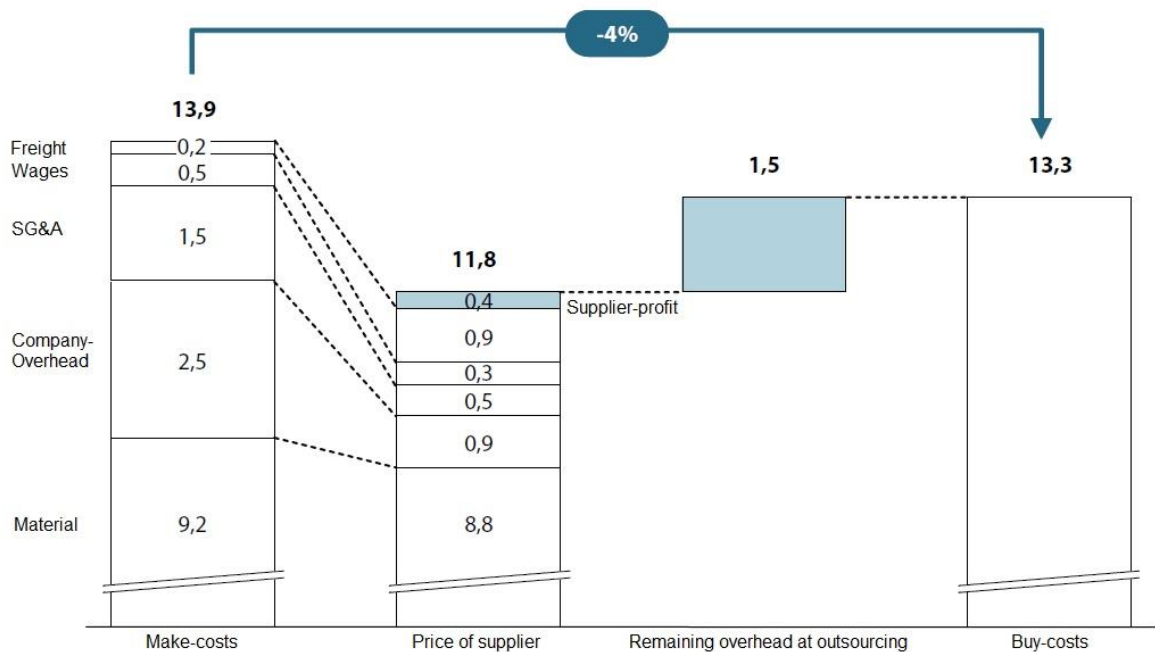
Figure 5: Cost comparison calculation make or buy

The exemplary calculation in Figure 5 shows that all costs are declining exempt from freight expenses as higher transportation efforts accompany with a change of make to buy. The profit for the supplier constitutes additional costs, too. The original cost positions plus the supplier profit make the price of the supplier, but this price must not be seen as buy costs, as there are still overhead expenses that are not omitted totally at outsourcing. The supplier's price plus remaining overhead at outsourcing make finally the buy costs that constitute the basis for comparing respectively decision making.

5   Sourcing strategies in procurement

Another strategy of supply is based on the diverseness of procurement sources, where the most important ones are single sourcing, modular sourcing and global sourcing. The general decision depends on if a company does the supplier management itself or if it outsources these activities (3rd party procurement). At 3rd party procurement special sourcing activities are outsourced to a specialized service provider and are predominantly procuring standardized MRO-articles (Maintenance, Repair and Operations). Such a 3rd party procurement achieves mainly the following positive aspects: (Werner, 2013, p. 159f.)

- Reduction of fixed costs in procurement due to decrease of administrative activities
- Decline of transaction costs
- Bundling of purchasing volume (purchase volume impact)
- Concentration on core competencies
- Internationalizing of procurement
- Achievement of cost transparency

The 3rd party procurement is usually not suited for articles of the strategic procurement, especially when the products are critical in terms of time or in need of explanation.[3]

5.1   Single sourcing

Single sourcing means that a company is voluntarily concentrating on one source for one kind of material. The main advantages and disadvantages of single sourcing are summarized in Table 4 (Werner, 2013, p. 161f.):

Pros	Cons
Purchase volume impact in buying.	High dependency of adding value partner.
Reduction of transport costs.	Lapse of competition.
Reduction of transaction and administration costs.	Disregard of integration of technical innovations (if supplier is unable).
Supports consistent quality.	Danger of stock-out.
Reduction of capital commitment.	Difficulty of supplier change.

Table 4: Pros and Cons single sourcing

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[3] In need of explanation are all products and services, of which suppliers or consumers can hardly identify the function, the purpose or the utilization. (Matys, n.d., p. 1)

Other related concepts of single sourcing are: (Werner, 2013, p. 161)

- **Sole sourcing:**
  This is an involuntary constraint to one supplier per kind of material due to monopolistic supplier situation. Sole sourcing is therefore an enforced single sourcing.

- **Double sourcing:**
  A voluntary two-sources-procurement per kind of material is named double sourcing and is particularly used for distribution of risks.

- **Multiple sourcing:**
  The customer tries to achieve price advantages by creating a spot market relationship with its supplier. It is an incoherent relation between the partners and is appropriate for products with a low need of explanation, a low purchasing volume and a low risk of supply.

5.2 Modular sourcing

For a further reduction of interfaces modular sourcing can be a practical instrument, as there can be too many interfaces even in single or double sourcing. The supplier dispatches pre-assembled modules, which reduces in-house production depth. This concept can be extended to System Sourcing, where the supplier is integrated in the product development process in addition. The modular or system supplier is usually located close to the customer, often in the same industry park or even within the area of the customer's site. These suppliers are first tier suppliers and as they are coordinating the flow of commodity on their own responsibility they can be seen as general contractors. Modular or system sourcing tends to a very high dependence between the involved protagonists. (Werner, 2013, p. 162ff.) Table 5 (Werner, 2013, p. 164) shows the main advantages and disadvantages of modular sourcing:

Pros	Cons
Reduction of interfaces (in view of the customer).	High dependency for supplier (usually major customer).
Concentration on core competencies.	High dependency for the customer.
Direct connection between customer and module supplier.	Re-coordination of information- and communication systems between modular- and sub-supplier.
Reduction of procurement costs.	Loss of innovation potential.
Abolition of delivery control.	Difficulty of supplier change.
Determination of quality standards.	Lapse of competition.
Reduction of freight costs (due to close location).	Reputation problems of the supplier affect the consumer directly.

Table 5: Pros and Cons modular sourcing

5.3   Global sourcing

Global sourcing is handling of the market in view of a systematically enlargement of the procurement policy to international sources and the primary aim is to reduce procurement costs, whereby the pros and cons are listed in Table 6 (Werner, 2013, p. 165). Due to the necessity of expansion of supply capacities, shortage of resources and price advantages manufacturers are more and more forced to get global players in procurement. (Werner, 2013, p. 164f.) The general, superior aim of global sourcing is an increase of the competitive ability. (Bullinger, et al., 2009, p. 353)

Pros	Cons
Provision of goods that are short or not available inland. That reduces dependence of domestic suppliers.	Exchange rate risks.
Increase of transparency over global activities.	Transport and quality risks.
Exploitation of economic cycle- and growth differences.	Increase of transport costs (dependent of Incoterms).
Reduction of purchase prices.	Communication complexity.
Increased pressure on domestic suppliers (especially for price negotiations).	Increase of safety stocks, as the danger of stock out situation increases.
Creation of new sales markets, because buying markets are potential sales markets.	Limiting in procurement strategies (e.g. just in time only limited possible).

Table 6: Pros and Cons global sourcing

When doing a comprehensive cost analysis it is substantial to consider the life cycle or total costs. (Bullinger, et al., 2009, p. 353) Global sourcing can reduce costs up to 30% in comparison with traditional procurement strategies. (Kleemann, 2006, p. 34)

Bullinger developed a flow chart for the determination of global sourcing strategy, see Figure 6. (Bullinger, et al., 2009, p. 355)

When doing global sourcing, at first the targets of an international purchase have to be prioritized that are concretized in the three fields cost targets, technical targets and market targets. The optimum number of suppliers per global purchased product is made out of the area of conflicts between risk minimization (particularly supply risk and opportunistic behavior, therefore tendency to multiple sourcing) and extent of control efforts (coordination and control efforts, therefore tendency to single sourcing). Pragmatically it should be started with several suppliers per material group and changed over to dual sourcing with the two best suppliers. The optimum geographical variance of the suppliers is made analogically according to the risk factor of the preferred procurement region (additionally to exchange rate risks especially political risks). (Bullinger, et al., 2009, p. 354f.)

Target prioritization	Option selection	Global sourcing strategy

- **Cost targets**
  - o Reduction purchase costs
  - o Optimization life cycle costs

- **Technical targets**
  - o Utilization international know-how
  - o Utilization international innovations

- **Market targets**
  - o Get to know potential market areas
  - o Regional adaption service portfolio

- Standardized
- Price important
- Demand predictable

Products

Simultaneous selection

Countries   Suppliers

- Cost advantages
- Know-how advantages
- Resource advantages

- References
- Abilities
- Resources

- **Product-country-supplier-mix**
  - o Ideal product portfolio
  - o Ideal number of suppliers per product
  - o Ideal geographical variation of suppliers

Figure 6: Flow chart determination global sourcing strategy

For global sourcing several requirements in view of the selection of partners and/or suppliers have to be clarified, which are described in the following chapter.

6 Criteria for selection of partners and suppliers

Generally the evolution and organization of cooperation between companies is based on the classical make or buy-problem that was executed in the last preceding chapter. A company reduces its deepness of adding value when giving off parts of the supply chain to partners via cooperation. Such an adjustment leads to coordination- and cost reduction, if the cooperating partner processes a better know how for the transferred added value activities. Important factors for the evaluation of the company-own depth of adding value are: (Krüger, 2004, p. 71f.)

- Core competencies
- Importance of added value activities for the strategically success of the company and
- Presence in certain geographical areas

Core competencies are permanent and transferable causes for the competitive advantage of a company that are based on abilities and resources. (Krüger & Homp, 1997, p. 27) These competencies are hardly to imitate by competitors, create cognition for assets for the

customers and build up the entry to a wide market spectrum. (Prahalad & Hamel, 1991, p. 71)

The lack of presence in an attractive region or know how and experience in political, administrative, economical, geographical or socio-cultural idiosyncrasies of a country can bring such companies to a cooperation with a partner located in the appropriate region that has that knowhow and experience. If the region and the particular activities have a strategically importance, a company can even decide to build up a local added value location if they have actually no local company. (Krüger, 2004, p. 71)

Pool-orientated cooperation are based on division of labor of products or added value activities. Usually such cooperation are characterized by long-term relationships of a more or less fixed range of companies and the goal is an efficient organization of cross-plant division of work, which is orientated on the classical industrial production based creation of value. The participants of the cooperation are arranged on different value-added steps. (Mildenberger, 1998, p. 32f.)

Criteria for selection of location

A goal-orientated planning and selection of place of location is very essential, as such decisions are long-term investment ones, which territorially shares capacities and competences of a company. (Lüder & Küpper, 1983, p. 5) In addition, the flexibility of the location structure is very limited because of the long-term activity. The possibility to change a location concerning factor endowment or its position is very little because of the necessary high investments that are combined with such a movement. (Emmrich, 2002, p. 332) This is especially valid for company-owned locations. For cooperation-locations the maturity depends on the length of the cooperation. (Krüger, 2004, p. 80)

The following discussion of location selection considers a selection in view of a foundation of a new location as well as an evaluation of locations concerning capacities as the case may be that capacities have to be adapted. In the case of adaption, there are two possible scenarios: (Lüder & Küpper, 1983)

- On-site expansion: addition of capacity
- On-site contraction: reduction of capacity

The selection of location is composed by two independent decisions, see Table 7: (Krüger, 2004, p. 80f.)

Decision	Affected by	Effects
Geography	International access targets, such as access to resources, market and technology	Environment of the location
Capacity and competences	International specialization targets, such as economies of scale and synergistic effects	Ability, capacity, efficiency, productivity and organizational ability of integration

Table 7: The two independent decisions of location choice

The ability of a location usually is the central point of the location decision in the classical just-in-time-concept and that decisions are dependent of the supplier's ability. General criteria are: (Krüger, 2004, p. 81)

- Price and ability
- Reliability concerning keeping delivery dates and quantities
- Distance and frequency of delivery[4]

These criteria can be operationalized for decision making as follows in Table 8 (Krüger, 2004, p. 81): (Wildemann, 1995, p. 158)

Criteria	Specificity		
Adherence to quantities	Exact delivery	Deviation upwards	Deviation downwards
Adherence to schedules	More than 1 day late	Up to 1 day late	Punctual
Flexibility to delivery frequency	Not possible	Limited possible	Direct possible
Customer specific stocking	No stocking	In normal case delivery from stock possible	Specific minimum stock level for all parts
Technical consulting and service	No consulting	Limited possibility	Available at any time
Demand power of the customer	<5% of turnover	>15% of turnover	>30% of turnover
Rate of organization	Low	Medium	High

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[4] Regional aspects are disregarded here, as they are part of the geographical decision.

Enforceability of special needs	Not possible	Delayed possible	Possible at any time
Quality of parts	Low	Medium	High
Completeness of the programme	Only for a little choice of executions	For approximately 70% of parts available	For 100% of parts available

Table 8: Criteria for rating of delivery location

The environment and properties of a location can be systemized and evaluated with the 4 dimensions of the location environment in Table 9 (Krüger, 2004, p. 82):

Economical factors	Political and administrative factors	Geographical factors	Socio-cultural factors
Economy growth Gross domestic product National income per head Changes in currency exchange rates Suppliers Raw materials Consumers Technical equipment Own commercial units	Form of government Bureaucracy Social tensions Liberty of capital flows Subventions Corruption Trade restrictions and barriers Local content Taxes Customs Legal system	Climate Topography Traffic infrastructure Information- and communication infrastructure Agglomeration effects	Language Religion Ethical norms Social norms Recreational value

Table 9: Location factors overview

In addition, location factors can also graduated in their importance to decision of location in limitational, substitutional and other factors. (Lüder & Küpper, 1983)

- Limitational factors: These factors are essential for a location and are derived directly from the access targets.

- Substitutional factors: These are "can"-criteria, so they do not need to be complied completely. Positive specifications of single factors can compensate negative specifications of other factors.

- Other factors: They are neither limitational nor substitutional, but are also able to affect the added value in a positive or negative way. The lower the number of limitational or substitutional factors, the higher is the number of these other factors. This group has to be verified critically, as it could contain as well factors that are important but that have been classed wrong or forgotten.

7   Decomposition of a portfolio into its contents

A decomposition of inventory stock or products designates the breakdown of the total portfolio into its contents. Thereby the transparency of inventory gets increased. (Werner, 2013, p. 230) Two classical tools are the ABC and the XYZ analysis.

7.1   ABC analysis for representative materials

With the help of an ABC analysis it is possible to filter especially those materials that are representative and cause a strong influence on turnover and costs. (Werner, 2013, p. 58) It is a possibility to break and decompose the total inventory (Schneider, 2012, p. 13f.) belonging to its value and its amount into A-, B- and C-articles. The ABC analysis is based on the assumption that materials have a different importance for a company. In supply chain management (SCM) an ABC analysis is also applicable for an arrangement of material demands, customer groups or forwarding agents. (Werner, 2013, p. 232)

A possible disadvantage of the ABC analysis is based in its one-dimensionality: It consults only criterion for decision making and should therefore be used only as one of several decision support tools. (Wirtschaftslexikon24, 2014a)

7.1.1   Origin of the ABC analysis and Pareto analysis

The first approaches for the ABC analysis come from Vilfredo Pareto and Max O. Lorenz, therefore it is occasionally also called Pareto analysis. The Pareto distribution (also Pareto principle or 80:20-norm) is a probability distribution that occurs in a big numerousness in real world. The basic assumption is that a low number of evaluated elements in an amount contributes very much to the amount's total value, whereas the vast part of the elements contributes only very little to the total value.

The so called 80/20-norm is seen as an ideal type of a distribution, to wit with only 20% of the customers are achieved already 80% of the business volume (A-customers), with 30% of the customers 15% of the business volume (B-customers) and with 50% of the customers

5% of the business volume (C-customers). The graphical description of this analysis produces a Lorenz curve. With this curve the analyzed data are classified corresponding to the defined classes. (Schnöckel, 2012, p. 3f.) The Lorenz curve is clarified in chapter 7.1.5 on page 32ff.

7.1.2 Distribution of the three categories

A classical arrangement of the percentage rates for an ABC analysis is illustrated in Table 10 (Schnöckel, 2012, p. 5). Basically, the determination of percentage rates for A-, B- and C-articles is adapted company individually. (Werner, 2013, p. 232)

Category	Value	Amount
A	70-80%	Low
B	15-20%	10-40%
C	5%	>40%

Table 10: Distribution of value percentages per category

Category A contains articles with a value of 70-80% but only a low amount (usually <20%) of the entire article code numbers. Activities for a stock reduction are preferred done for these articles. Category B represents 15-20% of the value respectively 10-40% of the articles and group C 5% respectively >40%, so about half of the total parts with the lowest value accrues only 5% of the total value. C-articles are usually C-parts, such as screws, screw nuts or seals. Only considering the value, C-articles do not seem to be suited well for utilization of cost reduction potentials, but appearances are deceiving: The management of C-articles creates disproportionally high transaction costs. (Werner, 2013, p. 232)

Transaction costs are costs that accrue at change of an object in a new sphere of influence. (Werner, 2013, p. 471) These costs do not accrue at goods production, but at the transmission of one economic subject to another. Costs accrue by the search for transaction partners, the initiation of transactions (e.g. contract conclusion costs, insurance rates) and the transaction itself (e.g. transportation costs). Further transactions costs are exemplarily accrued by the checking of assets, legal fees, informational costs of finding the quality, price and durability or the assignment of property rights. (Wirtschaftslexikon24, 2014b) "Transaction costs are a critical factor in deciding whether to make a product or buy it." (WebFinance, 2014)

7.1.3 Areas of application for an ABC analysis

Summarized, the ABC analysis is a tool to separate the essential from the inessential, which happens by a categorization in three classes:

- A: very important or urgent
- B: important or urgent
- C: less important or urgent

The highest importance of an ABC analysis is based in materials management, but it can also be used for analyzing the units for sale (demand management, distribution area- or distribution segment calculation, performance in customer business) as well as in cost accounting and controlling or in organization and time management. (Wirtschaftslexikon24, 2014a)

In the area of materials management the ABC analysis is mostly used in following fields: (Schnöckel, 2012, p. 5)

- Purchasing volume according to material group respectively –types
- Purchasing volume according to turnover per supplier
- Purchasing prices and conditions
- Materials according to acquisition and delivery times
- Suppliers according to adherence to schedules
- Materials according to stock and inventory turnover ratio
- Arrangements of staff capacities
- Compliance with quality standards

7.1.4 Procedural method for the execution of an ABC analysis

For convenience the following described procedural method in 6 steps is based on the assumption that the bases of the analyses are procured materials. But of course the procedure can also be transferred to suppliers etc. (Stanetzki, 2014)

1. At first the **consumption value** for the single material positions is determined by multiplying the quantity, which is consumed annually of every material, with the price, which was paid for this material in average.
2. **Arrange** of positions downwards to its consumption value with an afterwards **accumulation** of its single values.
3. Calculation of the **percentage due** of the **total value** for every position. Also the percentage has to be **accumulated**.

4. In the next step the **percentage due** of the **total number of positions** for every position has to be determined and **accumulated**. It is also possible to use the quantity or volume share as reference magnitude.

5. After that the **value limits** have to be drafted at **certain percentage dues** of the total value. An across-the-board allocation is not possible, but it has to be determined reasonable by the company.

6. In the last step the accumulated percentage dues (one due for every position) of the total number of positions are **opposed** to the accumulated percentage due of every position of the positions' total value in a **graphic representation**. Usually this is done with a Lorenz curve, see Figure 8.

The outcome of these six steps is arrangement of the investigated data in A-, B- and C-materials.

7.1.5   Lorenz curve in general and its application in ABC analysis

The Lorenz curve was developed by Max Otto Lorenz, an American statistician, as a graphical representation for statistic distributions to demonstrate the extent of disparity, as distribution is mostly nonlinear, but disparate. (Schnöckel, 2012, p. 12)

An equal distribution is rare in practice. Incomes for example are often disparate distributed, what causes a curve deviating from the diagonal, see Figure 7 (Latzko, n.d.):
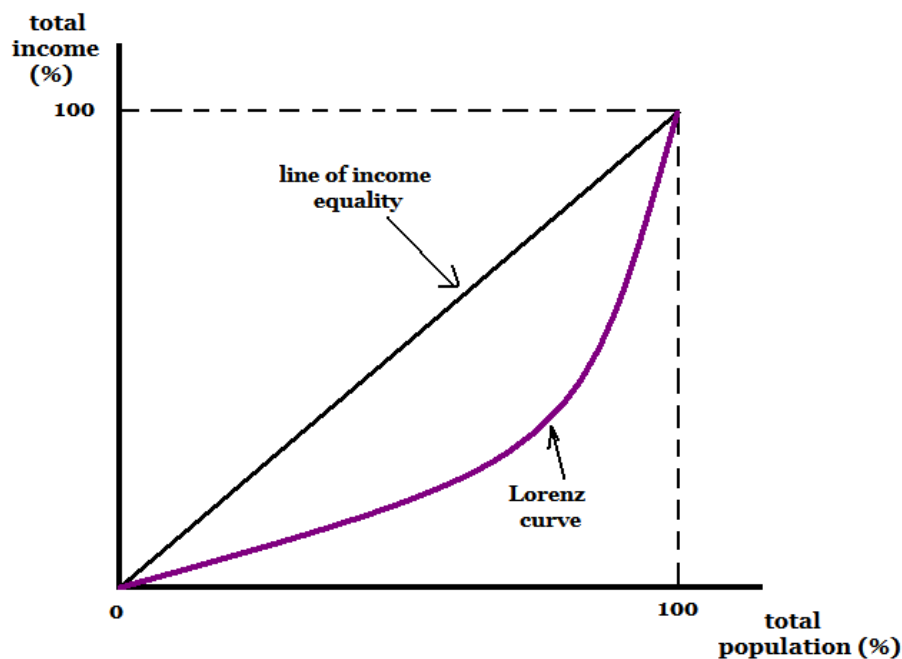
Figure 7: Lorenz curve population

Of course, for some statistic analysis with a total concentration the outcome is an almost right angle triangle with the vertexes (0%|0%) and (100%|0%) and the Lorenz curve has four more characteristic properties: (Schnöckel, 2012, p. 13)

- The curve starts at (0%|0%) and ends at (100%|100%),
- it never runs above the diagonal,
- it is monotone increasing and
- it is convex.

The steeper (flat) the Lorenz curve is formed, the stronger (lesser) the concentration respectively disparity is given, (Wirtschaftslexikon24, 2014c) or reworded: "The further the Lorenz curve bows away from the line of income equality, the more unequal the distribution of income." (Latzko, n.d.)

Figure 8 (Stanetzki, 2014) shows an exemplary representation of a Lorenz curve for an ABC analysis, wherein the accumulated value percentage as well as the accumulated amount percentage build the Lorenz curve. The pre-defined value percentage for A-articles is 80%, 15% for B-articles what leads to 5% for C-articles. With it is possible to readout the appending amount percentage for A-, B- and C-articles:
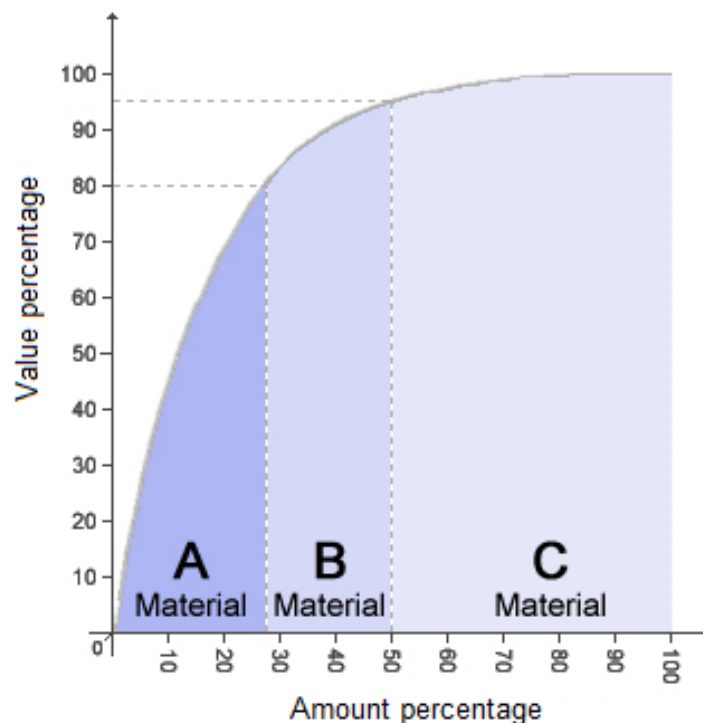
Figure 8: Lorenz curve ABC analysis

Figure 8 shows that A-materials cause the highest value (80%), even if they represent only a little bit more than a fourth of the total amount. C-articles constitute the lowest value (5%), even if they stand for the bulk of the goods.

7.2   XYZ-analysis for forecast accuracy

In addition to the ABC analysis the XYZ analysis is an alternative for decomposition of stock. It is complied with the consumption flow of goods. Analogically to the ABC analysis goods can be summarized to groups. The differentiation criterion for the classification of goods into X-, Y- and Z-segments is the particular planning reliability (forecast accuracy). To this the article positions have to be sorted by the increasing variation coefficient (standard deviation to arithmetical average). X-, Y- and Z-articles are basically classified as follows: (Werner, 2013, p. 232f.)

- X-articles: X-articles are described by a very homogenous (widely deterministically) consumption, a low variation of demand and a high accuracy of sales forecast. X-articles are predestinated for just-in-time deliveries.

- Y-articles: These articles are characterized by seasonal, trend orientated or cyclical variations. The forecast accuracy is moderate distinct.

- Z-articles: For Z-articles an inhomogeneous, asymmetric (stochastic) consumption is typically. The variation of demand is high and the forecast accuracy is low.

7.3   Combination of ABC- and XYZ analysis

Figure 9 visualizes the combination of the ABC- and XYZ analysis with the types of material procurement. Within this visualization the three fields demand based procurement, stock procurement as well as individual procurement are occurring. (Werner, 2013, p. 234f.)
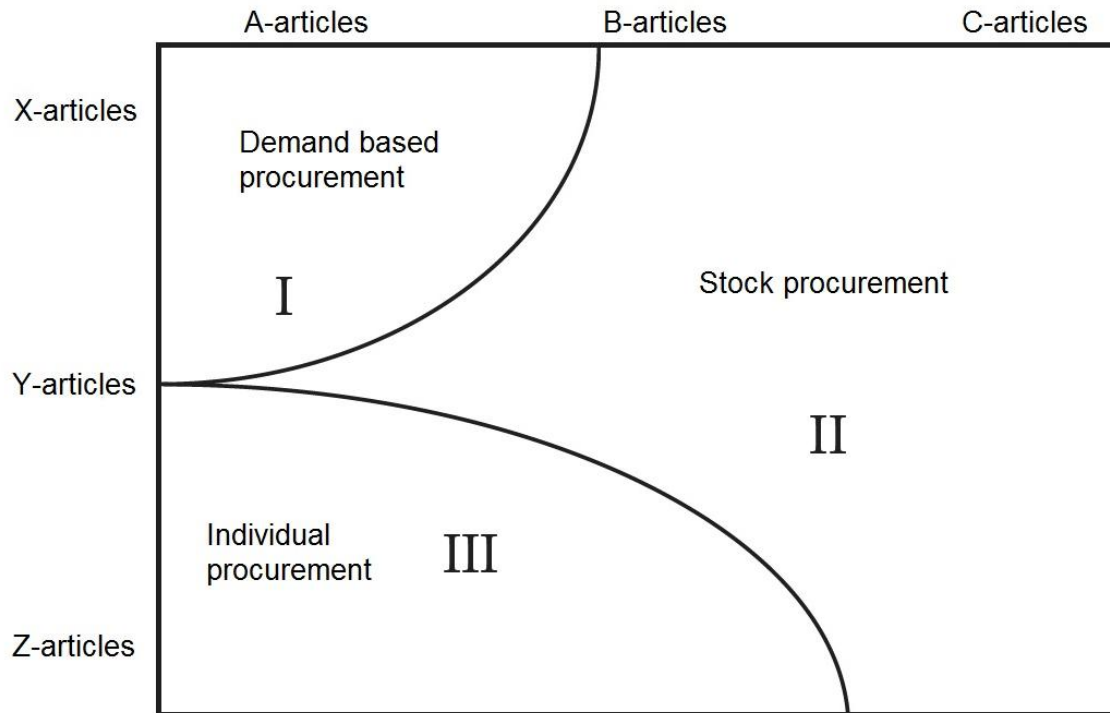
Figure 9: Combination ABC- and XYZ analysis

- Field I: Deliveries appropriate the just in time philosophy are suited for A-articles, which are characterized by a high value and a low amount. As type of procurement the production synchronized procurement (demand based), occasionally also the individual procurement, is chosen. For the execution of just in time the demand has to be as homogenous as possible, a characteristic that is valid particularly for X-articles.

  Keyword: Alleviation of capital commitment

- Field II: For C-articles, which are characterized by low acquisition prices, a stock procurement is adequate. On the basis of variable consumption flows X-, Y- and Z-articles are convenient for that type of procurement, whereupon the focus is based on Y-articles. Although these articles are insignificant in view of their value they accrue comparatively high transaction costs. Therefore a consideration of an external procurement service provider may be extended possibly.

  Keyword: Stock as cache

- Field III: Besides to the production synchronized procurement A-articles are required individually. Also B-articles are subject to individual procurement. The consumption is mostly quite inhomogeneous, why Z-articles are concerned. The problem of this type of procurement is based in its

uncommonness: There is rarely the possibility to learn from the mistakes of the past, as these activities feature only a low work routine.

Keyword: Project-related procurement

C   Development localization framework for Russia

For a concrete localization concept the initial position has to be determined and all involved people need to have the same knowledge about the concrete problem and the objective targets. Having determined the initial position the frame conditions have to be analyzed, which includes a detailed analysis of the concerning product and the relevant conditions of the target market.

1   Initial position of the localization project

Companies in western industrial nations are currently tending to phase out internationalized projects because of the actual globalization development of the world economy, and have to take the necessary steps to manage that challenge. Especially governments of developing countries, which are growing markets, are requiring local added value to strengthen their local economic system concerning technology, productivity, places of employment and know-how creation.

The Austrian company Melecs MWW[5], a medium-size producer of pantographs for railway vehicles, actually faces the challenge to administrate a dislocation of added value to the Russian Federation. In order to get to know the structure of the concerning company, which has to carry out a required local content of the value added chain, a short company description of Melecs is following.

1.1   Company description Melecs

MELECS MWW GmbH & Co KG, which was founded in 2009, is now the competence center of MELECS Holding GmbH for mechanical manufacturing situated at the Siemens facility in Vienna. The roots of Melecs are found in Siemens AG Österreich and are based on a Management-Buy-Out by the actual three managing directors. The structure of the entire Melecs group is shown in Figure 10 (Melecs Holding GmbH, 2009a):

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[5] MWW stands for Mechanikwerk Wien (German: Mechanical Manufacturing Vienna)
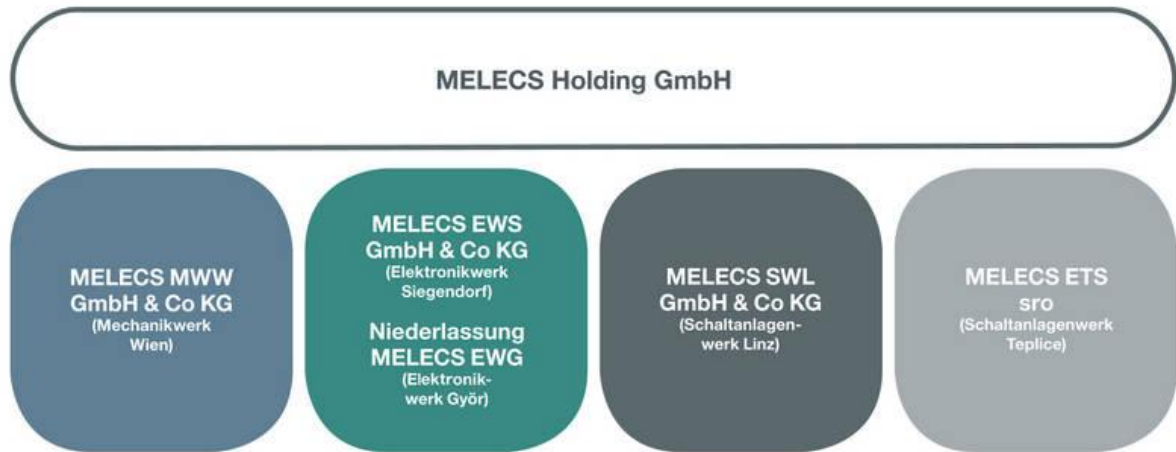
Figure 10: Structure of Melecs

The entire Melecs group is generally arranged into three divisions:

- Mechanics manufacturing (MWW)
- Electronics manufacturing (EWS, EWG)
- Switchgears and systems integration (SWL, ETS)

Out of the names of the three divisions the origin of the company's name MELECS was derived: *Me*chanics – *Elec*tronics – *S*witchgears.

As illustrated in Figure 10, MELECS MWW is a subsidiary company of MELECS Holding GmbH, which supports the operating entities of MWW, EWS, EWG, SWL and ETS in the fields of:

- *"Business Development*
- *Information Technology*
- *Human Resources*
- *Quality Management*
- *Purchasing and Logistics*
- *Accounting*
- *Strategy Marketing"* (Melecs Holding GmbH, 2009b)

The MWW is divided into the Center of Competence Pantographs (COCP) and the Center of Competence Mechanics (COCM). The COCP is appropriate for engineering, designing, R&D, sales and after sales of pantographs for the railway industry, while the COCM provides mechanical components for a wide range of applications, such as switch cabinets for telecommunications, medical technology, communication and electronics or special aluminum-welding-parts for pantographs.

The main customers of the COCP are from all over the world, such as Siemens, Ural Locomotives, Bombardier, ÖBB, DB, Vossloh or Zhuzhou Electric Locomotive.

1.2   Concrete problem and contract

Melecs MWW concluded a contract with OOO Ural Locomotives (UL) for the delivery of pantographs for the Russian Railways (RZD)-line ЭС1 (Desiro RUS). Ural Locomotives is a Russian railway locomotives manufacturer situated in the area of Yekaterinburg next to the Ural Mountains and was founded by a joint venture between Siemens and Sinara.

The Russian government ordered the end customer of the pantographs respectively the locomotives RZD to claim local added value from their suppliers as the government is also requiring in automotive industries. Due to that reason Siemens built up the joint venture Ural Locomotives with Sinara Group in Russia which are now also requesting local content from their sub-suppliers to reach the required localization.

As a result, a main part to comply this contract is the commitment to localize parts of the value added chain in the Russian Federation. From the Melecs' point of view this is the main criterion respectively the main challenge to comply and keep contract. The required local content is gradually increasing in fixed significant points in time as shown in the following Table 11.

Localization step nr.	Min. required local content	Requ. at latest from	Stipulated contents to reach localization	Estimated local content
Step 1	10-15%	Q2 2014	• final assembly or • swiveling mechanism incl. contact plates	• 12-15% • 15%
				12-15%

Step 2	40%	Q2 2015	• final assembly • main frame • lower arm • swiveling mechanism incl. contact plates • parallel guide rod and tie rod • C-parts (bolts, binders, hoses, etc.)	• 12-15% • 10% • 5% • 15% • 5% • 15%
				62-65%
Step 3	60-70%	Q1 2016	• final assembly • main frame • lower arm • swiveling mechanism incl. contact plates • parallel guide rod and tie rod • C-parts (bolts, binders, hoses, etc.)	• 12-15% • 10% • 5% • 15% • 5% • 15%
				62-65%

Table 11: Localization steps overview

Both localization steps 2 and 3 include the same contents, so in step 2 it is not necessary to localize all mentioned contents, but just as much as is needed to gain at least 40% local content.

Now the question is how to arrange the attainment of the required local content systematically and finally the main task is to create a general framework how localization can be executed in different variants out of the concrete contract from Ural Locomotives. So this work provides a complete procedure model how localization should be administrated without missing any details.

1.3   Objective targets for localization in Russia

A deployment of targets for the localization project is necessary to manage and control the following planning respectively execution. Targets have already been set up by Melecs, see Melecs MWW, 2010, p. 2:

Strategic targets

Strategic targets are long term targets of the company in combination with the localization project:

- Increase of market share by improvement of cost structure due to local added value, customs and lobbying.
- Increase of Melecs market share for pantographs in new rail vehicles business of actually 3-4% to 10% (end of 2014).

Operational targets

Operational targets are short- to mid-term orientated targets of particular departments of big enterprises. In this case, the operational target for the COCP of Melecs is:

- Short/mid-term: Compliance of localization requirements from Ural Locomotives.

Operational targets have to be subordinated to strategic targets as a cannibalization of particular sections could occur if superior long-term targets are not defined.

Occasion for reaching the targets

- Market access is only possible through fulfillment of local content requirements.
- Increase of market share, new orders and spare parts business in Russia is only possible with a local partner and local assembling respectively production.

Fulfillment of targets should expulse

- Market entrance respectively increased market share of competitive companies (e.g. Stemmann, Schunk or Leykov/Faiveley).

Additional annotations

- Political lobbying is considered as essential.
- Local partner should also be capable of supporting in acquisition and logistic matters.
- An adequate financial infrastructure such as financial security due to a major proprietary is desirable.

2 Analysis of the frame conditions

Having defined the initial position and objective targets, the frame conditions for the concerning product and the target country of planned localization have to be analyzed. This analysis generates the basis for the implementation of localization.

2.1 Product description pantograph

The product that constitutes the basis for the development of this localization concept is a pantograph, which has the function of a current collector mounted on the roof of electrical railway vehicles. The purpose is the securing of a safe electrical connection between the consumer (electrical locomotive) and the contact wire of the overhead catenary.

A pantograph basically consists of 4 principal elements:

- Base frame
- Lower arm including coupling rod
- Upper arm including parallel guide rod
- Swiveling mechanism including contact strips

The lower arm, upper arm and coupling rod in combination with the base frame form a four-bar-mechanism, which guides the pantograph in a vertical manner approximately, see Figure 11. (Melecs MWW Gmbh & Co KG, n.d., p. 1)

The lifting respectively lowering device can either be realized with an electrical or pneumatic drive. The electrical version, which is usually used for low speed range, raises the pantograph with a lifting spring and is lowered by an electrical spindle lowering device integrated in the base frame.

Pneumatic pantographs as shown in Figure 11 (Melecs MWW, 2013) are used for middle and high speed range[6].

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[6] ‚High-speed range' for rolling stock is defined by the International Union of Railways as follows: *"The High Speed advanced-technology trains shall be designed in such a way as to guarantee safe, uninterrupted travel:*
- *at a speed of at least 250 km/h on lines specially built for High Speed, while enabling speeds of over 300 km/h to be reached in appropriate circumstances,*
- *at a speed of the order of 200 km/h on existing lines which have been or are specially upgraded,*
- *at the highest possible speed on other lines."* (International Union of Railways, 2013)
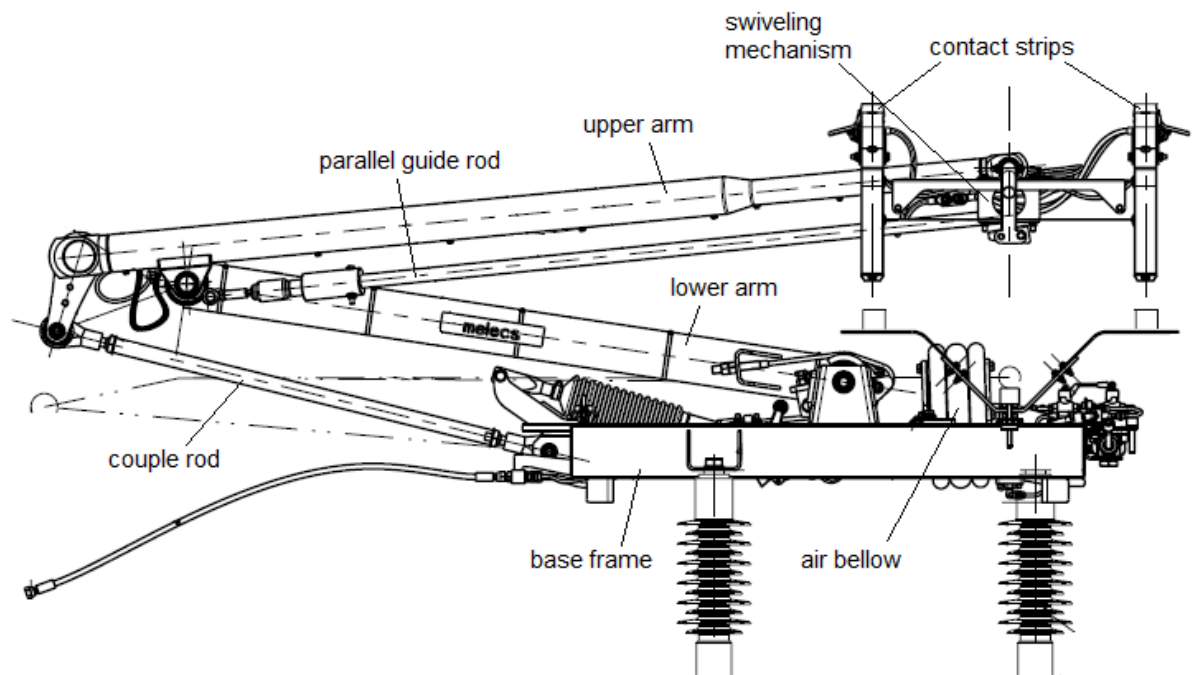
Figure 11: Lateral view pantograph

The raising of the pantograph is effected by a spring air bellow that also produces the necessary contact force, while the lowering occurs due to the pantograph's own weight after exhaustion of the bellow, which is arranged between the base frame and the lower arm. A constant contact pressing force against the catenary is ensured by pneumatic controls, which are supported by wind deflector plates at higher speed.

Optionally, it is possible to equip the pantograph with an automatic dropping device (ADD) that enables rapid lowering automatically in case of collision. (Melecs, 2013b)

2.1.1 Technical details pantograph MP160

The pantograph with the Melecs internal labeling MP160-2000/DC[7] is used for the electrical locomotive ES2G (Desiro RUS, see Figure 12 (Cyber Trans, 2012)), which is a five-part electric multiple unit (EMU) utilized by Russian Railways. The practical development of the localization concept is generally based on this product and the general framework will be deducted from that.

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[7] To ensure clearness, in the following the pantograph's appellation is shortened to MP160

Figure 12: Desiro RUS at test railroad ring in Scherbinka

The meaning of the item's name MP160-2000/DC is defined as follows:

- MP: Melecs Pantograph

- 160: speed up to 160 km/h

- 2000: width of swiveling mechanism including contact strips in mm

- DC: Direct Current

The main technical specifications are mentioned in the type plate label, see Figure 13 (Melecs MWW, 2013):

- Nominal voltage   3kV

- Nominal current   1.2kA

- Max. speed   160 km/h

- Weight   135 kg
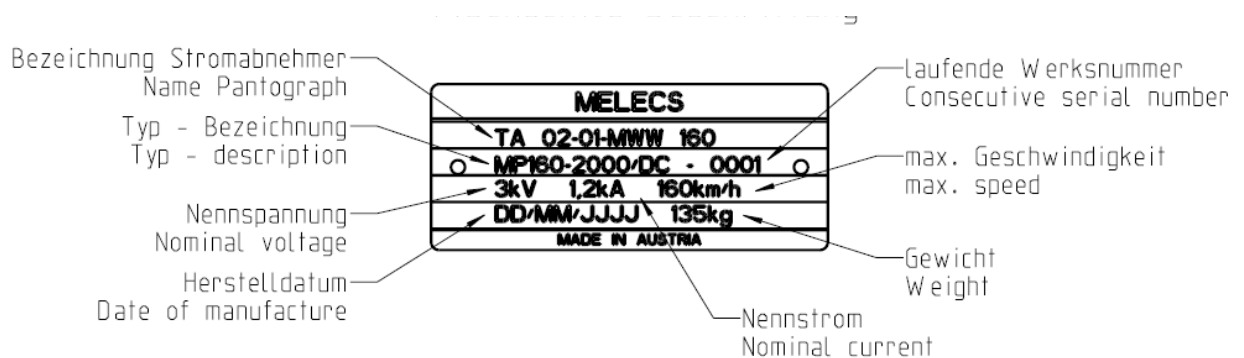
Figure 13: Type plate label MP160

Miscellaneous specifications: (Brekson & Neustrojew, 2012)

- Nominal current at standstill   300A
- Contact force, static adjustable   70 – 110N
- Min. working height   400 mm
- Max. working height   1,900 mm
- Max. elevation   >2,300 mm

Because of the special extreme weather conditions in Russia the pantograph's operating temperature range is from -40°C to +40°C what constitutes a big challenge concerning material requisitions. Especially the pneumatic hoses, of which most of them have to be flexible, have to comply with very high requirements as the pantograph is completely exposed on the train's roof.

Figure 14 (Melecs MWW, 2013) shows the complete assembled pantograph in a 3D-model:
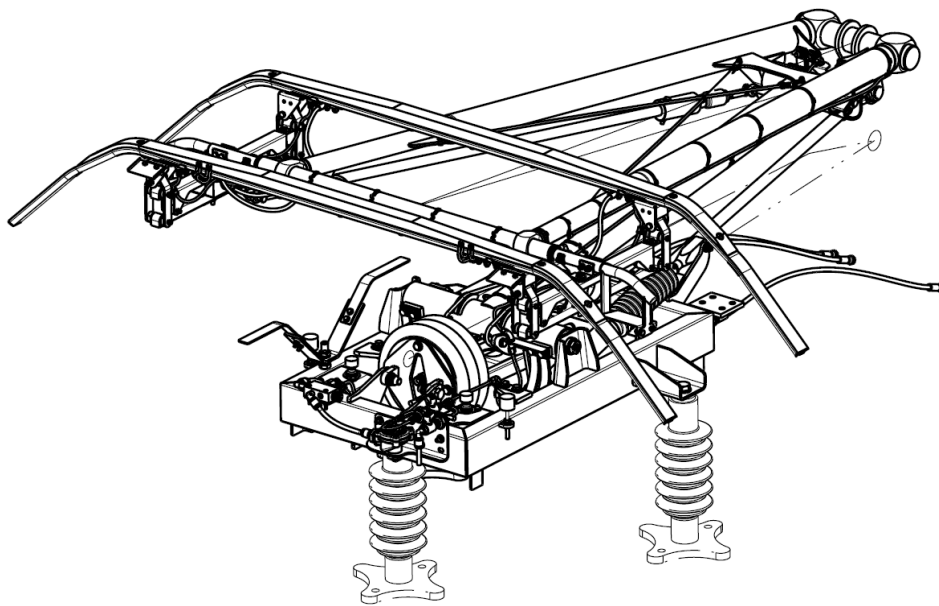
Figure 14: 3D-model MP160

2.1.2 Overhead calculation for the pantograph MP160

To calculate the sales price, or like in this case the profit margin as the sales price is already fixed, the multi-level overhead calculation is used. Based on the year 2013, the percentage overhead rate bases for original equipment are as follows:

Overhead rates for original equipment		
Position	Rate	Basis
Indirect material costs (IMC)	4.0%	Direct material costs (DMC)
Indirect production costs (IPC)	10.0%	Direct production costs (DPC)
Administrative overhead (AO)	7.5%	Manufacturing costs (MFC)
Sales overhead (SO)	7.0%	Manufacturing costs + Admin. overh. (MFC+AO)
R&D overhead (RDO)	7.5%	Manufacturing costs (MFC)

Table 12: Overhead rates original equipment[8]

The actual profit margin without any localization abroad based on the sales price is calculated by overhead calculation:

Overhead calculation MP160 per unit				
Position		[€]	total	Calculation
Direct material costs (DMC)		8.000,00		
Indirect material costs (IMC)	4,0%	320,00		DMCx0,04
Material costs (MC)			8.320,00	DMC+IMC
Direct production costs (DPC)		432,00		12hx36€/h
Indirect production costs (IPC)	10,0%	43,20		DPCx0,1
Production costs (PC)			475,20	DPC+IPC
Manufacturing costs (MFC)			**8.795,20**	**MC+PC**
Administrative overhead (AO)	7,5%	659,64		MFCx0,075
Sales overhead (SO)	7,0%	661,84		(MFC+AO)x0,07
R&D overhead (RDO)	7,5%	659,64		MFCx0,075
Overheads total (OT)			1.981,12	AO+SO+RDO
Net costs (NC)			**10.776,32**	**MFC+OT**
Sales price (SP)			8.500,00	
Profit margin (PM)	**-26,8%**		**- 2.276,32**	**SP-NC; %=PM/SPx100**

Table 13: Three-step overhead calculation MP160[9]

The direct material costs result from the actual bill of material (BoM).[10] The sum of the mentioned BoM represents the material costs when all expected parts for localization are already local content with respect to the estimated cost reduction through localization. The above quoted direct material costs of EUR 8,000 represent the actual costs without any local content.

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[8] Fictitious figures.
[9] Fictitious figures.
[10] The detailed BoM can be found in Table 21, p. 60, respectively in the annex.

Direct production costs are composed of 12 working hours per pantograph, which include among others preparing, assembling, testing and packing, multiplied by 36 EUR wage costs per hour. As shown in Figure 18 on p. 69 the average labor expense per hour in Austria is about EUR 32, but due to the necessary high qualification and experience of the employees in this case the labor costs are higher than the Austrian average. Another reason for the occurring higher costs is the executed assemble process in Linz whereas personnel costs in cities are higher than in the countryside.

The overhead calculation shows that this pantograph cannot be produced in Austria with winnings with respect to all direct, indirect and overhead costs. The main reason is that the material costs are too high for the attainable sales price in Russia and as a result also all overheads, which are based basically on the material costs, are proportional that high. Therefore, localization in a country with lower production costs and simultaneously an international sourcing of parts is necessary to achieve profit with the product, independently from the fact that localization is required by the customer anyway.

2.2 Analysis of relevant conditions for localization in Russia

Basic knowledge about the target country of the localization project and therefore an analysis of the relevant frame conditions for the Russian Federation (RF) in view of especially general economic factors, social and cultural aspects, customs and import regulations is necessary.

2.2.1 Country profile Russian Federation

General information

Area	17 m. km²
Population	143.7 m.
Capital city (population)	Moscow (12.1 m.)
Form of government	Republic
Head of state	Vladimir Putin
Head of government	Dmitri Medvedev
Language	Russian

Member in economic organizations	EBRD, WTO, IBRD, ICC, IDA, IFC, IMF, OSCE, UNCTAD, UNIDO, WCO, EURASEC[11]

Table 14: General information RF (Außenwirtschaft Austria, 2014, p. 1)

Economic information 2013

Important economic sectors	Oil and gas, mining, steel- and metal industry, heavy industry, agriculture and forest industry
Economic growth	1.3%
Austrian investments in Russia	8.5 bn. EUR (2012)
GDP per capita (at PPP) (*)	13,436 EUR
GDP nominal	1,572.2 bn. EUR
Inflation (%, annual average) (*)	6.5%
Unemployment rate (%, ann. avg.) (*)	4.6%
Rating (OECD-Country Risk Classification)	3 (Q1/2014)
Foreign indebtedness (*)	402 bn. EUR
Currency	Ruble (RUB)
Currency reserve (*)	493.3 bn. EUR (3/2014)
Currency rate to EUR	42.2 (avg. 2013), 46.8 (22nd May 2014)

Table 15: Economic information RF (Außenwirtschaft Austria, 2014, p. 1)

Foreign trade 2013

Exports worldwide	395.4 bn. EUR
Exports EU 27	212.4 bn. EUR
Most important export markets	Netherlands, Germany, Italy, China, and Ukraine
Most important products export	Mineral oil, petroleum gas, metals, chemical products, machinery and equipment
Imports worldwide	238.5 bn. EUR
Imports EU 27	100.7 bn. EUR
Most important import markets	China, Germany, Ukraine, USA, and Belarus
Most important products import	Machinery and equipment, food, chemicals and metals

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[11] At the time of writing this thesis the Russian Federation was not any longer a member of the G8, as the actual G7 decided to ban the Russian Federation at the 25th of March 2014

Austrian exports (EUR) (**)	3.48 bn. EUR, +9.2%
Most important products export	Machinery and equipment, pharmaceutical products, food, paper and boards
Austrian imports (EUR) (**)	3.18 bn. EUR, -22.2%
Most important products import	Gas and oil, metals, wood and wooden products

Table 16: Foreign trade volume RF (Außenwirtschaft Austria, 2014, p. 2)

(*) Estimates (EIU)

(**) STATISTIK AUSTRIA

Annotations

The Russian export figures are very dependent on the development of the energy markets respectively the price fluctuation (volatility) of the fossil energy sources, as about 70% of the total Russian export turnover is generated by selling these fuels (coal, gas, oil etc.). (Außenwirtschaft Austria, 2013, p. 26)

Russia is one of the most important trading partners for Austria outside the European Union and in the last years Russia has always been on the 10th or 11th place of the most important Austrian export markets. (Außenwirtschaft Austria, 2013, p. 29)

The big market chance for the Austrian economy in exporting to the Russian Federation can be seen in Table 16, as the Austrian export volume in 2013 to Russia was 9.2% higher than in 2012. The most important export products from Austria to Russia are mechanical engineering manufactures, constructions and vehicles (39.45% of the total export volume), whereas this sector had an increase of 15% compared to the preceding year. The second most important sector are chemical products (29.35%), but this sector's growth was only 0.1%. (Außenwirtschaft Austria, 2013, p. 29)

Figure 15 (Geographic Guide, 2014) shows the dimension and position of the Russian Federation including the actual existing most important rail roads:

Figure 15: Map and location of the Russian Federation

The Russian Federation is the largest-scaled country by far in the world, but in the ranking of population it takes only the 9th place (Central Intelligence Agency, 2014a), therefore the density of population especially in the north-eastern regions is quite low. The average density of population in Russia is approximately 8.5 inhabitants/km², in Austria there are about 101 inhabitants/km² as comparison. To overcome the long distances between the inhabited areas and between the areas of origin and need of raw materials, an efficient railway network is essential. In Russia the railway system plays the leading role in carriage of goods. (Außenwirtschaft Austria, 2013, p. 128)

2.2.2   Description of the Russian railway network

With a railway network of 85,200 km length, of which 43,100 km are electrified, the Russian Railway system is the second largest network in the world (Russian Railways, 2014) after the United States of America with a length of 224,792 km. As a comparison, the German railway network has a length of 41, 981 km and the Austrian is 6,399 km long. (Central Intelligence Agency, 2014b)

Other facts and figures of the Russian Railways network: (Russian Railways, 2014)

- 0.95 bn. passengers p.a.
- Responsible for more than 32.7% of passenger traffic
- 1.2 bn. tons of freight p.a.
- Responsible for 42.3% of Russia's total freight traffic (including pipelines)
- Operating over 11 time zones
- Employs over 976,000 people
- Assets worth over RUB 3,189.9 bn. (EUR 65.1458 bn.[12])
- Russia's 4th-largest company by revenue (over RUB 1,195.1 bn. (EUR 24.407 bn.) in 2010, according IFRS)
- Rolling stock: 20,227 goods and passenger locomotives, 1,026,600 goods wagons
- State-owned joint-stock company
- Net income over RUB 78.5 bn. in 2010 (EUR 1.603 bn.) – one of Russia's most profitable companies

2.2.3 Russian Railways' three year investment plan

On November 14th, 2013 the government met to arrange a three year financial and investment plan for Russian Railways. They planned to spend about RUB 396 bn. (EUR 8.087 bn.[13]) in 2014, RUB 415 bn. (EUR 8.475 bn.) in 2015 and RUB 438 bn. (EUR 8.945 bn.) in 2016. The Russian government will allocate over 300 bn. RUB for that investment programme. Actually the existing infrastructure limits economic growth in Russia and the main goal is to remove that limitation due to the railway structure. (Railway Gazette, 2013)

The main parts of the programme are to:

- increase freight capacity on the Trans-Siberian and Baikal-Amur routes,
- develop the Moscow transport center,
- modernize the 960 km Mezhdurechensk - Taishet route and
- build a bypass at Krasnodar.

At least 60% of the investments will be spent on renovation and modernization of the railway infrastructure, especially in Siberia and the Far East. In 2014 there will be 629 locomotive orders and 450 in each 2015 and 2016. (Railway Gazette, 2013)

The following Figure 16 (Schiller Institute, 2007) shows a map of projected rail constructions until 2030 including the above mentioned Trans-Siberian and Baikal-Amur Mainline (BAM) routes. The map, which was presented by an RZD-speaker on April 24th, 2007, is based on

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[12] Currency rate: 1 EUR = 48.966 RUB at 27.03.2014 (finanzen.net GmbH, n.d.)
[13] Currency rate: 1 EUR = 48.966 RUB at 27.03.2014 (finanzen.net GmbH, n.d.)

an RZD-map with the title "Prospective Topology of the Russian Federation's Rail Network Development until 2030". (Schiller Institute, 2007)

The mentioned facts and figures show the big potential in the Russian railway sector also for Western European nations, as the RZD is willing to cooperate with companies due to missing know how, especially in high-speed range.
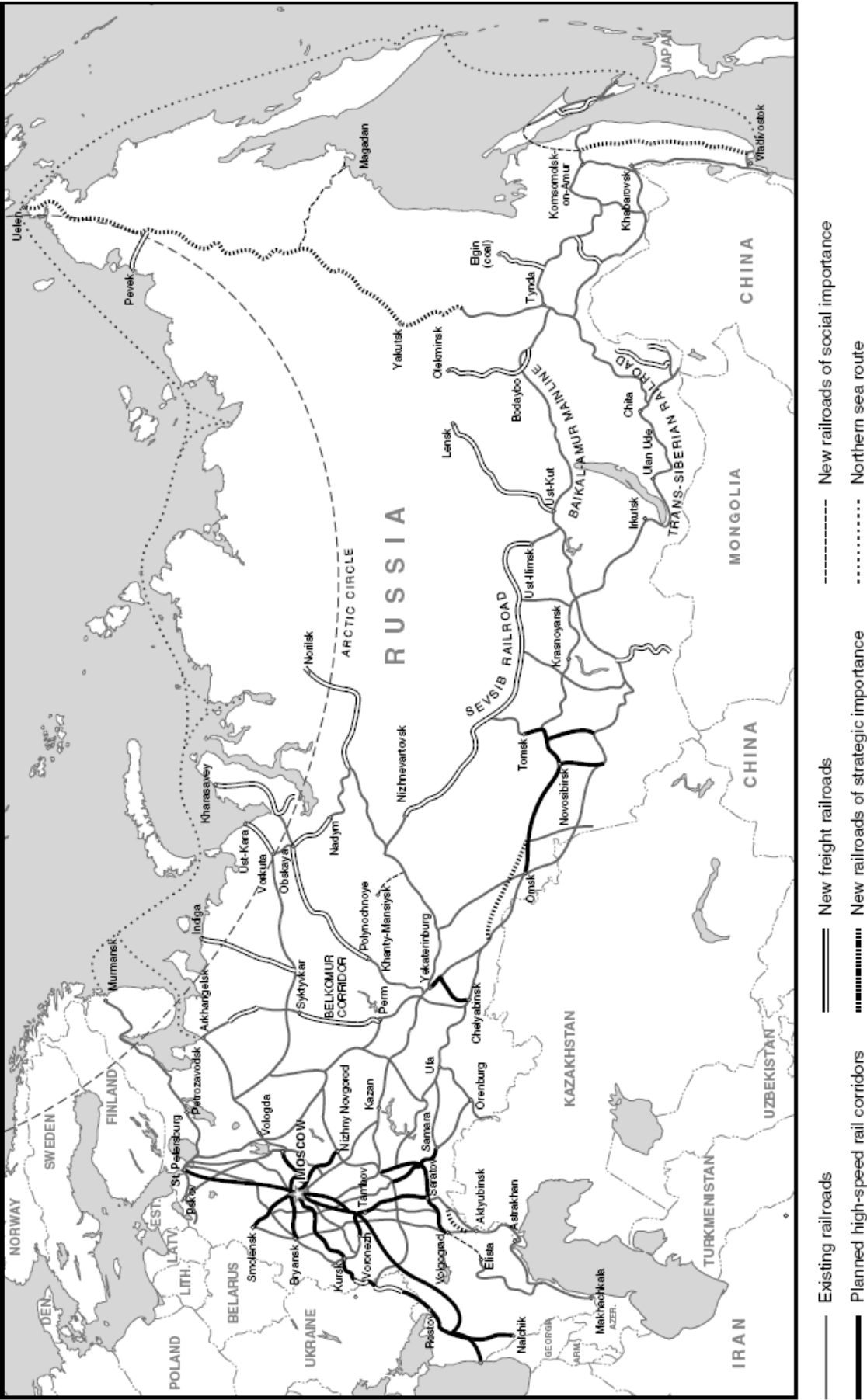
Figure 16: Planned Russian railroad development to 2030

2.2.4   Social and cultural aspects in the Russian Federation

Several unique factors affect the development of the Russian economy. The question is what effects the specific Russian aspects have on the domestic economical development and what these special aspects are: (Antropov & Bossert, 2005, p. 2)

- Factor nature and climate:

  Typical aspects are the diversity of climate zones, hard living conditions in a large part of the country and inconsistent weather conditions. Due to that, the consequences for the economy are low work productivity and therefore low competitiveness, high energy and resources consumption per production unit and special needs of resources respectively economic aid in several regions.

- Factor economy and geography:

  As the Russian Federation is the largest state in the world, there are often great distances between raw material sources, production plants and markets. Therefore, economic consequences are high transport costs, low competitiveness and as a result a development of isolated, underdeveloped areas.

- Factor geopolitics:

  The Russian Federation has the longest boarders of the world and is easy to attack, so the country makes big efforts and expenditures on frontier protection and national defense.

- Factor socioculture:

  Due to historical reasons the Russian society is affected by an important part of the intellectual and low importance of material. Other ideals are collectivism, paternalism and a strict denial of social inequity. The sociocultural consequences are less rationality of behavior compared to western countries, the development of collective property- and economic systems, a complicated system of motivation and incentives and a big role of the government in social- and economic policy.

The Russian government has not been seen just as an administrative body, but also as a structure of the intellectual, social economic ideals. Therefore the Russian tradition is historically closely connected with the special role of the state. This form of government was often misapplied by authoritarian, dictatorial regimes, which caused the stereotype of the need of a strong hand for the Russians. The ambition to have a strong state has always been combinable with imagination of democracy and autonomy of the lower society and the basis for that is the autonomy of the communities, a large variety of economics, politics in the regions, and a democratic situation in everyday life.

The economic system has already involved the following central issues during the 1970s and 1980s: (Antropov & Bossert, 2005, p. 3f.)

- No functional system of market correlations:
  E.g. lack of employment market, lack of merchandise markets, lack of a bank systems etc.
- Parasitism:
  A lot of companies and citizens had their prosperity at the costs of others due to profit-redistribution from the brave to the lazy ones.
- Deficits as a character of the system:
  Companies stopped the extensive growth of the total production and therefore caused lack of natural, material and financial resources and labor. Due to that the permanent demand could not be satisfied, which led on the one hand to an increase of production, but on the other hand companies were forced to increase their stocks because of logistical shortage of material resources.
- Bureaucratic administrative system.
- A mainly closed economy.

2.2.5 Doing business and handling of the market in Russia

The Russian market provides big chances on the one hand, but one the other hand it also constitutes high risks. An engagement in Russia should be considered very well and it is also helpful to have some experience in other eastern markets. Some characteristics of the Russian economic structure, which often make the execution of business extensive and complex, are: (Außenwirtschaft Austria, 2013, p. 33)

- Complex relationship network
- Shadow economy[14],[15]
- Competition with all instruments
- Political and legal arrangements
  - Tariff burden
  - Certification and other non-tariff regulations
  - Foreign exchange control regulations

These characteristics can be prohibitive for singular consignments. An intensive treatment of the market and the maintenance of business contacts are necessary for a long-standing success.

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[14] Also known as hidden, informal, invisible, parallel or black economy.
[15] Actual estimates assume that more than 30% of the Russian economy is executed in black or grey economy. (Außenwirtschaft Austria, 2013, p. 37)

When executing commercial operations with Russian customers it is important to observe that business dealings with Russian companies can exclusively be done on the basis of decent written agreements. A delivery on the basis of an order by phone or by a simple order sheet is not possible, as both import respectively export customs clearance and the appropriation of foreign exchanges from or to Russia are bound to the draft of an official delivery contract. (Außenwirtschaft Austria, 2013, p. 34)

Especially shadow economy, the confidence in trusting personal and informal relationships, distinctive thinking in hierarchies and the special role of bureaucracy are the most important characteristics that have to be considered when doing business in Russia. Due to the developed shadow economy Russian businessmen also tend to do business with foreigners via third companies.

Collaboration with the Russian bureaucracy is often difficult because of big administrative discretions, informal networks and low wages of simple magistrates which can cause non-orthodox procedural methods. In addition, a lot of inconsistent regulations and a very formalistic construction of them can hinder an efficient execution of official matters.

Russian enterprises emphasize a lot on hierarchy and status which has to be considered at negotiations (seating arrangement), at handing over presents and at business lunches. Good personal relationships and handshake have a high importance on the success of negotiations. Strategic acting of Russian businessmen, which can put advantages above apparent good personal relationships, should not be underestimated.

As behavior in Russia is very formalistic all formalistic requirements should be kept. From case to case, payment liability for a Russian enterprise is only acknowledged by Russian courts of justice if the contract is signed by the general director and the chief accounting officer of the company and the contract has to be stamped in addition by a round company stamp. Agreements in fax form are not acceptable.

When closing an exportation contract with a Russian company the United Nations Convention on Contracts for the International Sale of Goods[16] should be executed, independent from the appointed law in the contract, as both Austria and Russia are member states of the United Nations Commission on International Trade Law (UNICTRAL). This matter can be meaningful in the frame of product liability, as this contract covers also consequential damages. (all previous information out of Außenwirtschaft Austria, 2013, p. 37ff.)

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[16] Also known as Viennese Convention for Sale of Goods.

For more detailed information about doing business in Russia, the 'Länderreport Russland' (German: Country report Russia) from the Austrian Chamber of Commerce provides more in-depth information, see Außenwirtschaft Austria, 2013 in the list of literature.

2.2.6   Abridgement of the Russian tax system

In general there are three groups of taxes and charges in the Russian Federation:

- Federal taxes,
- Regional taxes and
- Municipal taxes (Außenwirtschaftscenter Moskau, 2012, p. 34)

As a description of the total tax system in the Russian Federation would be too extensive and is not necessary for this localization project, Table 17 (Außenwirtschaftscenter Moskau, 2012, p. 47f.) only quotes the main taxes that have to be paid by registered legal persons in Russia.

Tax/group of tax	Actual tax rate
Value added tax/ Federal tax	18% - in general for goods, work and services
	10% - for specific kinds of food and products for kids
	0% - at export or relocation of goods under the regime of the customs-free area, services and work in association with exportation, for services and work that are directly associated with transportation of goods, etc.
Company related tax on earnings/ Federal tax	0% - on special earnings, that are paid from Russian companies in form of dividends
	9% - on earnings, that are paid from Russian companies to Russian companies or natural persons (Russian residents) in form of dividends
	15% - on earnings, that are paid from Russian companies to foreign companies or natural persons (Non-Russian residents) in form of dividends (if there are no special regulations due to international/interstate agreements)
	10% - on earnings of foreign companies from shipping, aircraft or other transports, if the foreign company doesn't have a permanent Russian establishment (if there are no special regulations due to international/ interstate agreements)
	20% - on other earnings of foreign companies, if the foreign company doesn't have a permanent Russian establishment (if there are no special regulations due to international/interstate agreements)
	15% - on earnings of national or municipal bonds (with

	exceptions)
	20% - on gainings from Russian or foreign companies, whose activities are justifying a Russian permanent establishment
Tax on assets/ Regional tax	Max. 2.2% of the declining balance from the taxable asset
Tax on transports/ Regional tax	From RUB 1 to RUB 50 per hp
Industrial injury insurance	0.2% – 8.5% of payroll
Obligatory social insurance contribution	Gross salary up to RUB 512,000: Basic fee – 30%, thereof: 22% annuity insurance 2.9% social insurance 5.1% federal health insurance Gross salary more than RUB 512.000: 10% additional fee for annuity insurance fund

Table 17: Russian tax rates

Double-tax agreement

"Double tax agreements, double tax treaties or, in short, DTAs represent a complex area in the field of international tax. (…) As the name suggests, a double tax agreement is an agreement or a contract regarding double taxation or, more correctly, the avoidance of double taxation. (…) A DTA is therefore a contract signed by two countries (…) to avoid or alleviate (minimise[!]*) territorial double taxation of the same income by the two countries."* (Association of Chartered Certified Accountants, 2012, p. 1)

Austria already had a double-tax agreement with the Soviet Union in 1981 that was also valid in the Russian Federation until the conclusion of the new agreement in 2000, which is effective actually and which regulates the particular direct taxes like tax on earning, income tax, tax on wages and tax on assets. (Außenwirtschaft Austria, 2013, p. 57)

Profits of Austrian companies, which are operating in Russia and do not have a Russian commercial unit, are charged with Austrian tax corresponding to the double-tax agreement between Austria and Russia. Profits that can be attributed to a Russian commercial unit (e.g. branch office) from an Austrian company are subject to Russian profit taxation. An Austrian representation in Russia is not subjected to Russian profit taxation as long as it is not

classified as a commercial unit due to its activities by the Russian tax authorities. (Außenwirtschaft Austria, 2013, p. 55)

2.2.7 Exportation of pantographs to the Russian Federation

A main aspect to administrate successful localization is to have an appropriate logistic concept, as there may appear high unforeseeable additional expenditures and troubles at customs clearance if this matter is not executed accurate with consideration to existing regulations. The basis for developing solid logistic concepts is a detailed knowledge about the concrete conditions of custom- and import regulations in the Russian Federation.

Custom and import regulations

The **custom duty** of pantographs for importing to the Russian Federation for customs tariff number (product code) 8607 9980 is 5%. (European Commission Trade, 2014)

Break down and product description for the product code 86079980:

"86   Chapter 86 Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electromechanical) traffic signaling [!] *equipment of all kinds* [!]

8607   Parts of railway or tramway locomotives or rolling stock:

8607.99   Other:

8607.99.80 Other" (European Commission Trade, 2014)

The product code is based on the **TARIC** system (Tarif Intégré des Communautés Européennes), which is the common custom tariff of the European Union established from the combined nomenclature.

Importation value added tax (IVAT) is 18% of the duty paid value[17] in the RF, which can be refunded by a Russian enterprise and is therefore usually no final cost factor. This refund is independent of the property of the goods, so it does not matter if Melecs has in circumstances the property rights at the time of exportation.

Besides Austria and Russia have a double tax agreement, which prevents paying VAT in both countries. The supply is a classical export to a third country and therefore exempted of VAT in the country of origin, when a few requirements are fulfilled. It is important to receive the exportation confirmation from the importer or shipper that acknowledges that the goods

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[17] Basis: value of the goods plus customs.

left the European Union. Without such a confirmation the delivery is not valid as a tax free export shipment for the Austrian tax authorities.

Another levied fee is the **customs clearance fee** (CCF) according to the dutiable value of the goods. The detailed rates are:

Dutiable value	Customs clearance fee
Not exceeding 200,000 RUB	500 RUB
Exceeding 200,000 RUB but not exceeding 450,000 RUB	1,000 RUB
Exceeding 450,000 RUB but not exceeding 1,200,000 RUB	2,000 RUB
Exceeding 1,200,000 RUB but not exceeding 2,500,000 RUB	5,500 RUB
Exceeding 2,500,000 RUB but not exceeding 5,000,000 RUB	7,500 RUB
Exceeding 5,000,000 RUB but not exceeding 10,000,000 RUB	20,000 RUB
Exceeding 10,000,000 RUB	30,000 RUB

Table 18: Customs clearance fees

The customs clearance fee decreases to 75% of the according rates in Table 18 (European Commission Trade, 2014) when placing the customs declaration electronically.

Binding information for custom tariffs can be requested from the Austrian Federal Ministry of Finance in Austria, a nonbinding from the Central Inquiry Office for Customs in Villach. (Bundesministerium für Finanzen, 2014)

Another adjuvant way for acquisition of information is to get in contact with the Chamber of Commerce in Vienna or also with the Austrian Center of Foreign Trade in Moscow. These institutions are supporting Austrian companies among others in finding out customs regulations or if there are any custom suspension procedures when doing exportation to Russia.

Finally, the costs for customs when exporting goods (pantographs) from Austria to the Russian Federation are summarized:

Factor	Value	Basis	Annotations
Duty	5%	Value of the goods	Pro forma invoice is required for declaration of the value.
IVAT	18%	Value of the goods + duty	Refundable for a Russian company.
CCF	Table 18	Dutiable value of the goods	75% when placing declaration electronically

Table 19: Summary custom expenses export to RF

Duty suspension in rail vehicle industries

The RZD is actually trying to obtain a duty suspension for the rail vehicle industries as it already exists for example in automotive industries. This should affect foreign corporations to localize their production and therefore an achievement of Russian added value to improve the Russian economy. Another background of these attempts is to transfer know how and technical processes to the RF. This suspension is only applicable when the concerning company has a local production, so of course it is reclaimable for the end customer RZD but also for companies that generate local added value with their own production site.

Such duty suspensions already exist for some products for railway industries, but at the moment they do not for pantographs.

The Russian government set a number of products respectively the appending custom tariff numbers on a list with advantaged importation products. The pantograph-tariff is also within these numbers. This procedure has been checked by Ural Locomotives since the beginning of 2014, but due to its complexity the implementation has not succeeded until now, so the capableness is still unclear actually.

Contemplable and eligible importers

In general only companies that are situated in the Russian Federation can behave as importer of goods according to Russian law in view of custom- and importation VAT purposes. That means in this case that either Ural Locomotives or Selena Elektrotransport could import the pantographs.

Another option would be to dispose the pantograph to a Russian service provider that resells the product to the final customer or to the company that does a further processing within the Russian Federation. Such service providers are usually shippers that charge an extra fee for that service. Usually every major Austrian forwarding agency has a local branch in Russia

that offers that services, but the fee is very high (up to 20% of the goods' value).[18] To save costs, the exporter should try to have that matter executed by the Russian customer or partner, as Russian shippers offer those services for a fraction of costs to domestic companies compared to a European provider.

Of course, also a Russian subsidiary company of Melecs like an OOO could phase out the customs clearance. A foreign representation, an agency or just a Russian tax account number is not adequate for that purpose.

As already mentioned, it is not necessary that the ownership for the goods is already transferred to the customer at importation, what impacts the **taxation for the goods**: If the importer, who can only be a Russian legal person, already has the property rights for the goods at importation, it is a tax free export shipment. If otherwise the transfer of ownership to a Russian company is not executed at importation, so Melecs is still the owner of the goods, the final accounting for the pantographs has to be charged with 18% Russian VAT as this finally causes an inner Russian consignment. (Kern & Pichler, 2014)

Summarized, there are 4 possibilities which can assume the customs clearance and importation to the Russian Federation:

- A Russian Melecs legal entity
- The Russian end customer (Ural Locomotives)
- A Russian partner of Melecs for a further processing of the goods (e.g. Selena Elektrotransport)
- A Russian service provider (e.g. a shipping agent)

2.2.8   Company foundation in the Russian Federation

If the decision is made to build up an own entity in the Russian Federation (RF), the legal form of the future company has to be chosen. Basically, there are 3 main possibilities that are mostly common for founding a new establishment in Russia. These forms differ mainly in the range of duties and responsibilities the company is allowed to execute. (München Legal, 2013, p. 1 ff.)

Representation

This commercial unit only has the right to represent the interests of the holding company, like marketing, advertisement, set up of contacts etc. As it is no juristic person in the legal sense it is not allowed to execute commercial activities for a representation.

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[18] Percentage based on a commercial offer from an Austrian shipper.

Branch office

A branch office is allowed to execute the function of the representation and in addition to operate commercially. These commercial operations are carried only by the name of the holding company which means that all contracts can only be concluded by the holding. A branch office is no juristic person in the legal sense, too.

The disadvantage of a branch office is caused by its regulations of liability. The holding company assumes liability to the contractual partners and the Russian state for all activities of the branch office.

If a company plans exclusively commercial activities in Russia, a branch office is rather adverse due to its transfer of liability.

OOO (Russian: LLC)

The OOO (Obschestvo s Ogranitschennoi Otvetstvennostiu) is like a GmbH in Austria or an LLC (limited liability company) and represents a juristic person according to Russian law. It is allowed to operate commercially in its entirety. As in the Austrian GmbH, an OOO is limited liable as the associates are only liable for their deposits, which represents the big advantage compared to a branch office.

3   Implementation of localization concepts

After analyzing all relevant frame conditions for the concerned target country, in which the localization project will be executed, the necessary steps for the factual implementation of localization can be administrated by consideration of the worked out conditions.

In this chapter all matters that have to be considered when having the challenge of doing localization of parts from the added value chain will be processed. The initial position and the frame conditions in view of Melecs for this planned localization project were clarified in the previous chapter. A less detailed breakdown respectively a clearly arranged procedure model is elaborated in chapter D: Résumé on page 106.

3.1   Strategic decisions

These are fundamental decisions of general principle, which have to be made by the top management with support of the appropriate departments.

3.1.1   Location selection for establishing an appropriate entity

The location selection is a strategic decision administrated by the top management. As already elaborated the selection of the location of a new establishment is a long-term decision and should therefore be done with a high elaborateness. A wrong or even just not 'the best' decision can reduce the competitive ability explicitly and is therefore often responsible for the collapse of foreign companies' investments. Once the target country is chosen and fixed it should be investigated accurately in view of the elements mentioned in the theory and basics part (B6: Criteria for selection of partners and suppliers), which can also be used here. If there is consideration about incurring high investments, like founding an own new production plant, the country should also be searched to possibilities to set up the location in a special economic zone, if such zones exist in the country.

On average the costs of a project realized in a special economic zone in the Russian Federation are 30-40% lower compared to Russia general in practice. (Special Economic Zones JSC, 2012a)

Special economic areas in the Russian Federation

"Special economic zones (SEZ)is [!] a large federal project aimed at regions development by direct foreign and Russian investments attraction to the hi-tech economy industries, import-substituting production, shipbuilding and tourism." (Special Economic Zones JSC, 2012a)

In general, there are four different types of the 17 existing special economic zones in Russia: (IHK Industrie- und Handelskammer Hannover, 2013)

- Industrial and production zones (6 locations)
- Technology and innovation zones (5 locations)
- Tourist and recreational zones (4 locations)
- Port zones (2 locations)

The aim of Special Economic Zones (SEZ), of which some are established for already 50 years, is to bring investments, scientific, manufacturing and managing technologies to the Russian Federation. The main advantages of the SEZ for investors are: (Special Economic Zones JSC, 2012b)

- Economic stability
- Human resources
- Transport access
- Removal of administrative barriers
- Protection of investors from corruption

Figure 17: Special economic zones in Russia[19]

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[19] Each industry and technology zones in Figure 17 (Special Economic Zones JSC, 2012a) show one zone fewer than mentioned in the previous enumeration as in each type of zones two locations are overlapped.

Benefits when investing in SEZ are summarized in Table 20 (Sokolov, 2013): (Special Economic Zones JSC, 2013a)

Tax incentives	Russia	SEZ
Income tax	20%	0-13.5%
Property tax	2.2%	0% for 10 years
Transport tax (EUR/hp)	0.1-3.8	0 for 10 years
Land tax	1,5%	0% for 5 years
Insurance payment fee	34%	14%[20]

Table 20: Tax incentives SEZ

Free customs zone: No import duties and VAT when importing raw materials, equipment, construction materials, and components. Furthermore no export duties and VAT for finished goods.

Ready-to-use infrastructure: Free connection to utility lines, favorable rent rates, buy-out of land is allowed on favorable conditions, ready-to-work custom offices.

The main barrier for becoming a resident in an SEZ is the necessary requirement to invest at least 120 m. RUB (capital asset), thereof 40 m. RUB within the first three years of the activities. (Special Economic Zones JSC, 2013a, p. 9)

The contemplable zones for Melecs to set up an appropriate entity with a production line for pantographs are:[21]

- Industrial Zones:

  These vast territories are located in the major industrial regions of Russia. The main advantages in addition to the above mentioned ones are adjacency to production resources, an existing infrastructure and access to key thoroughfares. Especially the SEZ 'Titanium Valley' in Sverdlovsk oblast, the surrounding oblast of Yekaterinburg, would be obvious for Melecs, as Ural Locomotives is also situated in this area.

  Priority development directions of industrial zones are:

  o *"Motor vehicles and components production (…)*
  o *Instrument-making and equipment production for different economic industries (…)*

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[20] Limited to residents of innovation or industrial SEZ that are involved in R&D and for residents of tourist areas.
[21] Both tourism and logistics zones can expulsed from the outset.

- o *Aircraft building supplies production*
- o *Railway engineering (…)*
- o *Techno-innovative activities."* (Special Economic Zones JSC, 2013b)

- Innovation Zones:

  These zones enable great opportunities for innovative products to fabricate science-intensive goods because they are located in major centers of scientific traditions and research schools, which allows access to professional personnel resources.

  Innovation zones pay particular attention to:

  - o *"Industry*
  - o *Nuclear physics and nanotechnologies*
  - o *Bio- and medical technologies*
  - o *Other kinds of science-intensive production businesses."* (Special Economic Zones JSC, 2013c)

If a company wants to operate in a special economic zone, there are 5 necessary **steps to become a resident** in a special economic zone: (Special Economic Zones JSC, 2013a, p. 9)

- Step 1:

  Registration of a legal entity in the municipality of the special economic zone's location.
- Step 2:

  Submission of the following documents either directly to the SEZ or to the Ministry of Economic Development: (Special Economic Zones JSC, 2012c)
  - o Planned activity
  - o Required area
  - o Committed investments
  - o Requirements of infrastructure
  - o State registration copy
  - o Copy of tax registration
  - o Constituent document copy
  - o Business plan according to the requirements of the Ministry of Economic Development.
  - o Articles of association and other applications.[22]
- Step 3:

  Assessment of the project by the Supervisory Council.

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[22] The necessary list of documents is determined by the legislation of the Russian Federation.

- Step 4:

  Assessment of the project by the Expert Council of the Ministry of Economic Development.

- Step 5:

  Conclusion of the agreement with the Ministry of Economic Development on acting in a SEZ territory, receipt of SEZ residence certificate.

Cluster regions

In addition to Special Economic Zones also European company clusters represent a convenient location for the set up of a local company. Such clusters exist for example in Samara/Togliatti or in Skolkovo/Selenograd (Moscow region). Both have a wide diversified industrial landscape and a favorable situation to important motor- and waterways. The clusters are especially high developed in vehicle manufacturing with its appropriate supplying industry as well as in mechanical engineering and metal processing. (Clemens, 2011)

Moscow is by the way the first choice for an expansion to Russia also for German organizations and about two-thirds of the 4,600 German companies engaged in Russia have their base in Moscow. Moscow is also the most important research site in Russia by far. Actually about 1,600 organizations are concentrated in Moscow that are involved in doing research and development, which constitutes about 70% of the scientific research potential in the Russian Federation. (Führt & Clemens, 2012)

Industrial labor costs – an international comparison

A selection of costs of personnel in processing trade industry in 2011 is shown in Figure 18 (Schröder, 2012, p. 6). The amount of personnel costs is both an important component of unit labor and an essential factor for the location selection. If there are considerations to relocate activities from a local place abroad, in 82% of the cases the wages are an important or even very important factor. (Schröder, 2012, p. 2)

A detailed representation of data acquisition and the base of the calculation method are quoted in Schröder, 2012, p. 2f.

Country	wages in EUR/h
Norway	52,61
Switzerland	44,96
Western Germany	37,57
France	35,91
Germany	35,66
Austria	31,88
Japan	27,46
Italy	26,45
USA	23,81
UK	23,12
Eastern Germany	22,42
South Korea	15,34
Czech Republik	9,99
Brazil	8,12
Hungary	7,35
Poland	6,46
Russia	5,10
Turkey	4,68
Romania	3,73
China	3,17
Belarus	2,88
Ukraine	2,50
Moldova	1,88
Philippines	1,50

wages in EUR/h
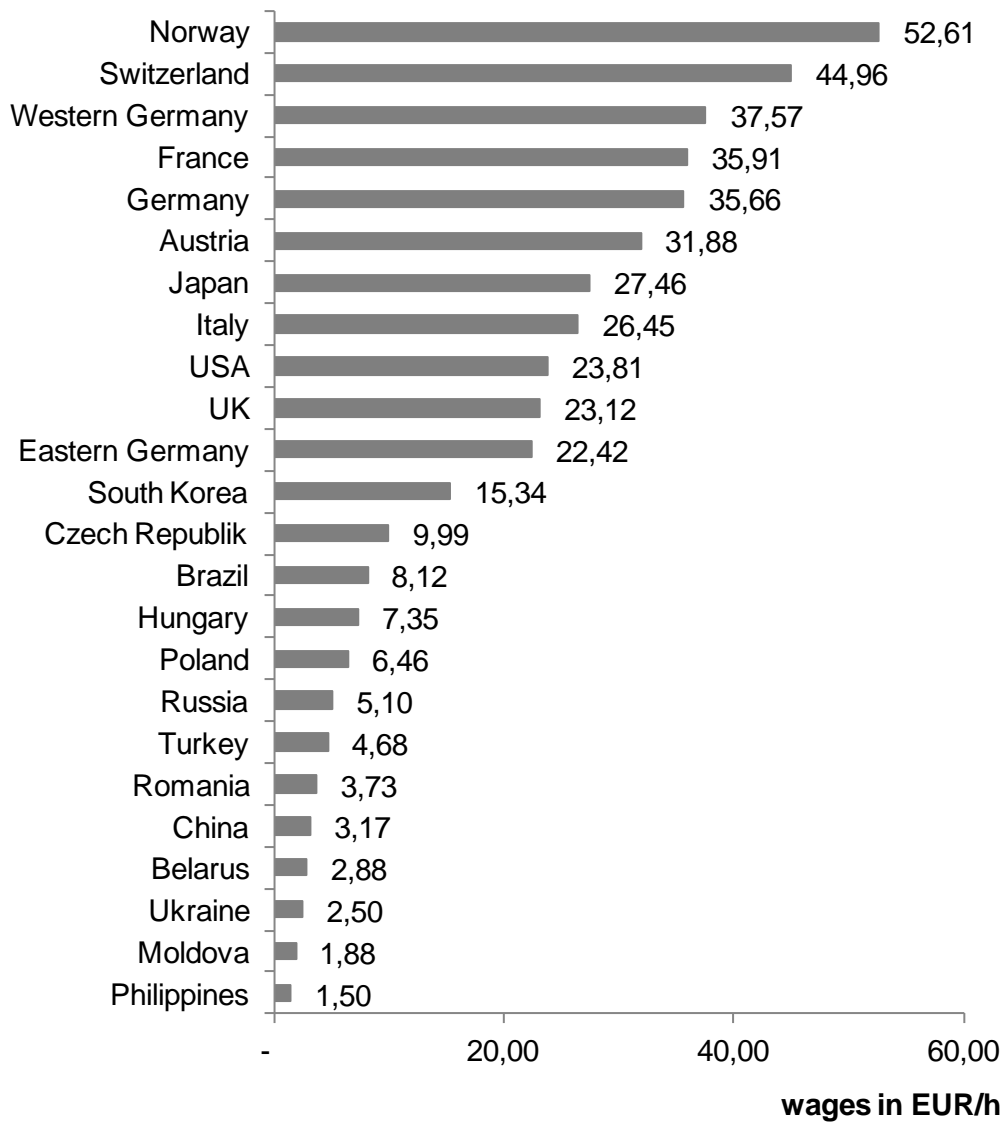
Figure 18: Industrial personnel costs

Figure 18 shows that the Russian industrial labor costs in average accrue only a sixth of costs compared to Austria and therefore Russia is suitable for relocation of parts of the value added chain, especially assembling processes, in view of labor costs.

3.1.2 Selection of potential commercial partners

In addition to the general requirements and methods of partner selection in chapter B6 on page 25f., the following issues should be proved and evaluated: (Melecs MWW, 2010, p. 3)

- Structure of property (owner, concern, base of head office, corporate form, CEO)
- Number of employees (clerks vs. workers)
- Financial structure, balance (capital and current assets, equity ratio, credit-worthiness, loans, collaterals)
- Market share (OEM, after market)

- Certificates, licenses, authorizations, etc.
- References, projects, products, knowledge and access to market
- Business strategy and purpose (short-, mid- and long-term)
- Planned investments (without cooperation)
- Lobbying power (political, economical, technical) at relevant authorities (e.g. permission) and at the end customer (Ural Locomotives resp. RZD)
- Company infrastructure organizational: existing and absent functions
- Company infrastructure technical: depth of added value, manufacturing- and assembling equipment, condition and adequacy of building
- Know how of management and employees

3.2   ABC analysis for the pantograph

To categorize the single parts of the complete pantograph in view of their necessity and importance to localize, a detailed analysis of the bill of material (BoM), which can usually be read out from an ERP system, is required, see Table 21.

The resources[23] in the abridgment of the BoM for the pantograph MP160 shown in Table 21 are already ranked belonging to their value from the highest to the lowest amount. The column 'Pot. l. c.' (potential local content) represents the estimated possibility to source these parts in Russia in 3 categories:

1   short-term ability to local sourcing (accessible for localization step 2)

2   mid-term ability to local sourcing (accessible for localization step 3)

3   long-term or from the view of present-day no ability to local sourcing

Category 3 also considers articles that have a high strategic importance for a company and will therefore not be localized due to strategic reasons. This fact is also based on a make or buy decision.

After estimating the local sourcing possibility and the possible achievable cost reduction the allocation has to be proofed and verified by acquiring possible suppliers. This acquisition can be done by the company itself, by a Russian partner or by a service provider. Also the Austrian Chamber of Commerce with its foreign trade center in Moscow supports companies at supplier search.

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[23] Due to nondisclosure reasons the resources are just named by the abbreviation R (resource) and a consecutive number. The appending kind of material is shown in the right column 'Category of material'.

Column 'ABC' represents the categorization of every particular component for the ABC analysis:

A   80% value percentage of the direct material costs (DMC)

B   15% value percentage of DMC

C   5% value percentage of DMC

In correlation with localization the articles of category A have the highest potential for achieving a determined local content of a product.

Res.	Cum. qty.	Value [€]	Qty.	Unit	Unit	Pot. l. c.	Est. cost red.	Value loc. [€]	Value [%]	Cum. value	ABC	Category of material
R1	0,51%	1.900,00	1	ST	pc.	1	20,00%	1.520,00	22,46%	22,46%	A	welding and metallic parts
R2	1,01%	950,00	1	ST	pc.	2	10,00%	855,00	12,63%	35,09%	A	welding and metallic parts
R3	1,52%	910,00	1	ST	pc.	2	20,00%	728,00	10,76%	45,85%	A	pneumatic parts
R4	2,02%	703,00	1	ST	pc.	3	0,00%	703,00	10,39%	56,24%	A	separate BoM
R5	2,53%	520,00	1	ST	pc.	1	20,00%	416,00	6,15%	62,39%	A	welding and metallic parts
R6	3,03%	380,00	1	ST	pc.	1	20,00%	304,00	4,49%	66,88%	A	welding and metallic parts
R7	3,54%	253,02	2	ST	pc.	3	0,00%	253,02	3,74%	70,62%	A	pneumatic parts
R8	4,04%	220,87	1	ST	pc.	3	0,00%	220,87	3,26%	73,88%	A	pneumatic parts
R9	4,55%	269,00	1	ST	pc.	1	20,00%	215,20	3,18%	77,06%	A	welding and metallic parts
R10	5,05%	198,32	1	ST	pc.	2	10,00%	178,49	2,64%	79,70%	A	pneumatic parts
R11	5,56%	157,32	4	ST	pc.	2	10,00%	141,59	2,09%	81,79%	B	standard parts
R12	6,06%	87,42	3	ST	pc.	3	0,00%	87,42	1,29%	83,08%	B	pneumatic parts
R13	6,57%	95,40	2	ST	pc.	2	10,00%	85,86	1,27%	84,35%	B	welding and metallic parts
R14	7,07%	81,92	4	ST	pc.	3	0,00%	81,92	1,21%	85,56%	B	pneumatic parts
R15	7,58%	87,00	1	ST	pc.	2	10,00%	78,30	1,16%	86,72%	B	spring, damper
R16	8,08%	63,50	1	ST	pc.	3	0,00%	63,50	0,94%	87,66%	B	welding and metallic parts
R17	8,59%	63,50	1	ST	pc.	3	0,00%	63,50	0,94%	88,60%	B	welding and metallic parts
R18	9,09%	58,84	4	ST	pc.	3	0,00%	58,84	0,87%	89,47%	B	standard parts
R19	9,60%	67,31	2	ST	pc.	2	30,00%	47,12	0,70%	90,16%	B	welding and metallic parts
R20	10,10%	49,42	2	ST	pc.	2	10,00%	44,48	0,66%	90,82%	B	standard parts
R21	10,61%	33,65	1	ST	pc.	2	30,00%	23,56	0,35%	91,17%	B	welding and metallic parts
R22	11,11%	24,88	4	ST	pc.	1	10,00%	22,39	0,33%	91,50%	B	electrical parts
R23	11,62%	24,11	1	ST	pc.	2	10,00%	21,70	0,32%	91,82%	B	rubber parts
R24	12,12%	21,20	1	ST	pc.	1	10,00%	19,08	0,28%	92,10%	B	standard parts
R25	12,63%	20,57	8	ST	pc.	1	10,00%	18,51	0,27%	92,37%	B	electrical parts
R26	13,13%	20,57	8	ST	pc.	1	10,00%	18,51	0,27%	92,65%	B	electrical parts
R27	13,64%	18,56	1	ST	pc.	1	10,00%	16,70	0,25%	92,89%	B	standard parts
R28	14,14%	16,04	1	ST	pc.	3	0,00%	16,04	0,24%	93,13%	B	pneumatic parts
R29	14,65%	16,22	2	ST	pc.	1	10,00%	14,60	0,22%	93,35%	B	welding and metallic parts
R30	15,15%	14,53	0,200	KG	kg	2	0,00%	14,53	0,21%	93,56%	B	
R31	15,66%	15,16	2	ST	pc.	2	10,00%	13,64	0,20%	93,76%	B	standard parts
R32	16,16%	12,41	1	ST	pc.	3	0,00%	12,41	0,18%	93,95%	B	standard parts
R33	16,67%	13,16	1	ST	pc.	1	10,00%	11,84	0,18%	94,12%	B	welding and metallic parts
R34	17,17%	11,46	2	ST	pc.	2	10,00%	10,31	0,15%	94,27%	B	spring, damper
R35	17,68%	12,52	2	ST	pc.	1	10,00%	11,27	0,17%	94,44%	B	standard parts
R36	18,18%	10,99	1,187	M	m	3	0,00%	10,99	0,16%	94,60%	B	pneumatic parts
R37	18,69%	12,13	1	ST	pc.	2	10,00%	10,92	0,16%	94,76%	B	shafts
R38	19,19%	12,06	1	ST	pc.	1	10,00%	10,85	0,16%	94,93%	B	welding and metallic parts
R39	19,70%	11,34	4	ST	pc.	1	10,00%	10,21	0,15%	95,08%	C	standard parts
R40	20,20%	10,92	2	ST	pc.	2	10,00%	9,83	0,15%	95,22%	C	standard parts

Table 21: Bill of material[24,25] including ABC-Analysis

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[24] The broken line symbolizes a cut off of the BoM as the complete one would be too extensive in this position; the total BoM can be found in chapter E: Annex.
[25] Fictitious figures.

The result of the ABC-analysis can be illustrated with the Lorenz curve in Figure 19, which shows the accumulated value percentage to the corresponding accumulated quantity percentage. The vertical lines cut the Lorenz curve at the pre-defined 80% and 95% value percentage and separate the diagram into the 3 categories A, B and C:
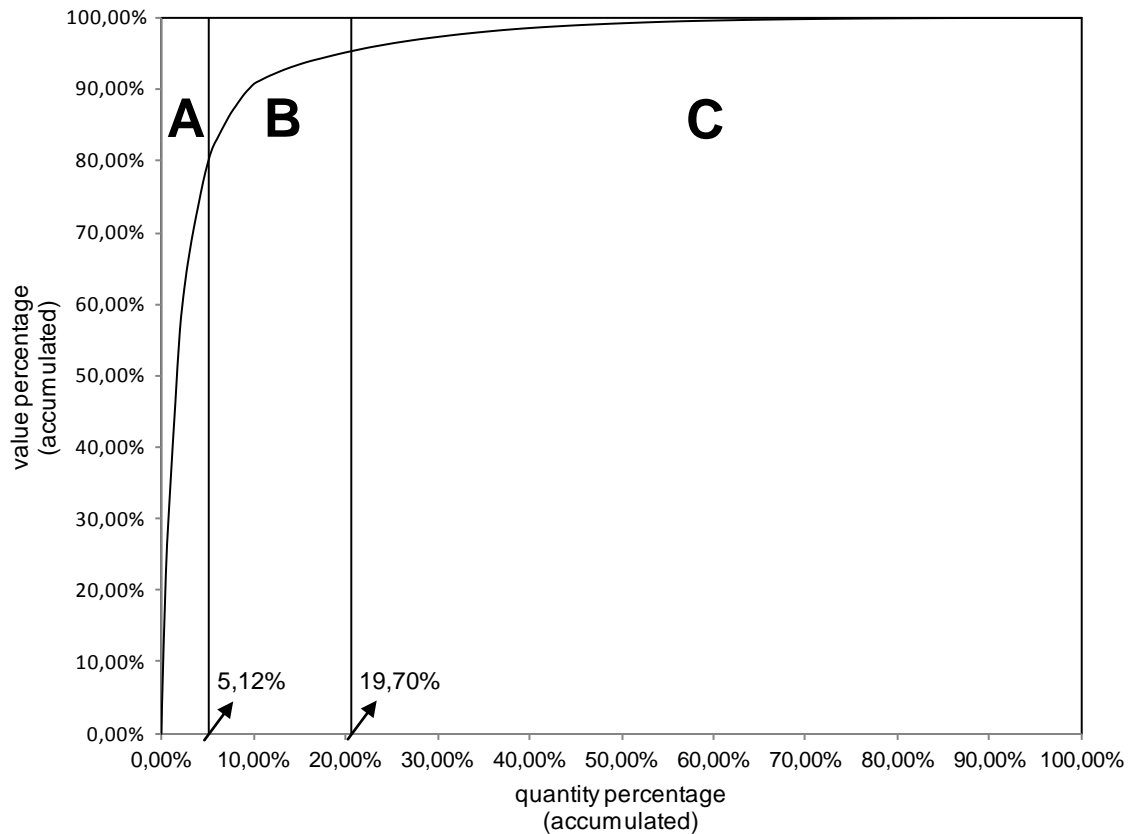

Figure 19: Lorenz curve ABC analysis

The ABC-analysis shows that 80% of the value of the goods is caused by only 5.12% of the goods' quantity (A-articles), 95% of the value is caused by 19.7% of the (B-articles) and as a result the 80.3% of the articles with the lowest value are causing only 5% of the accumulated value percentage (C-articles). This can be illustrated with a bar diagram, which shows the corresponding value and quantity percentage of every category A, B and C, see Figure 20:
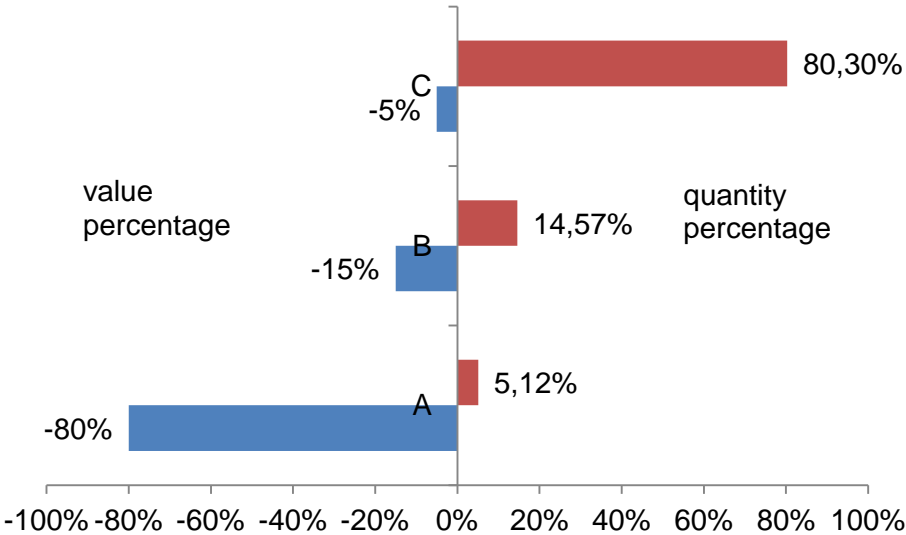
Figure 20: Bar diagram ABC analysis

3.3 Prioritization of goods for localization

For a decision-making support to cull the articles that should be localized prioritized the following matrix in Figure 21 can be an assistance tool. It considers the classification of the ABC-analysis[26] and the potential of local sourcing[27] as already defined in chapter 3.2.
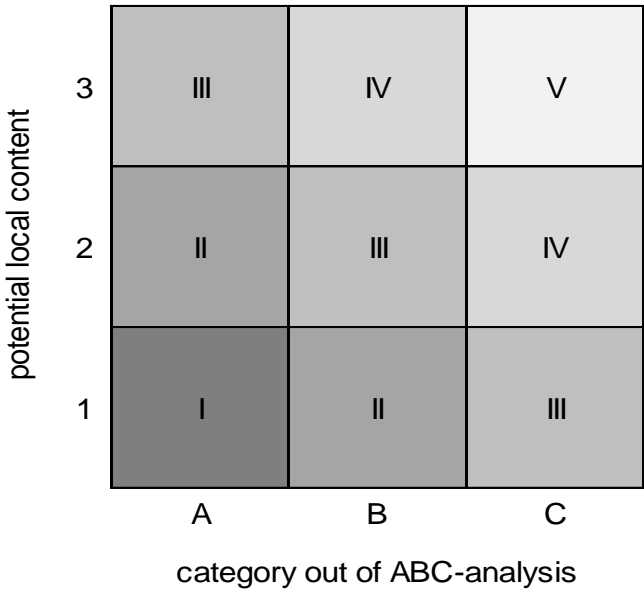

Figure 21: Decision matrix goods prioritization for localization

The axis of abscissa indicates the three categories resulted from the ABC-analysis (from A – high value percentage to C – low value percentage), while the axis of ordinate indicates the

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[26] A: high, B: medium, C: low value
[27] 1: high, 2: medium, 3: low potential for local sourcing

three categories of the potential for local sourcing (from 1 – high potential to 3 – low potential for local sourcing).

This decision matrix in Figure 21 shows 5 categories (scale from I to V) whereupon I represents the articles which should and/or can be localized preferential and category V contains the articles which are unfavored to localize.

Category I represents the most preferable one because of its high potential to localize on the one hand and it contains the articles with the highest material value out of the ABC-analysis on the other hand. Therefore those articles are quick in transformation and create a higher local content compared to B- and C-articles.

Category II has either a medium value, is easy to localize or has a high value and a medium potential of localization, therefore both characteristics should be paid the same attention.

This logic of evaluation continues up to category V, which represents parts with a very low value (the whole group represents only 5% of the total material costs and would therefore create just a low percentage of local content) that are in addition hard to localize and therefore this category is the most insignificant one for localizing it in Russia.

If the bill of material respectively a category is (still) too extensive for a clear evaluation it is useful to execute the procedure again with a new allocation of all contained articles of the concerned category, which causes a refined outcome.

Prioritization within the 5 categories of goods' localization prioritization

When doing the classification for category I exemplarily, the bill of material shows that 4 resources are included in this category: R1, R5, R6 and R9. These resources are the most preferable ones of all which should have the highest attention for localization of all articles in the bill of material.

Further criteria to arrange the materials of the 5 categories could be the value of the goods, the estimated cost reduction or even both of them depending on the pursued objective. A more detailed evaluation of prioritization of the resources within one of the five categories can either be done graphically (see Figure 22) or using a table to arrange the resources (see Table 22).

The final decision of prioritization is influenced by the primary objectives, whereas in general two different purposes can be pursued when executing localization:

- **Attainment of maximum local content**

  In this case a high local content of the value added chain has to be reached. The prime characteristic for prioritization is the resources' value, as the local content is the higher the higher the value of the resources is distinctive.

  This purpose is usually pursued when a certain local content is required by the end customer, like the initial position in this case.

- **Attainment of maximum cost reduction**

  If the main objective is to reduce costs due to localization of goods, the prime characteristic for prioritization is the absolute estimated cost reduction.

If the primary objective is represented by one of these two characteristics, a simple gradation of the appropriate specification (either value or estimated cost reduction) is possible and adequate (see Table 22), but if the objective of localization is not absolutely definable, a combination of both specifications can be evaluated graphically (see Figure 22).

The value and estimated cost reduction of the goods summarized in category I are:

Resource	Value [€]	Cost reduction [%]	Cost reduction [€]	Prioritization
R1	1.900,00	20%	380,00	I.I
R5	520,00	20%	104,00	I.II
R6	380,00	20%	76,00	I.III
R9	269,00	20%	53,80	I.IV
Total	**3.069,00**		**613,80**	

Table 22: Prioritization of goods in category I

Because of the circumstance that the resources are already arranged belonging to their value in the bill of material in Table 21 and the estimated cost reduction is 20% for every resource in this case, the prioritization is just simply the original sequence, as the absolute cost reduction in Euro is already arranged downwards belonging to its value. The column 'Prioritization' represents the detailed prioritization for localization of resources within category I.

Table 22 also constitutes the total possible local value of the resources and the estimated cost reduction of resources comprised in category I.

A prioritization in combination of both value and cost reduction can be evaluated as shown in the following Figure 22.
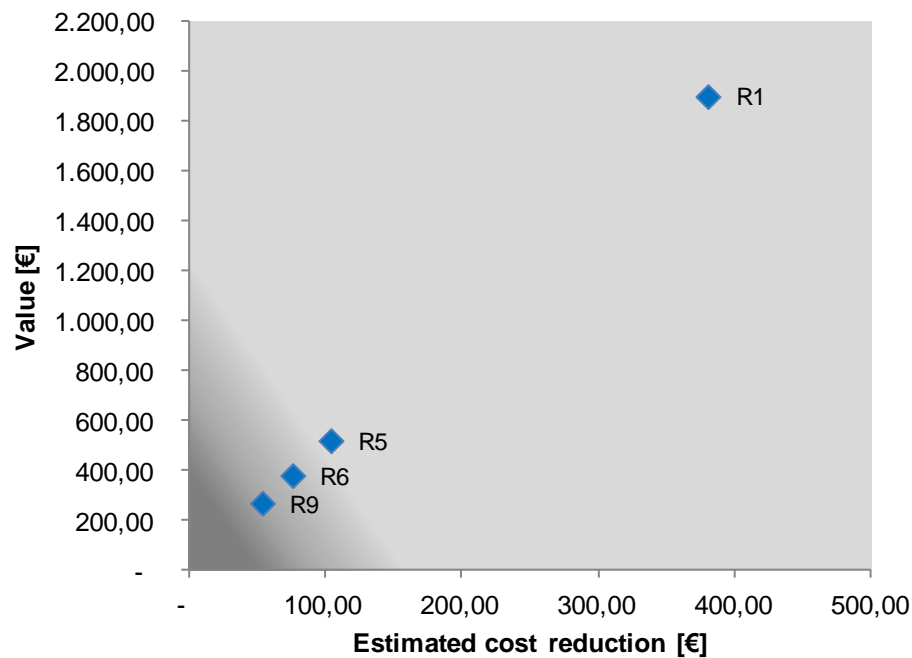
Figure 22: Combined prioritization

Figure 22 considers the estimated cost reduction (axis of abscissa) and the value of the single resources (axis of ordinate). The five blue data points represent the four resources of the bill of material contained in category I (R1, R5, R6 and R9).

The highest priority for localization of resources within a category is the dark grey area top right whereupon the priority drops continuously to the light grey area with the lowest priority down left.

Further procedure

Depending on the extent of the bill of material it may be useful to start the localization process for the 1st category, even if the other categories are not analyzed in detail finally. The further procedure contains basically the sourcing of the contemplable parts in Russia, wherefore the purchasing department is responsible.

The operational responsibility depends on the chosen business model, whereupon it is usually advantageous if the sourcing process is executed by a local agent that is familiar with the circumstances and conditions in the target country of the localization project.

3.4   Concepts for the logistical execution

With regard to the export regulations to the Russian Federation in chapter 2.2.7 some possible concepts in view of collaborating with a Russian enterprise, with no claim to be

complete, are constituted in this chapter. The collaboration partner will be Selena Elektrotransport, a producer of pantographs situated in Moscow region. Selena is one of the few producers of pantographs in Russia and was recommended as partner to Melecs by Ural Locomotives. The director of Selena is also employed at the technical approval authority for railway industries in Russia. Therefore the targets concerning the selection of the Russian partner company in 1.3: Objective targets, like politically lobbying, can be reached by cooperating with Selena.

3.4.1   Assembly in Austria: Know-how transfer

This variant cannot be seen as a real localization, but as an often necessary pre-stage to that. In order to get the workers, who will be involved to the assembling process in the partner-factory, acquainted with the assembling, calibrating and testing processes, they get a professional training course in the Austrian manufacturing site, where they also get acquainted with the required quality standards and used tools.

This pre-step of localization step 1 (10-15% local content achieved by local assembly in Russia) would only be done for the first batch of 4 pantographs in localization step 1 but has turned out as a practicable way also to find out which tools the future cooperation partner has already used and what tools he will need in addition to execute the assembling process in the required quality, especially in consideration of the necessary first article inspection (FAI) of the final customer Ural Locomotives.

The process of execution is shown in Figure 23, wherein the participating parties, the executed operations and the occurring flows of invoices, material and manpower are illustrated. The curved black line represents the external frontier between the European Union and the Russian Federation.

The participating parties are:

- Melecs (seller) in Austria respectively the European Union
- Ural Locomotives (end customer of the final pantographs) in the Russian Federation
- Selena (possible assembly partner) in the Russian Federation
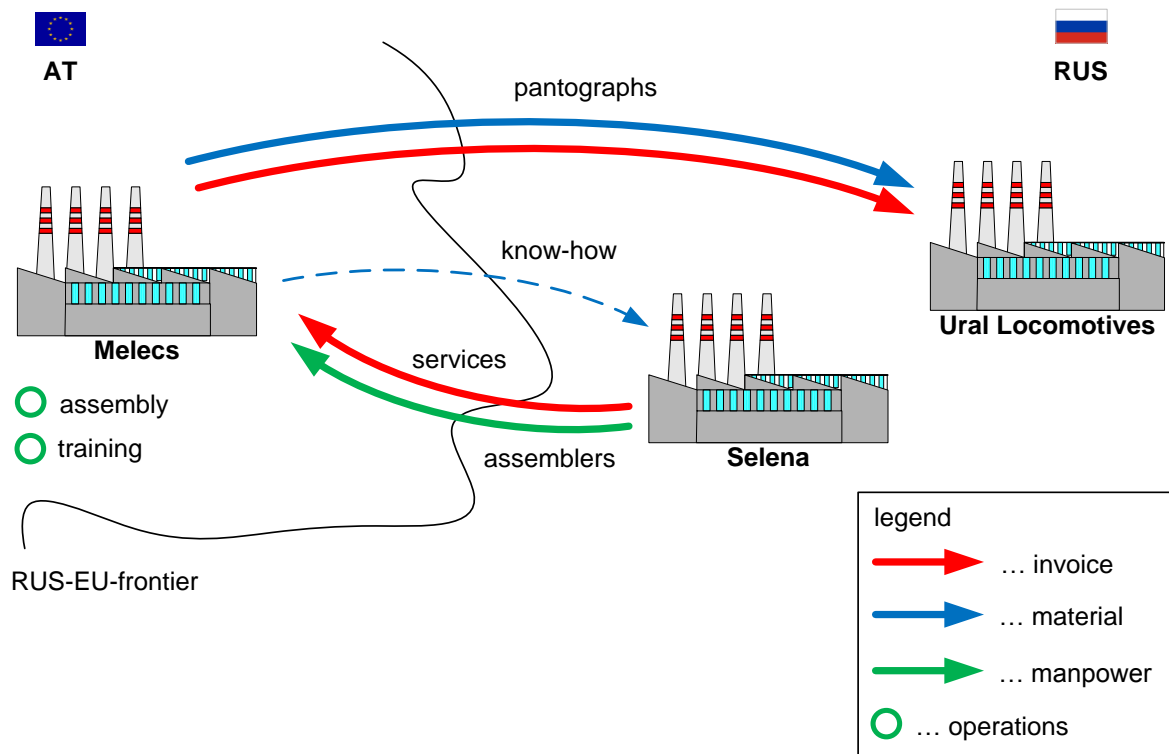
Figure 23: Assembly in Austria with know-how transfer

In this variant the assembling partner Selena sends workers to the Austrian Melecs company where they get a general training and get to know about the assembling process. Selena charges the labor costs of its workers to Melecs, what represents Russian content of added value as a monetary flow for the assembly is occurred to a Russian company, but is not actually localized in the target country. As a side effect a know-how transfer is carried out. The final pantograph is delivered identically as usual without localization, in this case free carrier (FCA) Linz, whereas Ural Locomotives is responsible for transport and customs and also for paying the arising costs.

At this point it is worth to be mentioned that before this variant a non-disclosure agreement (NDA) between Melecs and Selena should be concluded. This NDA protects Melecs of an illegal use of know-how by Selena as they see very detailed technical details and the exact function of the pantograph with all its characteristics and devices when executing the assembly on-site in Austria as well. The obligated party accepts to keep the accessed information as a secret.

3.4.2   Russian Melecs tax number – import by Ural Locomotives

This is another variant in which Ural Locomotives accomplishes the importation and provides the pantographs to Selena for further handling. This assumes the registration of a Russian Melecs tax number because the company receives on the one hand 18% VAT for the

delivery of the pantographs from UL as it is not the owner of the goods at importation, which finally causes a liability to Russian VAT because of the inner Russian supply, and on the other hand Melecs has to pay Russian VAT to Selena for the assembling. The balanced VAT (received minus paid VAT, which results in positive amount) has to be paid by Melecs via a Russian tax number to the Russian fiscal authority. For Ural Locomotives the paid VAT is no cost factor as it is refundable in the annual tax declaration.

AT

contract supply & assembly

RUS

PG SKD (+18%) + assembly (+18%)

Melecs

◯ pre-assembly

PG SKD (provision) - import & customs by UL

Ural Locomotives

RUS-EU-frontier

assembly (+18%)

contract assembly

PG

Selena

◯ final assembly

18% VAT balanced

MELECS
tax number

18% VAT

Russian fiscal authoritiy

legend

⟶ … invoice

⟶ … material

⟶ … contract

⇢ … cash flow

◯ … operations
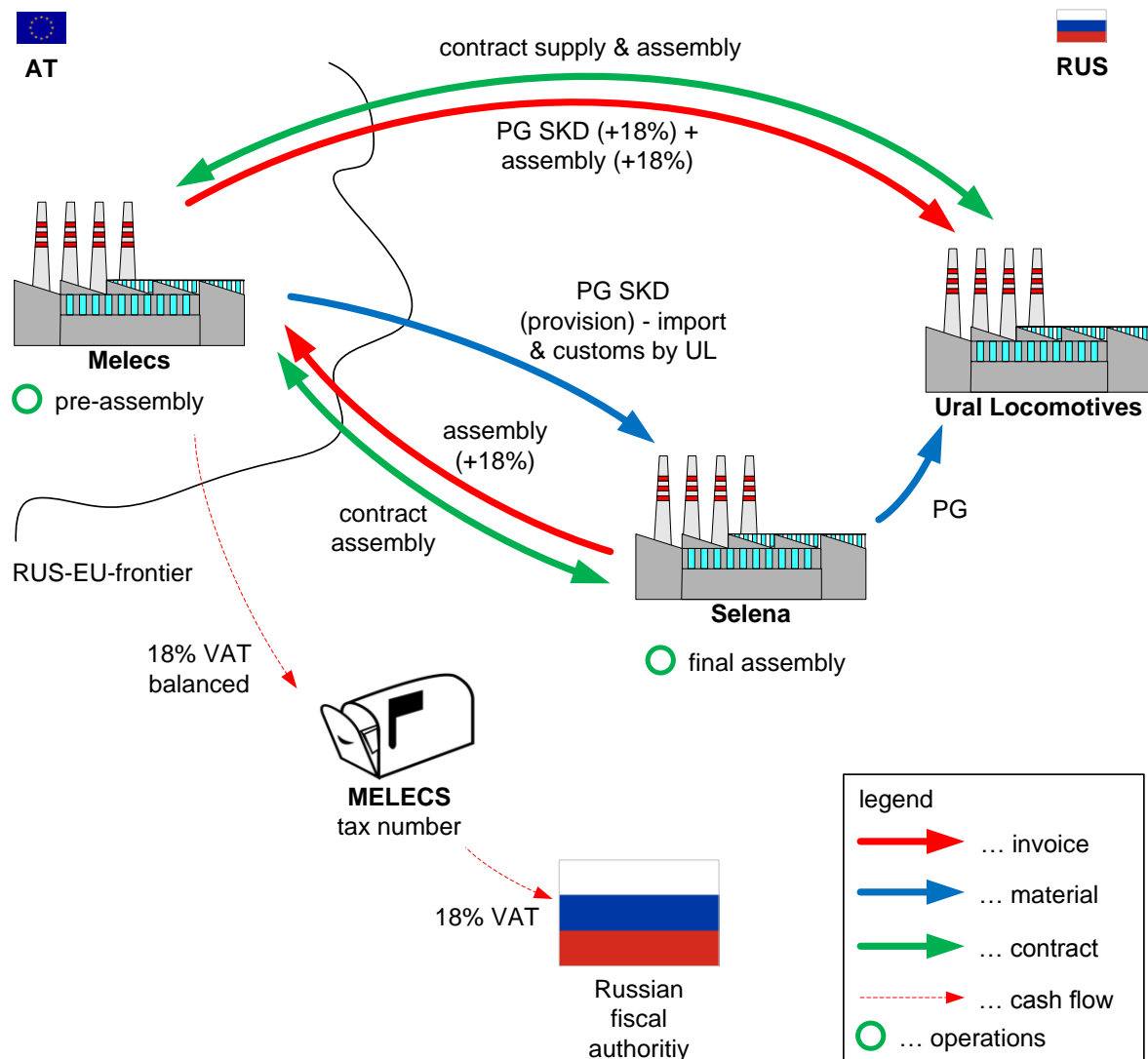
Figure 24: Russian Melecs tax number

As on the long-term view anyway a Russian Melecs OOO or a license production of Selena is planned, this variant constitutes too much effort as it would only be used for 16 pantographs from the actual point of view and the foundation of a tax number would cause costs of about EUR 6.000[28]. In addition, this execution postulates that UL is willing to do the importation.

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[28] Amount based on an offer from a tax consultant.

This execution can also be done without a Melecs tax number registration in the Russian Federation with the reverse charge mechanism.

3.4.3   Reverse charge mechanism

As the delivery of the final pantographs is within Russia it is subject to Russian VAT. Because of the absence of a Russian Melecs tax number a transition of the tax liability to the Russian customer occurs – this mechanism is called reverse charge, which means that Melecs can issue the invoice without VAT and does not need to register for tax reasons in Russia. The Russian customer has to declare the transaction of the tax liability in its Russian preliminary turnover tax return and can claim it for input tax deduction under the general requirements. The customer acts as a tax agent in this case, compare chapter 2.2.6: Abridgement of the Russian tax system on page 57ff.

The VAT from the assembly accounting from the cooperation partner Selena to Melecs remains as a cost factor.
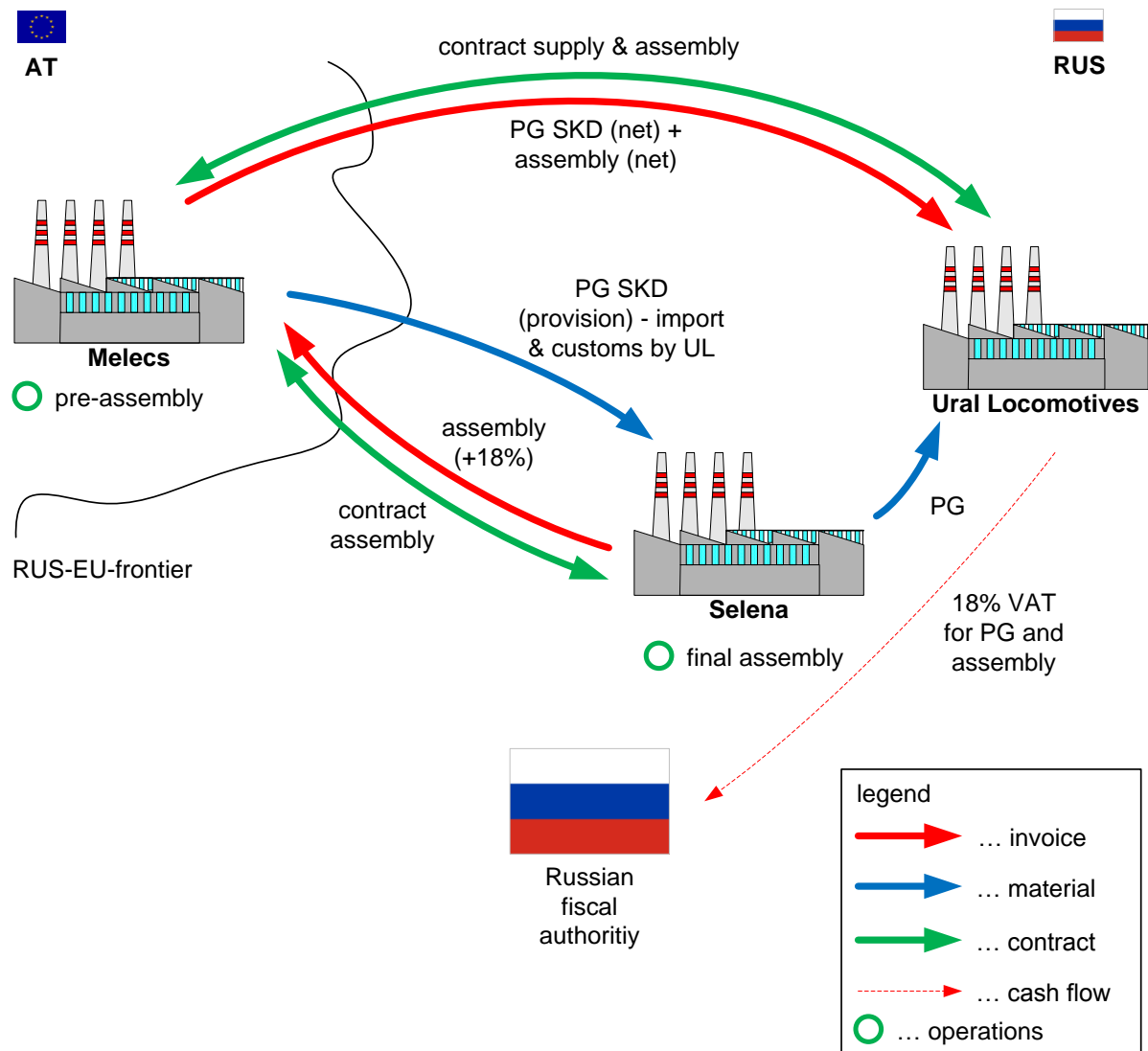
Figure 25: Reverse charge mechanism

The reverse charge method is relatively complicated in its execution and should therefore be done only for long term application due to its occurring efforts.

3.4.4   Russian Melecs tax number – import by shipping agent

In this variant a Russian shipper is responsible for the import, who charges a fee for that importation service. The pantographs are sold to the shipper as a tax free export shipment, but the pantographs are directly forwarded to the assembling partner. The shipper remains the owner during the assembling process and after finishing the assembly the shipper accounts the pantograph, transportation costs, customs and the service fee with 18% VAT to Melecs. Also Selena allocates the assembling costs with 18% VAT. Melecs accounts the total pantograph to Ural Locomotives +18% VAT due to the inner Russian delivery and has to pay the balanced VAT to the Russian fiscal authority via the Russian tax number. As the

accounting for the total pantograph contains a higher VAT than the invoice from Selena and the shipper combined, Melecs receives more VAT than paid to a Russian company and this overrun has to be discharged.
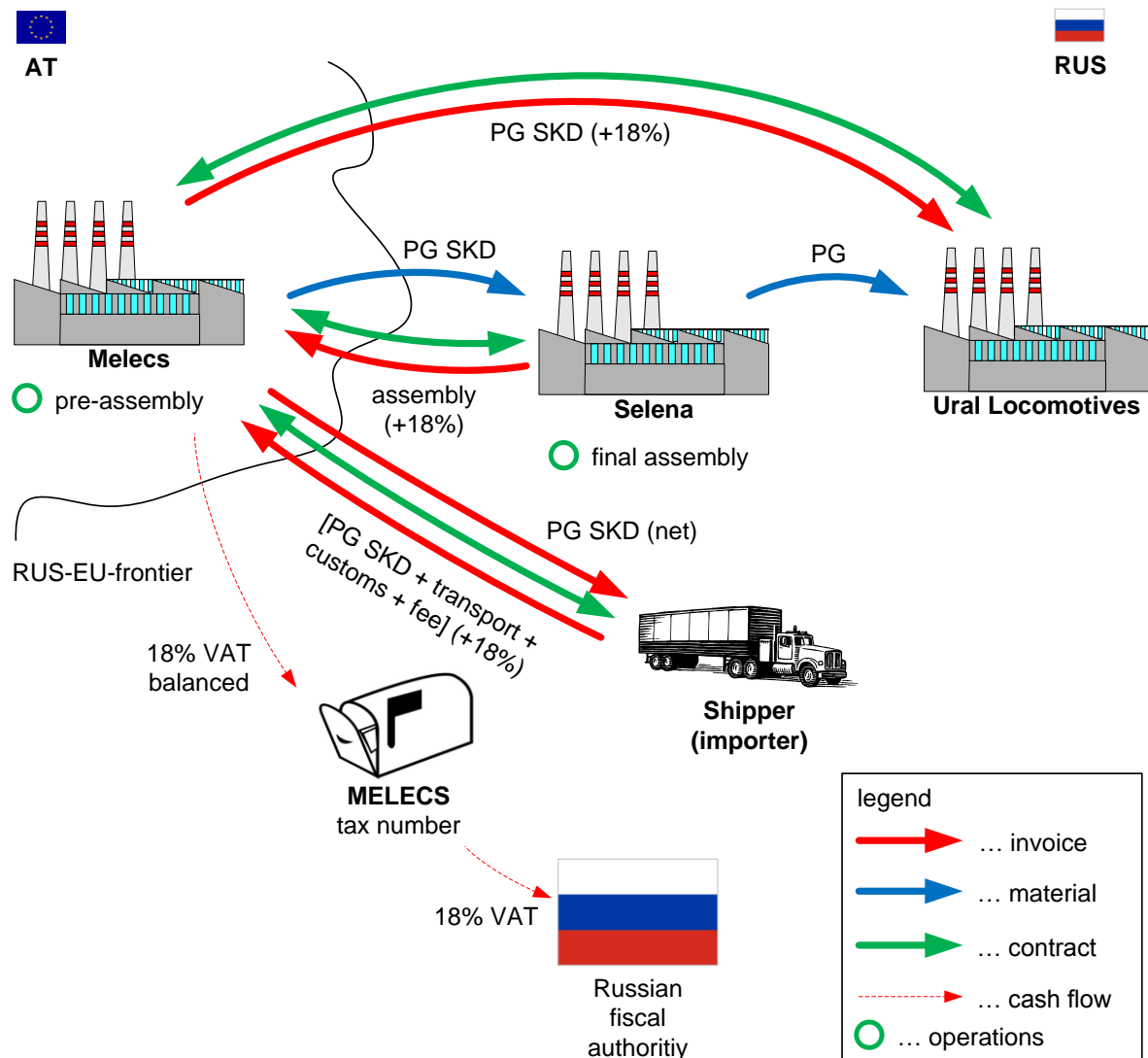
Figure 26: Shipper as importer with Melecs tax number

This variant could also be executed with the reserve charge mechanism. The procedure would then be executed in the same way as it was described above, but the disadvantage in view of the lost 18% VAT is higher than before because the VAT on the invoice from the shipper remains as an additional cost factor.

3.4.5 Importation by Russian cooperation partner

This concept will be executed in practice. Selena will buy components (Austrian respectively European parts) from Melecs, what causes a tax-free export shipment. Melecs has a general contract with Ural Locomotives, wherein Selena gets in as an additional co-contractor. In addition a license contract between Melecs and Selena has to be drafted. Finally, Selena

sells the final pantograph directly to Ural Locomotives, which represents a tax-free inner-Russian delivery. Figure 27 summarizes the planned process:
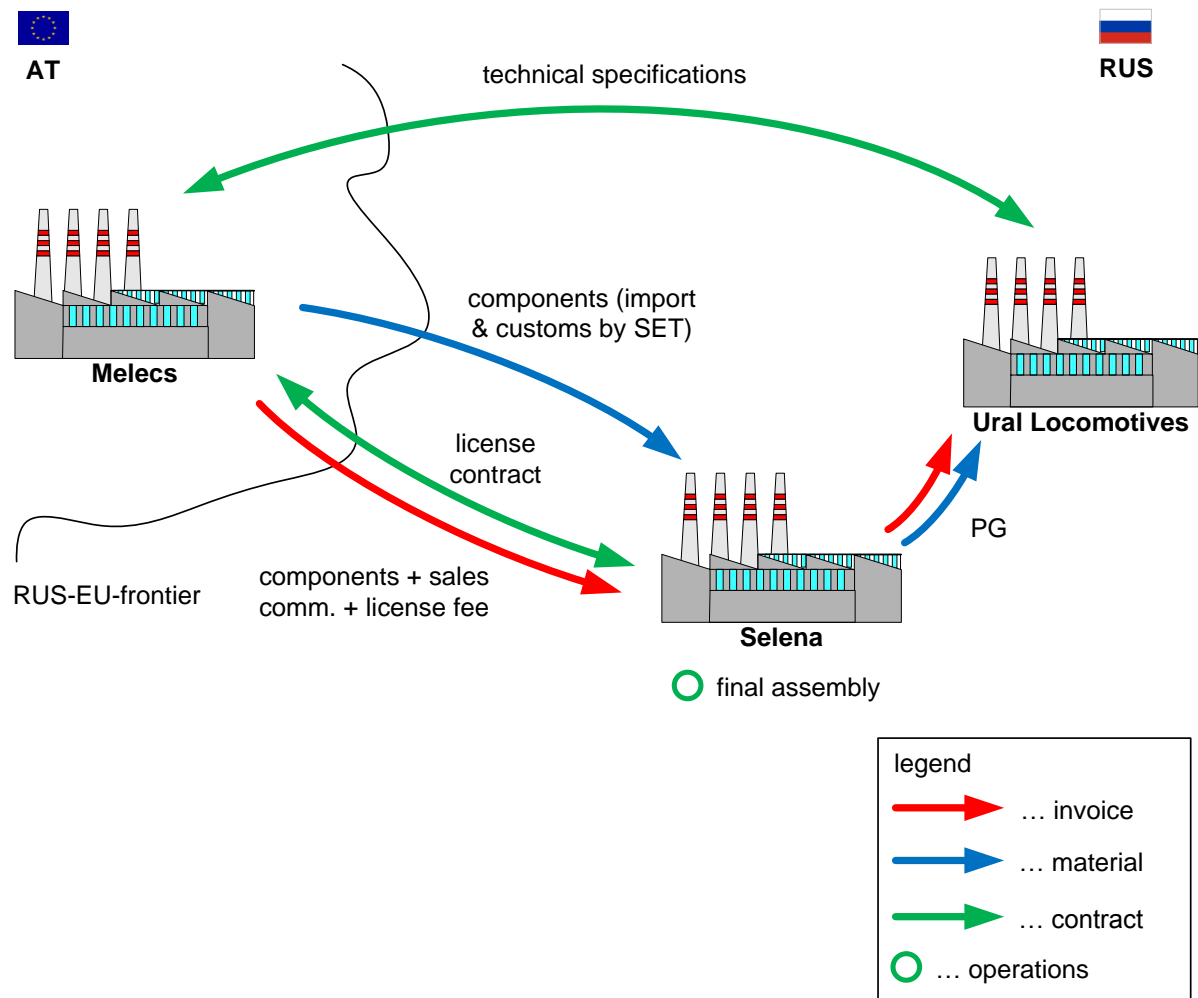
Figure 27: Importation by Russian partner

Without an appropriate Russian Melecs entity this concept is the most efficient one. There is no need for a Russian Melecs tax number and all transportations are conducted directly to the destination of need. The import will be done by Selena respectively by a commissioned Russian service provider, which is usually a shipping agency.

3.4.6   Importation by Russian Melecs OOO

The final step stipulates the foundation of an appropriate Russian Melecs OOO, which is a subsidiary firm of Melecs Holding respectively an associate company of Melecs MWW. As this OOO is a legal person, it is allowed to conduct both the importation and custom clearance. The following Figure 28 postulates that at the time of foundation of the OOO there is no production or storage at the Melecs OOO site, but it is only responsible for importation and accounting.
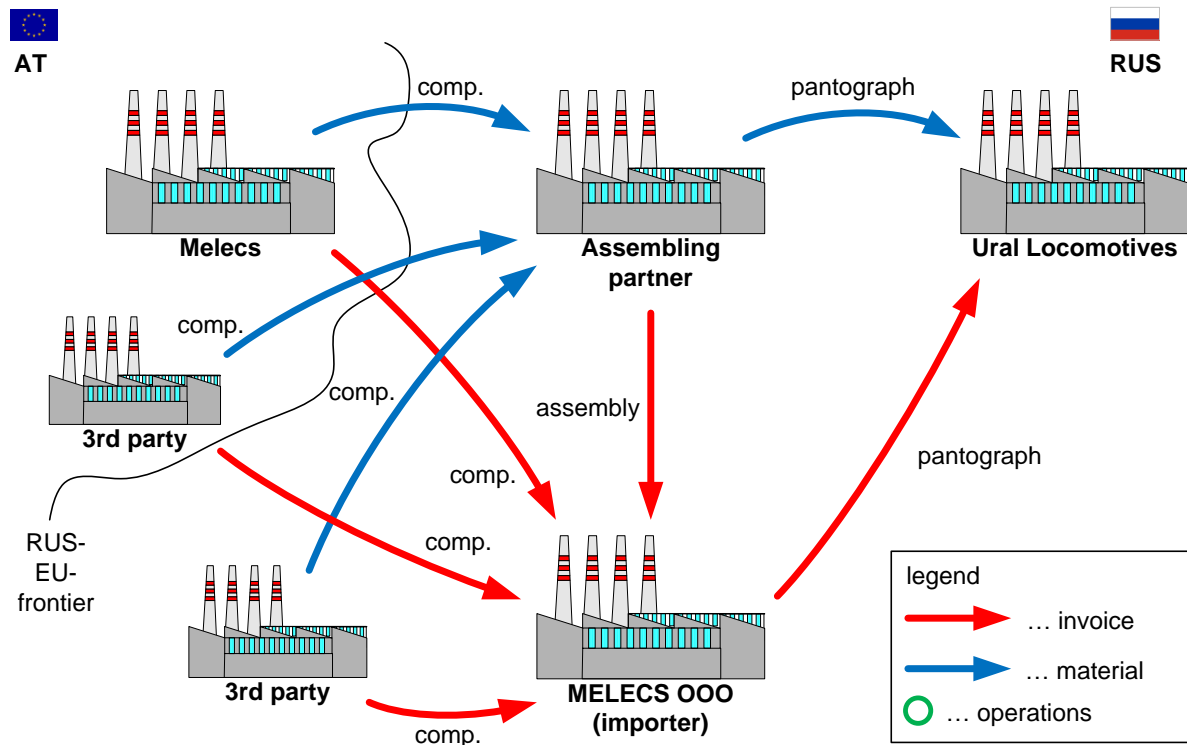
Figure 28: Russian Melecs OOO[29]

Melecs AT does not have any more a contract with the end customer Ural Locomotives, but Melecs RUS concludes the contract. This is especially advantageous in view of exchange rate risk as the contract will be negotiated in RUB and not as the actual state in EUR.

3.4.7   Summary

The previous chapters showed some possible concepts for carrying out a localization project in view of logistic execution. Of course some other possibilities for the execution, like outward processing, exist but they are not useful for this case and can be looked-up in relevant literature.

An assessment and evaluation of the persecutive concept has to consider basically the following objects:

- Current transport costs
- Nonrecurring costs (e.g. foundation of tax number, company)
- Complexity of transport handling and financial accounting
- Willingness of the business partner (e.g. reverse charge mechanism in view of Ural Locomotives, processing of importation in view of Selena Elektrotransport)

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[29] Due to clarity reasons the necessary contracts are not illustrated any more, but simplified a contract is necessary everywhere where an invoice is accounted.

A detailed evaluation for all concepts would be too extensive, but the main aspects respectively Pros and Cons are mentioned in the particular chapters. A detailed case calculation for the option in 3.4.5: Importation by Russian cooperation partner is conducted in the following business case calculation with the background of a license manufacturing.

3.5   Business case calculation for a long-term evaluation

For a long-term monetary evaluation of a localization project a detailed business case calculation is essential. The following calculation shows a comprehensive estimation for the net present value (NPV) of all projects that are planned in Russia by Melecs in connection with localization. The business case is based on the option of a license manufacturing by a Russian partner enterprise and should give a view about how a business case calculation could be formed and what kind of costs have to be considered.

3.5.1   Material rates for the several steps and projects

The material rate sets the costs of material in relation to the sales revenue and is calculated as shown in Formula 1 and Formula 2:

$$material\ rate\ MR\ (\%) = \frac{direct\ material\ costs\ DMC}{sales\ price\ SP} * 100$$

Formula 1: Material rate

To compare the development of the material rates of the particular localization steps (from 1 to 3, see chapter 1.2, p. 39f.) the material rate of each step is required separated.

$$MR\ per\ step\ (\%) = MR\ AT + MR\ RU$$

Formula 2: Material rate per step

To commemorate the three steps of localization a summarized scheme of the required stepwise increasing local content mentioned in chapter 1.2 on page 39f. is shown in Figure 29. The red arrows are representing the contractual fixed scheduled dates of delivery with the corresponding delivery quantity.
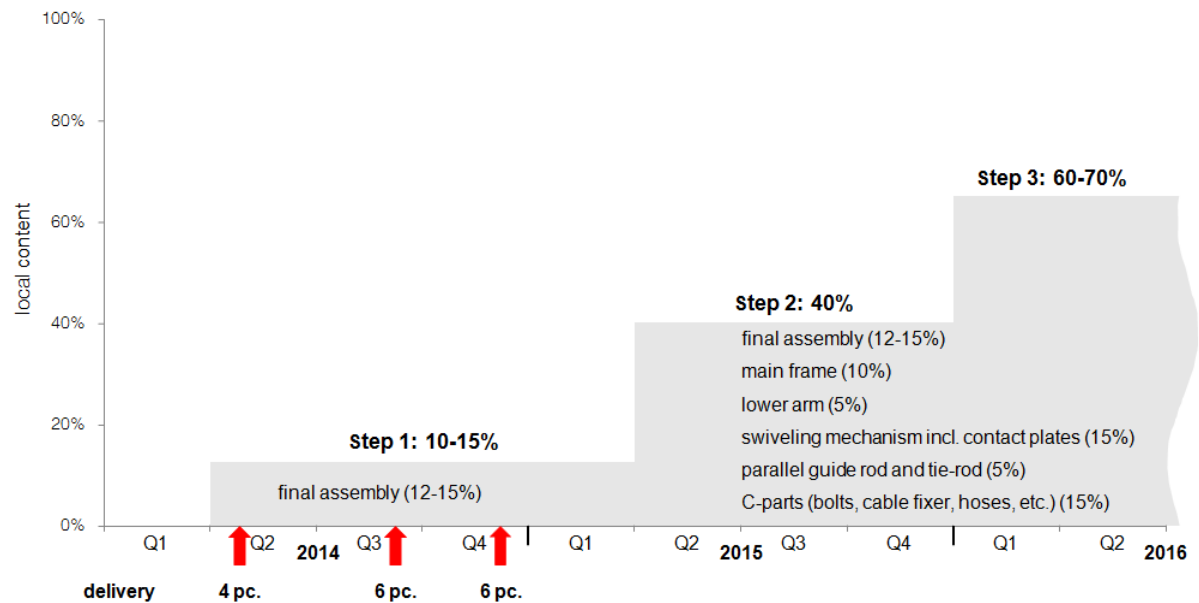
Figure 29: Required stepwise localization

Actually the projects of Melecs which should be carried out localized in Russia are Desiro RUS, 2ES7, EP2K, EP20 and Rest, which represents several exiguous projects. The projects' names are based on the locomotives' labeling. In addition to that projects also new projects are considered to avoid an unrealistic decline of the sales figures when running down the actual projects and also the planned spare parts (SPP) volume is included in the business case calculation.

The material rates of the single localization steps are calculated in Table 23, wherein the left part shows the detailed development of the material rate for the projects Desiro RUS and 2ES7 during the three phases of localization and the right part shows the material rates of the remaining planned projects, at which the total material rate is estimated and split up onto parts that will be sourced within the European Union and Russian parts.

Material costs Desiro RUS, 2ES7			SP: 8.700,00
Ann.: material rate always based on DMC			
Step 1			
MC AT	DMC	-8.000,00	
	IMC	-320,00	4,00%
	MC	**-8.320,00**	
	MR	91,95%	
Step 2			
MC AT	DMC	-4.465,02	
	IMC	-178,60	4,00%
	MC	**-4.643,62**	
	MR	51,32%	
MC RUS	DMC	-2.749,14	
	IMC	0,00	0,00%
	MC	**-2.749,14**	
	MR	31,60%	
	MR Step 2	82,92%	
Step 3			
MC AT	DMC	-1.747,59	
	IMC	-69,90	4,00%
	MC	**-1.817,49**	
	MR	20,09%	
MC RUS	DMD	-5.083,07	
	IMC	0,00	0,00%
	MC	**-5.083,07**	
	MR	58,43%	
	MR Step 3	78,51%	

Material rate EP2K			
Assumption MR	70,00%	thereof	
MR MWW	21,00%	30,00%	EU-parts
MR RUS	49,00%	70,00%	RU-parts

Material rate EP20			
Assumption MR	73,31%	thereof	
MR MWW	21,99%	30,00%	EU-parts
MR RUS	51,31%	70,00%	RU-parts

Material rate rest			
Assumption MR	80,00%	thereof	
MR MWW	24,00%	30,00%	EU-parts
MR RUS	56,00%	70,00%	RU-parts

Material rate spare parts			
Assumption MR	70,00%	thereof	
MR MWW	10,50%	15,00%	EU-parts
MR RUS	59,50%	85,00%	RU-parts

Material rate new projects			
Assumption MR	75,00%	thereof	
MR MWW	22,50%	30,00%	EU-parts
MR RUS	52,50%	70,00%	RU-parts

Table 23: Material rates[30]

The material rates demonstrate positive developments as they are getting lower the more parts are localized in Russia. It is assumed that the projects Desiro RUS and 2ES7 cause the same material costs and sales price, as they are basically the same type of construction. The high prices for Austrian material cause a material rate of 91.95% in the first step, wherein the total material is sourced in Austria. At the last localization step the material rate declines to 78.51%, which signifies a material rate reduction of more than 13 percentage points.

3.5.2 Production costs in Russia

The following calculated costs of production are based on a total production respectively assembling in Russia executed by Selena Elektrotransport. The hourly wage rate is predicated on a schedule of costs of the potential partner. The production costs for one pantograph are calculated as follows in Formula 3:

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[30] Fictitious figures; IMC for Russian parts cannot be estimated and are irrelevant as Melecs MWW is not concerned by them.

$$production\ costs\ (€) = hourly\ wage\ rate(€) * work\ expenditure/h$$

Formula 3: Production costs

Table 24 breaks down the production costs for each single project in EUR:

Production costs license production								
hourly wage rate	-7,5 €							
	DR	2ES7	EP2K	EP20	Rest	SPP DR	New pr.	SPP EP2K
work expenditure (h)	15,00	15,00	13,00	15,00	13,00	0,00	13,00	0,00
production costs	-112,50	-112,50	-97,50	-112,50	-97,50	0,00	-97,50	0,00

Table 24: Production costs in Russia[31]

Spare parts do not have any work expenditure in case of production costs as they are sold directly to the end customer without any further treatment. The hours of work expenditure have been multiplied with a factor to consider the lower productivity in Russia compared to Austria.[32]

3.5.3 Annual costs for Melecs at license production

As the business case is calculated project-related it is necessary to estimate all the occurring costs, which can be nonrecurring or annual running costs. The business case is not calculated with the classic overhead calculation as the overhead rates are based on a distribution key of the last year and these rates are changed respectively adapted every year. Therefore, an overhead calculation would distort the outcome too much especially in remote future and would lower the information value as a result.

The anticipated fixed expenses consolidated in Table 25 are supposed annually to be able to evaluate the annual development of the operating profit.

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[31] Fictitious figures; The yellow highlighted segments represent input values, what is valid for the total business case calculation.
[32] Due to nondisclosure reasons this factor cannot be mentioned here.

Annual costs license production		
Partner development SET 2015		**[€]**
Travel costs Melecs staff	-	3.000,00
Training SET staff in Linz	-	7.000,00
Contract construction	-	3.000,00
Interpreter	-	2.000,00
Instruction manuals	-	1.000,00
Tools	-	2.000,00
Nonrecurring costs 2015	**-**	**18.000,00**
Running extraordinary costs		**[€]/y.**
Travel costs Melecs staff	-	5.000,00
Sales efforts	-	5.000,00
Running annual costs	**-**	**10.000,00**
Overheads total		**[€]/y.**
Ass.: 1,5 man-years	-	90.000,00
Infrastructure 10%	-	9.000,00
Running annual overheads	**-**	**99.000,00**
Development costs new projects		**[€]**
Nonrecurring costs 2019	**-**	**30.000,00**

Table 25: Annual costs[33]

Partner development Selena Elektrotransport 2015

Travel costs for Melecs staff in 2015 include expenses for technicians and quality managers that are required to develop Selena in view of the assembling process and quality requirements, but no expenses for sales, as these are considered in the annual running costs. Expenses for the training of Selena staff in Linz, Austria, consider costs for flights (EUR 3,000), accommodation (EUR 1,500) and labor expenses (EUR 2,500). Tools consider special equipment like checking and testing apparatus, which Selena actually does not have available but is necessary to do the assembling process with the required quality and to pass the first article inspection (FAI).

Running extraordinary costs and overheads total

Running extraordinary costs consider the running annual costs for travelling of Melecs staff to Selena or possible Russian suppliers as well as extraordinary project-related sales efforts. Overheads total represent all incidental costs that occur in administration with the Russian projects, whereas an expenditure of time of 1.5 man-years is assumed. Such costs consider for example research and development. In addition to the occurring wage costs also costs for

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[33] Fictitious figures.

infrastructure, such as rent of building or necessary technical equipment, are respected with a factor of 10% of the wage costs. (Ortner, 2014)

3.5.4 Earnings by license fee

In general there are two possibilities that come into question to demand the license fee: (Lehmann & Schneller, 2002, p. 54ff.)

- A fixed quota license fee or a
- Percentage share of the final sales price

In the following Table 26 both types are applied: Quota license for the standard pantograph projects and a percentage share for spare parts.

Earnings are also generated due charging the sales price of the Austrian parts with a sales commission, which does not appear obvious on accounting from Melecs to the consumer. Therefore the rate of this sales commission can be changed and adapted between the several projects. Table 26 shows the planned rates respectively amounts for both sales commission and license fee:

Additional fees	DR Step 2	DR Step 3	2ES7	SPP DR	SPP 2ES7	new pr.
Sales commission	15%	20%	20%	25%	25%	20%
License fee	500,00	500,00	500,00	10%	10%	500,00

Table 26: Additional fees due to licensing[34]

The advantages of a fixed quota license are a better ability of planning and the independency of the sales price, which is not totally influenceable by Melecs.

3.5.5 Contribution margin

The calculation for the total contribution margin (CM) in Table 27 creates an overview for the CM of the particular projects, but is not useful for the final net present value calculation as for a long-term view the overhead calculation is not significant enough because of the necessary annual adaption of the overtime rates.

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[34] Fictitious figures.

Contribution margin (CM) total			DR Step 2	DR Step 3	2ES7	SPP DR	SPP 2ES7	New pr.
SP			9.200,00	8.700,00	8.800,00	500.000,00	300.000,00	8.500,00
DMC MWW			- 4.465,02	- 1.747,59	- 1.747,59	- 52.500,00	- 31.500,00	- 1.912,50
DMC SET			- 2.749,14	- 5.083,07	- 5.083,07	- 297.500,00	- 178.500,00	- 4.462,50
PC SET			- 112,50	- 112,50	- 112,50	-	-	- 195,00
Transport			- 223,25	- 87,38	- 87,38	- 2.625,00	- 1.575,00	- 95,63
Customs			- 256,74	- 104,86	- 104,86	- 3.281,25	- 1.968,75	- 95,63
Customs clearance fee			- 154,04	- 62,91	- 62,91	- 1.968,75	- 1.181,25	- 57,38
CMI			**1.239,31**	**1.501,70**	**1.601,70**	**142.125,00**	**85.275,00**	**1.681,38**
Sales commission			- 669,75	- 349,52	- 349,52	- 13.125,00	- 7.875,00	- 382,50
Licence fee			- 500,00	- 500,00	- 500,00	- 50.000,00	- 30.000,00	- 500,00
CMII			**69,55**	**652,18**	**752,18**	**79.000,00**	**47.400,00**	**798,88**
CMII (%)			**0,8%**	**7,5%**	**8,5%**	**15,8%**	**15,8%**	**9,4%**
IMC MWW	4,00%	4,00%	- 178,60	- 69,90	- 69,90	- 2.100,00	- 1.260,00	- 76,50
AO MWW	7,50%	8,00%	- 348,27	- 136,31	- 136,31	- 4.368,00	- 2.620,80	- 159,12
SO MWW	7,00%	8,00%	- 349,43	- 136,77	- 136,77	- 4.717,44	- 2.830,46	- 171,85
RDO MWW	7,50%	10,00%	- 348,27	- 136,31	- 136,31	- 5.460,00	- 3.276,00	- 198,90
CMIII			- 1.155,02	172,88	272,88	62.354,56	37.412,74	192,51
CMIII (%)			-12,6%	2,0%	3,1%	12,5%	12,5%	2,3%

<p align="center">Table 27: Contribution margin total[35]</p>

Contribution margin I considers the sales price to Ural Locomotives and all direct costs occurred by manufacturing, transport and customs, while contribution II and III consider the sales commission and license fee respectively indirect and overhead costs. Table 27 shows that a positive contribution margin for Desiro RUS (DR) is even not possible in localization step 2, as it is also not possible in step 1; see Table 13 on page 46. For all other projects and Desiro RUS in localization step 3 a positive contribution margin is accessible.

The two different overhead rates after contribution margin II for AO, SO and RDO are caused by different rates for standard projects and spare parts. The first column is valid for the projects Desiro RUS (DR), 2ES7 and new projects whereas the second column is applied for spare parts (SPP).

The calculation of the contribution margin for Melecs in Table 28 constitutes the CM with respect to the sales price from Melecs to Selena Elektrotransport and all accruing costs for Melecs except indirect and overhead costs:

Contribution margin Melecs	DR Step 2	DR Step 3	2ES7	SPP DR	SPP 2ES7	New pr.
MC MWW	- 4.465,02	- 1.747,59	- 1.747,59	- 52.500,00	- 31.500,00	- 1.912,50
SP MC AT	4.465,02	1.747,59	1.747,59	52.500,00	31.500,00	1.912,50
Sales commission	669,75	349,52	349,52	13.125,00	7.875,00	382,50
Licence fee	500,00	500,00	500,00	50.000,00	30.000,00	500,00
CMI	**1.169,75**	**849,52**	**849,52**	**63.125,00**	**37.875,00**	**882,50**
CM on SP UL	12,7%	9,8%	9,7%	12,6%	12,6%	10,4%
SP Melecs to SET	**5.634,77**	**2.597,11**	**2.597,11**	**115.625,00**	**69.375,00**	**2.795,00**
CM on SP SET	**20,8%**	**32,7%**	**32,7%**	**54,6%**	**54,6%**	**31,6%**

<p align="center">Table 28: Contribution margin Melecs[36]</p>

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[35] Fictitious figures.

The contribution margin in Table 28 shows the amount that is available per project and piece to cover the indirect and overhead costs.

The calculation of the contribution margin for Selena in Table 29 constitutes the CM with respect to the final sales price from Selena to Ural Locomotives and all accruing costs for Selena:

Contribution margin SET	DR Step 2	DR Step 3	2ES7	SPP DR	SPP 2ES7	New pr.
SP to UL	9.200,00	8.700,00	8.800,00	500.000,00	300.000,00	8.500,00
MC AT	- 5.134,77	- 2.097,11	- 2.097,11	- 65.625,00	- 39.375,00	- 2.295,00
MC RUS	- 2.749,14	- 5.083,07	- 5.083,07	- 297.500,00	- 178.500,00	- 4.462,50
Licence fee	- 500,00	- 500,00	- 500,00	- 50.000,00	- 30.000,00	- 500,00
PC	- 112,50	- 112,50	- 112,50	-	-	- 195,00
Transport	- 223,25	- 87,38	- 87,38	- 2.625,00	- 1.575,00	- 95,63
Customs	- 256,74	- 104,86	- 104,86	- 3.281,25	- 1.968,75	- 95,63
Customs clearance fee	- 154,04	- 62,91	- 62,91	- 1.968,75	- 1.181,25	- 57,38
CM SET	**69,55**	**652,18**	**752,18**	**79.000,00**	**47.400,00**	**798,88**
	0,8%	7,5%	8,5%	15,8%	15,8%	9,4%

Table 29: Contribution margin Selena Elektrotransport[37]

3.5.6 Analysis and verification of local content

The achieved local content depends on the used basis but is usually calculated on the basis of the sales price as follows in Formula 4:

$$local\ content\ basis\ SP\ (\%) = \frac{MC\ RUS + PC + transport + customs + CCF + CM\ SET}{sales\ price} * 100$$

Formula 4: Local content basis sales price

Another option is to calculate the local content on the basis of the manufacturing costs as shown in Formula 5:

$$local\ content\ basis\ manufacturing\ costs\ (\%) = \frac{MC\ RUS + PC}{MFC} * 100$$

Formula 5: Local content basis manufacturing costs

Table 30 shows the local content on the basis of the final sales price, at which the requirements in view of the necessary localized percentage of the added value are based. Additionally also the local content on the basis of the manufacturing costs (MFC) is calculated to show a comparison between the two described options.

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[36] Fictitious figures.
[37] Fictitious figures.

Local content per project	DR Step 2	DR Step 3	2ES7	SPP DR	SPP 2ES7	new pr.
Local content on basis sales price	38,8%	70,1%	70,5%	76,9%	76,9%	67,1%
manufacturing costs PG	7.996,42	7.292,67	7.292,67	363.125,00	217.875,00	6.952,50
local content on basis MFC	35,8%	71,2%	71,2%	81,9%	81,9%	67,0%

Table 30: Confirmation of compliance local content[38]

With the actual evaluated bill of material the required local content can be fulfilled apart from Desiro RUS Step 2, where 40% of the final sales price has to be localized in minimum. There are generally two options to increase the percentage of local content:

- Potential local content
  The single components of the bill of material have been analyzed in view of their potential to source them in Russia (from 1: short-term to 3: long-term or no ability to local sourcing, see chapter 3.2: ABC analysis for the pantograph, p. 70). As the material rate in both Step 2 and 3 is still around 80% (see Table 23, p. 88), this option represents a good possibility to increase local content by localization of components. Thereto it is necessary to check in detail if articles, which were assessed to category 2[39], have however a mid-term ability to local sourcing in Russia and could therefore be transferred to category 1, what finally would cause an increase of local content in localization step 2. In this option it has to be considered that the custom expenses are decreasing when increasing the percentage of Russian parts.

- Increase of contribution margin (CM) Selena
  An increase of Selena's CM causes a higher local content, but this option can only be realized by a decrease of Melecs earnings, that means Melecs would have to reduce the sales commission and/or the license fee.

3.5.7 EBIT and present value

The calculation of the earnings before interest and taxes (EBIT) in Table 31 is based on the sales volume multiplied by the percentage contribution margin subtracted by the annual extraordinary costs and the total overheads. The final net present value (NPV) is evaluated as follows in Formula 6:

$$annual\ net\ present\ value\ NPV = \frac{annual\ EBIT}{(1 + DF)^T}$$

Formula 6: Net present value

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[38] Fictitious figures.
[39] Mid-term ability to local sourcing.

Sales volume Melecs

Projects	SP [€]	P(%)	p(%)	2015 Pc.	2015 Vol.	2016 Pc.	2016 Vol.	2017 Pc.	2017 Vol.	2018 Pc.	2018 Vol.	2019 Pc.	2019 Vol.	2020 Pc.	2020 Vol.	2021 Pc.	2021 Vol.
Desiro RUS	2.597,11	100%		46	259.199,56	92	238.933,94	100	259.710,80	100	259.710,80	100	259.710,80	0	0,00	0	0,00
2ES7	2.597,11	100%	60%	60	155.826,48	60	155.826,48	60	155.826,48	60	155.826,48	60	155.826,48	80	124.661,18	100	155.826,48
SPP Desiro RUS	115.625,00	50%		0,3	17.343,75	0,4	23.125,00	0,6	34.687,50	0,7	40.468,75	0,8	46.250,00	1	57.812,50	1	57.812,50
SPP 2ES7	69.375,00	50%		0,1	3.468,75	0,2	6.937,50	0,4	13.875,00	0,6	20.812,50	0,8	27.750,00	1	34.687,50	1	34.687,50
New projects	2.795,00	100%		0	0,00	0	0,00	0	0,00	0	0,00	0	0,00	80	223.600,00	80	223.600,00
Sales volume license					**435.838,54**		**424.822,92**		**464.099,78**		**476.818,53**		**489.537,28**		**440.761,18**		**471.926,48**

Projects	CM MELECS (%)	2015 CM total	2016 CM total	2017 CM total	2018 CM total	2019 CM total	2020 CM total	2021 CM total
Desiro RUS	32,71%	53.808,64	78.155,66	84.951,80	84.951,80	84.951,80	-	-
2ES7	32,71%	50.971,08	50.971,08	50.971,08	50.971,08	50.971,08	40.776,86	50.971,08
SPP Desiro RUS	54,59%	9.468,75	12.625,00	18.937,50	22.093,75	25.250,00	31.562,50	31.562,50
SPP 2ES7	54,59%	1.893,75	3.787,50	7.575,00	11.362,50	15.150,00	18.937,50	18.937,50
New projects	31,57%	-	-	-	-	-	70.600,00	70.600,00
CM total		116.142,22	145.539,24	162.435,38	169.379,13	176.322,88	161.876,86	172.071,08
Annual extraordinary costs	-	28.000,00	10.000,00	11.000,00	12.100,00	13.310,00	14.641,00	16.105,10
Covering Melecs license	-	**88.142,22**	**135.539,24**	**151.435,38**	**157.279,13**	**163.012,88**	**147.235,86**	**155.965,98**
Overheads total	-	99.000,00	98.374,45	100.604,87	101.327,13	132.049,40	99.279,54	101.049,33
EBIT license	-	**-10.857,78**	**37.164,78**	**50.830,51**	**55.952,00**	**30.963,48**	**47.956,32**	**54.916,65**
EBIT (%)		-2,5%	8,7%	11,0%	11,7%	6,3%	10,9%	11,6%
Present value	4% discount fact.	10.857,78	35.735,37	46.995,66	49.741,12	26.467,72	39.416,60	43.401,43

Present value 2015 230.900,11

Table 31: Present value calculation Melecs license[40]

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[40] Fictitious figures.

The upper part of Table 31 calculates the total sales volume of every project per year considering the sales price (SP), probability P(%) resp. p(%)[41]) for realization of the project and the planned sales figures in pieces (Pc.). The sales volume is multiplied by the percentage contribution margin of every single project, which generates the total contribution margin in EUR that is available for extraordinary and overhead costs considered in the lower part of the calculation table. The annual EBIT is devalued with a discount factor of 4%. That generates finally the annual present value respectively the added present value in 2015.

3.5.8 Graphical evaluation of the outcome

Graphical evaluations for the key figures of a business case calculation are a helpful and often necessary way to prepare the outcome in a clearly arranged breakdown. If a business case calculation considers miscellaneous scenarios, these can be compared easily in a graphical format and support the top management in decision making.

The following line charts in Figure 30, Figure 31 and Figure 32 show each both the annual and accumulated figures of sales volume, covering and earnings before interests and taxes (EBIT) in Euro. The axis of abscissa represents the particular year and the axis of ordinate represents the amount in thousand Euros.
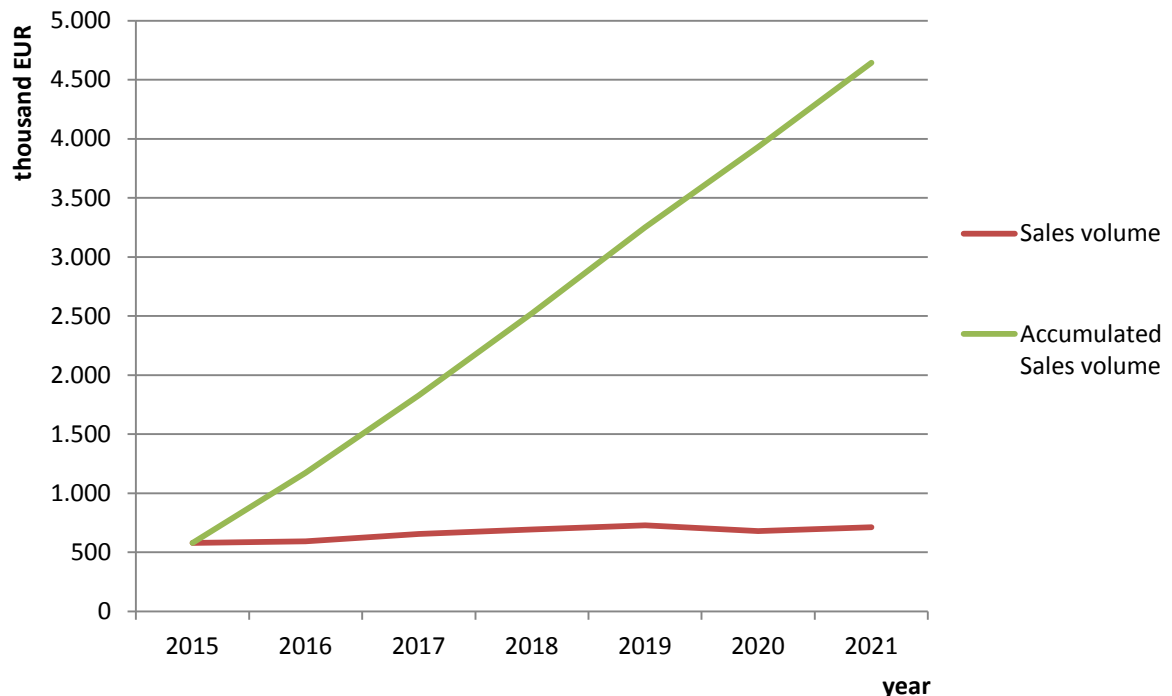
Figure 30: Sales volume graphical

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[41] For the project 2ES7 two different probabilities are required, what is represented by two different signs.

The brown line in Figure 30 represents the annual development of Melecs' sales volume in Euro, whereas the green line shows the accumulated sales volume from 2015 to 2021, where a total sales volume of approximately EUR 4.64 m. will be reached.
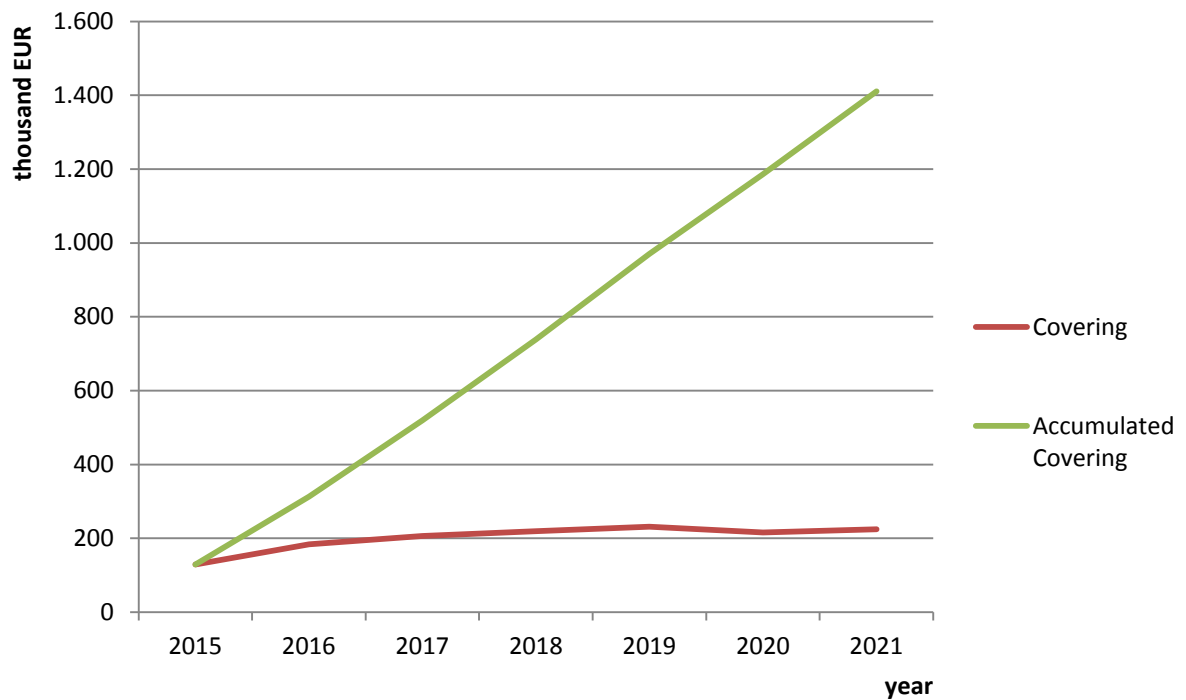
Figure 31: Covering graphical

The brown line in Figure 31 shows the attainable covering per year and the green line the accumulated covering in thousand Euros. In total, about EUR 1.41 m. are available out of the Russian license projects within the next seven years for covering fixed costs respectively overheads of Melecs.

Both the annual sales volume and annual covering show a minor decrease from 2019 to 2020 (see Figure 30 and Figure 31), which is basically based on the phase-out project Desiro RUS. The new projects starting in 2020 will not compensate this major project from the actual point of view.
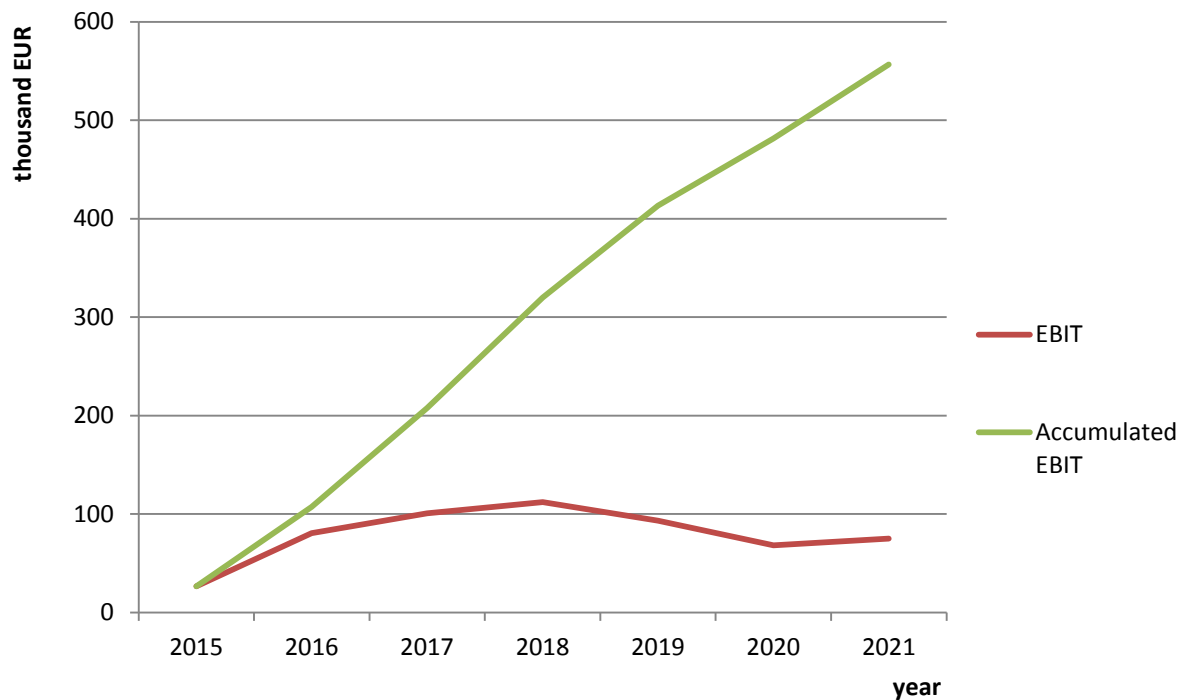
Figure 32: EBIT graphical

Figure 32 shows the expectable EBIT per year (brown line) and the accumulated EBIT until 2021 (green line), which is supposed to be about EUR 556,000 for all Russian license projects.

The distinct decrease of the EBIT in 2019 and 2020 compared to the preceding year is on the one hand based on the necessary extraordinary development costs in 2019 for the new projects (see Table 25, p. 90) starting in 2020 and on the other hand on the phase-out of project Desiro RUS in the end of 2019, which cannot be compensated by the new projects beginning in 2020.

3.5.9 Profit for Selena Elektrotransport

For estimating and optimizing an adequate possible profit for Melecs, which consists of the sales commission and license fee, it is also necessary to calculate the thereby remaining profit for the Russian partner Selena Elektrotransport. For a long-term business relationship a balanced and for both sides satisfying profit should be accomplished. The profit with the actual cost structure for Selena is calculated in Table 32:

Sales volume Selena

Projects	SP [€]	P(%)	p(%)	2015 Pc.	2015 Vol.	2016 Pc.	2016 Vol.	2017 Pc.	2017 Vol.	2018 Pc.	2018 Vol.	2019 Pc.	2019 Vol.	2020 Pc.	2020 Vol.	2021 Pc.	2021 Vol.
Desiro RUS	8.800,00	100%		46	418.600,00	92	809.600,00	100	880.000,00	100	880.000,00	100	880.000,00	0	0,00	0	0,00
2ES7	8.700,00	100%	60%	60	522.000,00	60	522.000,00	60	522.000,00	60	522.000,00	60	522.000,00	80	417.600,00	100	522.000,00
SPP Desiro RU	500.000,00	50%		0,3	75.000,00	0,4	100.000,00	0,6	150.000,00	0,7	175.000,00	0,8	200.000,00	1	250.000,00	1	250.000,00
New projects	300.000,00	50%		0,1	15.000,00	0,2	30.000,00	0,4	60.000,00	0,6	90.000,00	0,8	120.000,00	1	150.000,00	1	150.000,00
Sales volume					**1.030.600,00**		**1.461.600,00**		**1.612.000,00**		**1.667.000,00**		**1.722.000,00**		**817.600,00**		**922.000,00**

Projekt	DB SET (%)	2015 DB total	2016 DB total	2017 DB total	2018 DB total	2019 DB total	2020 DB total	2021 DB total
Desiro RUS	7,50%	3.164,62	60.690,02	65.967,42	65.967,42	65.967,42	0,00	0,00
2ES7	8,55%	44.617,82	44.617,82	44.617,82	44.617,82	44.617,82	35.694,26	44.617,82
ET Desiro RUS	15,80%	11.850,00	15.800,00	23.700,00	27.650,00	31.600,00	39.500,00	39.500,00
ET 2ES7	15,80%	2.370,00	4.740,00	9.480,00	14.220,00	18.960,00	23.700,00	23.700,00
DB Total	11,91%	62.002,45	125.847,85	143.765,24	152.455,24	161.145,24	98.894,26	107.817,82
Covering resp. profit Selena		**62.002,45**	**125.847,85**	**143.765,24**	**152.455,24**	**161.145,24**	**98.894,26**	**107.817,82**

Table 32: Profit Selena Elektrotransport[42]

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[42] Fictitious figures.

The accumulated covering for Selena is approximately EUR 852,000 with an average of 121,700 per year, which represents an acceptable value as Selena has among others no costs for research and development concerning these projects.

3.6 Document management

When the decision is made to outsource production or other parts of the added value chain usually a change out of drawings and all other necessary technical specifications and data occurs. Such a change out usually occurs in view of suppliers, which need technical specifications too. To guarantee that every business partner has the right and actual data, an effective document management system is essential.

3.6.1 Actual state of the change management process

Especially a change of technical specifications during the product life cycle is a critical point and is handled by the engineering change management.

Engineering change management

This management system describes the functions and processes that are established in a company to administrate changes in a controlled and documented way. The verbal description of the Melecs-process of change management is actually defined internal as follows:

- An amendment can only be done on the basis of a notification of change.
- That notification can come directly from a customer or intern from any department.
- A notification of a customer has to be executed appropriate to the requirements and, if desired, confirmed after completion.
- The changes have to be deposited in the production plans and material specifications in SAP (change number).
- An internal announcement has to be edited analog. In this case, the confirmation is carried out to the department that required the amendment.
- The amendment-checklist has to be filled in during the execution and has finally to be archived with the notification of change. (Wimmer & Stockbauer, 2012)

The process' target is a scheduled implementation of approved changes. The change management process emerges out of Melecs' internal process model in Figure 33 (Melecs, 2013a) and is part of the Product Lifecycle Management within the customer related processes:

Management Processes

| Strategic Planning & Controlling | Financial Planning & Controlling | System-, Process- & Improvementmanagement |

Customer Related Processes

Customer Relationship Management (CRM)

Plan > Acquisition > Bid > Sell > Customer Care

Product Lifecycle Management (PLM)

Plan & Portfolio Management > Define > Realize > Change Management > Phase Out

Supply Chain Management (SCM)

Plan > Source > Make > Deliver > Return

Support Processes

| Human Resources | Procurement & Strategic Logistics | Information Management | Marketing & Communication |

Product Lifecycle Management MWW

Plan

Project Planning > Obsolescence Planning > Document Control

Define

Product requirement definition > RAMS / LCC > Standards

Realize

FAI > Product Validiation > Launch / ASS

Changes

Configuration Management > Change Management

Control cycle

Knowledge Mangement > End of Product Life Cycle > CIP

Development

Product Development > Development Planning > Development Outcome

Figure 33: Process map model Melecs - PLM MWW

Finally, the change management process is actually defined as follows in Figure 34 (Wimmer & Stockbauer, 2012):
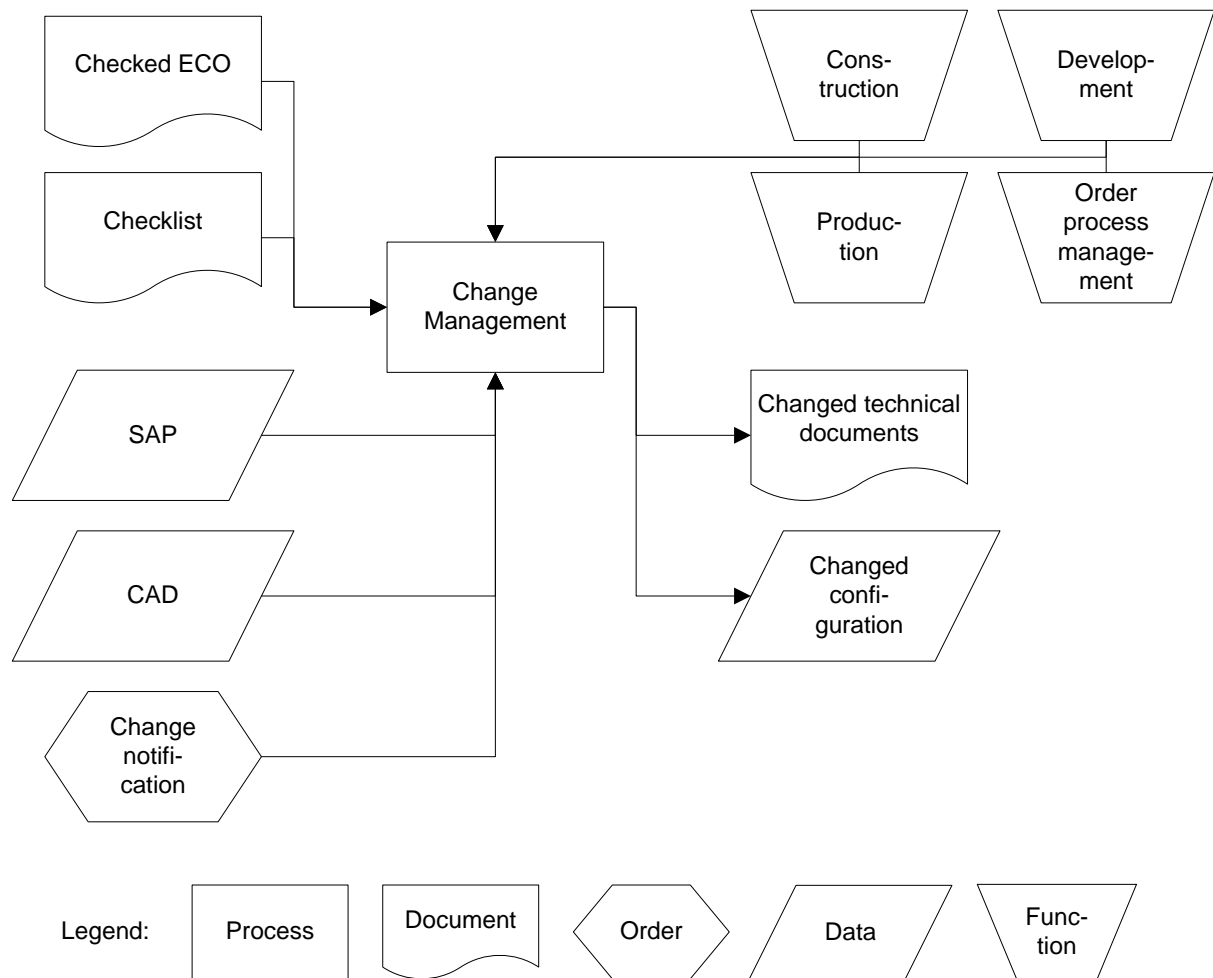

Figure 34: Change management actual process

The visualized process in Figure 34 shows the general process environment and influencing factors of the change management process in the turtle display format as it is used company internally.

Input factors of the change management process in Figure 34 are a change notification as the impulse generator, supporting documents (checked engineering change order (ECO) and checklist) and data based on SAP and CAD. The concerned departments of change management are construction, development, production and order process management. The change management process generates changed technical documents and configuration data.

The process of document document amendments itself can also be shown in a process visualization, see Figure 35. The process starts with an order to change which can be released from a customer or from an internal department. The process consists of 5 main sub-processes:

- Creation of a consecutive change number,
- Change of the drawing,
- Adaption of the bill of material,
- Data administration in SAP and
- Adaption of the spare parts list for the customers.

All these five main processes have a common parallel accessory process, which represents the go over and infill of an amendment checklist. The process is finished when the form is filled in and all the requirements from the checklist, at which the main processes have to be conducted, are fulfilled. Figure 35 shows the actual process in a flow chart:
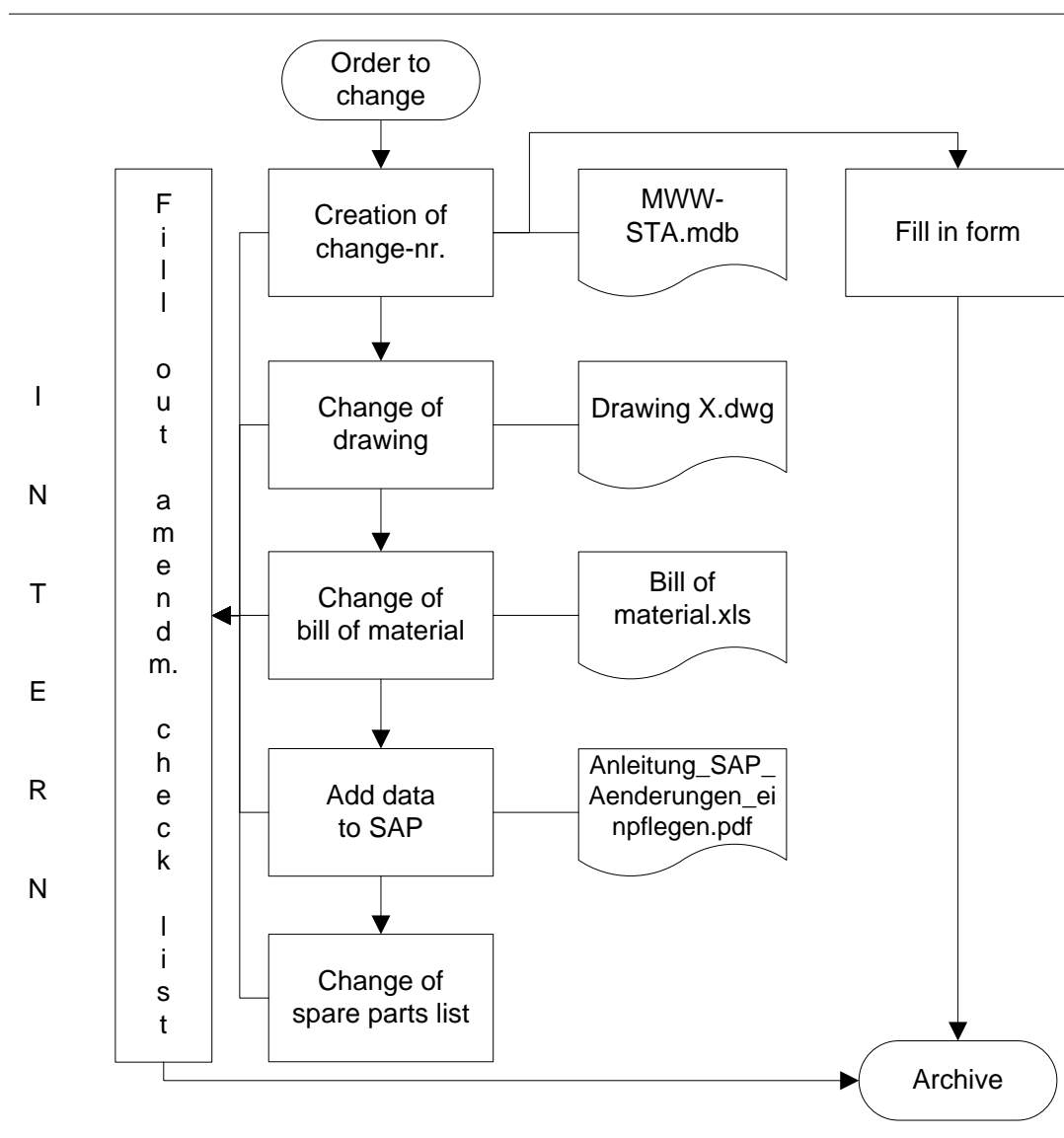

Figure 35: Amendment of documents actual state process visualization[43]

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[43] Based on observation of a document amendment process in practice.

3.6.2 Target state for cooperation with external partner

The actual existing process for the amendment of documents in 3.6: Document management, p. 100ff., has to be extended with an external part when doing a localization project. The external part can represent for example a license manufacture partner or also a supplier. This advanced process should ensure that occurring changes of technical drawings, bills of material or of any other specifications are consistently transferred to all concerned external parties.
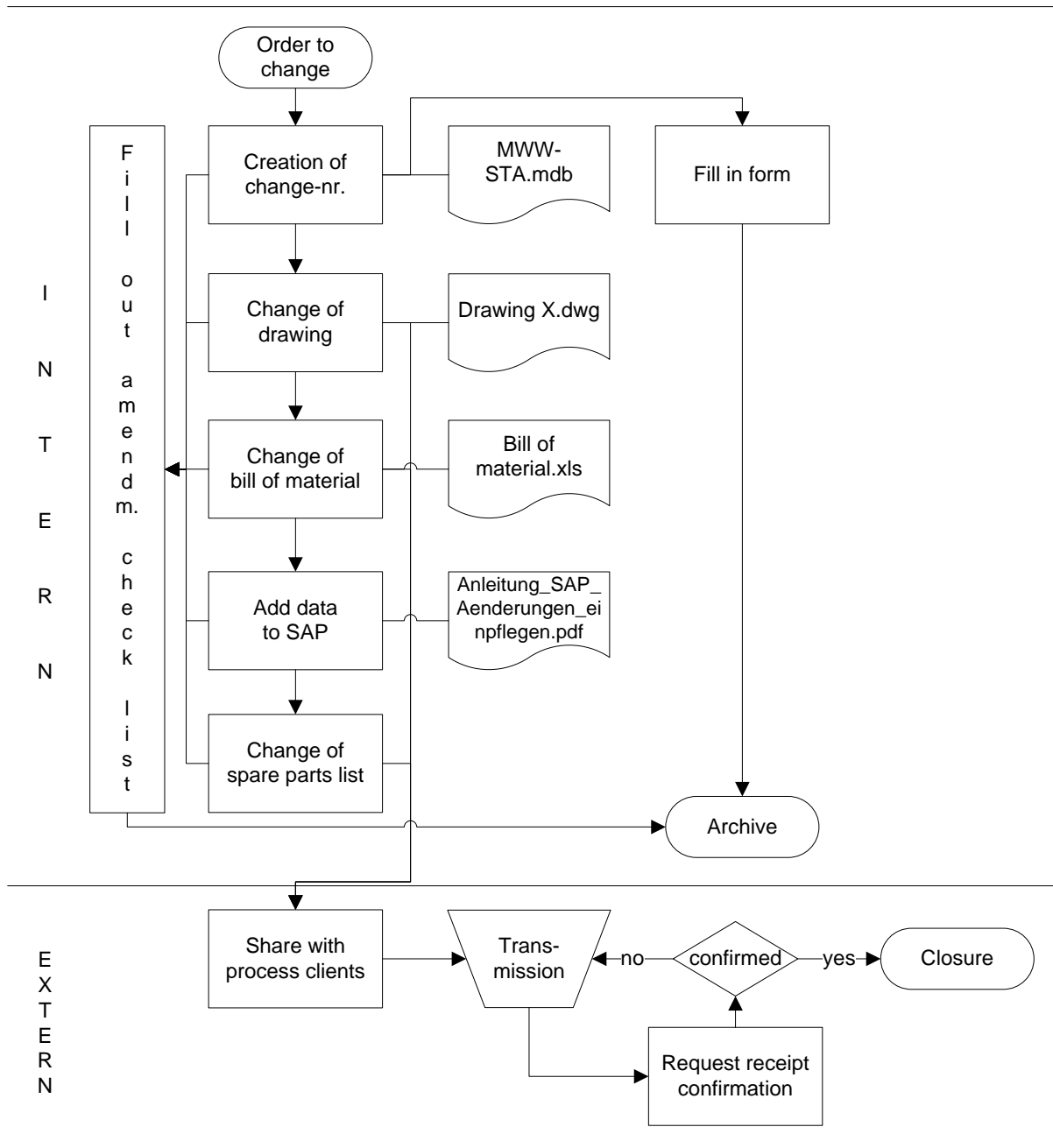

Figure 36: Amendments of documents target state process visualization

The communication between the interface of the internal departments and the clients usually is done via electronic transmission, mostly E-Mails. The use of a standard exchange data file like pdf or step is to consider when transmitting data and it has to be always taken care about the origin of the recipient. Because of the importance that every party has the right and actual documents and data, a receipt confirmation has to be requested to ensure that the transmission was successful.

D   Résumé

The workout of this thesis showed that the challenge of localizing parts of the supply chain implicates a multitude of most diverging duties and responsibilities for a company especially when localization should be reached outside of one's own economic area.

In order to get a clearly arranged overview for all involved departments with all their duties and responsibilities when doing localization, the following work breakdown structure (WBS)[44] in Figure 37 shows all subject matters that have to be executed during a localization project. Depending on both the extent respectively resulting contents for the localization project as well as the structural organization of the concerned enterprise, some work packages may be dropped out and also some responsibilities may change between the appropriate departments, but the following procedure map shows a general break down and allotment of tasks that have to be executed up to company foundation.

Usually the supply chain- (SCM) and product lifecycle management (PLM) are primarily responsible for the implementation and acquisition of information, while the top management decides about strategic determinations like the form of business model or the selection of location on the basis of the SCM's and PLM's information.

Supporting processes are usually executed by the controlling-, accounting- and finance departments and support the localization implementation basically in terms of strategic- and financial planning as well as controlling during the whole phase. A comparative calculation of all different possibilities and variants that may occur during the planning phase represents a main part of those affairs.

A work breakdown structure constitutes the framework of a project and breaks it down into small, assessable work packages. (Alby, et al., 2014) A function orientated arrangement divides the project analogically to the company's functions, while an object orientated arrangement divides the project itself into its components. (Truecare Project Performance, 2014)

The following inducted procedure model in Figure 37 is generally valid and independent of branches or products, except some responsibilities of the departments may differ due to the structure of a company. The combined respectively hybrid structured project structure plan in Figure 37 combines both a function orientated and an object orientated work breakdown structure.


[44] Also known as project structure plan (PSP).
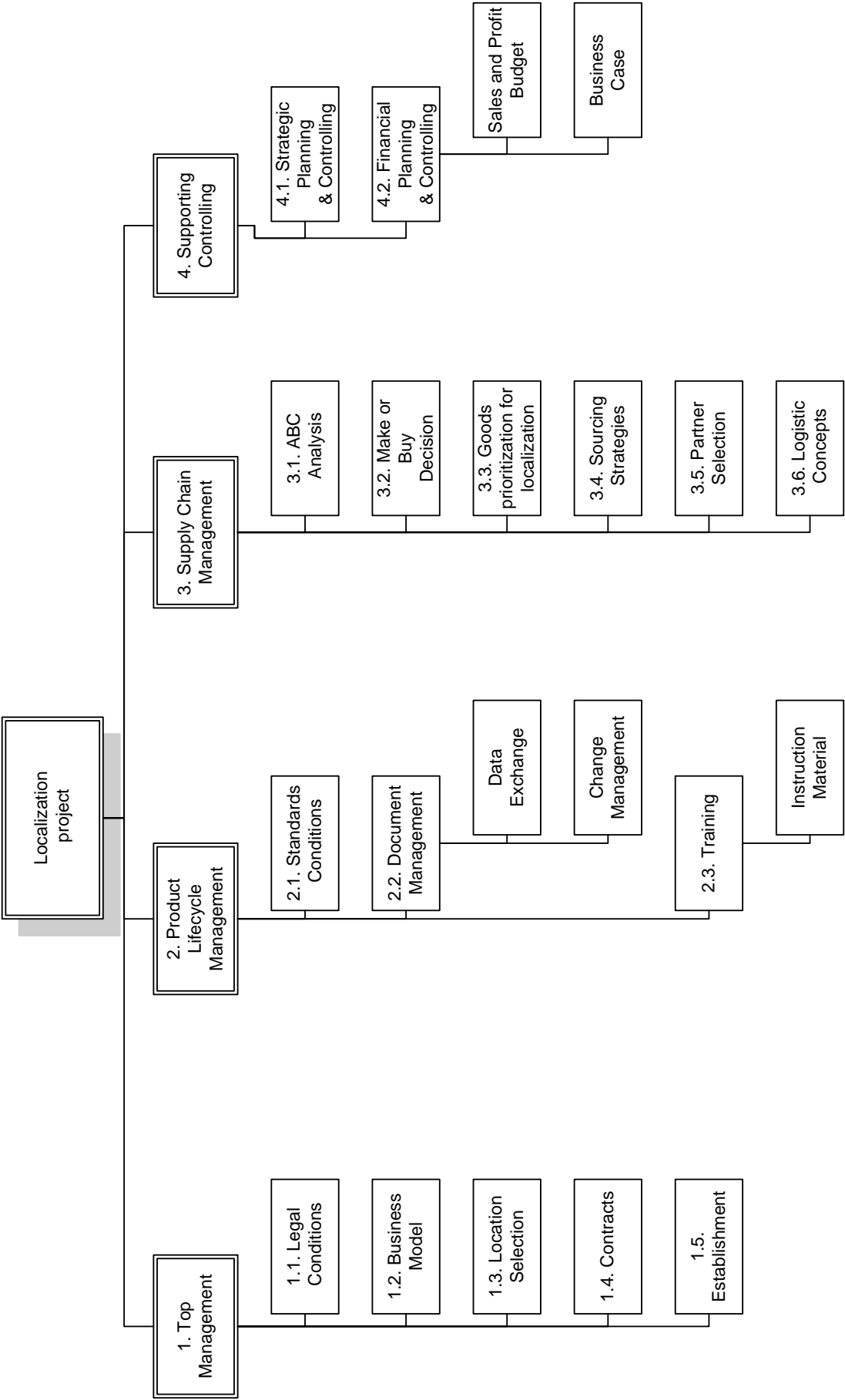
Figure 37: Hybrid project structure plan

The most important and fundamental assignments for a long-term successful achievement of localization have to be made by the **top management** according to the depending legal conditions. The decision about the applied business model, which is mainly influenced by the target market, the planned extent of localization and by the availability of possible business partners, is a decision of general principle, whereby also the selection of location has to be considered in this evaluation. Typical forms of possible business models are:

- Licensing
- Cooperation
- Outsourcing
- Mixed models with own added value
- Market entry with own entity

Especially small and medium-sized enterprises (SMEs) will choose any form of cooperation with another enterprise due to the lack of experience and resources, which are usually both financial and manpower, to set up an entity in the target country.

In interdependency with the business model also possible locations for planned activities have to be analyzed, at which the key and most influencing factors for an evaluation are:

- Availability and usability of special economic zones
- Labor costs
- Infrastructure
- Environment, e.g. business park, suppliers

The **product lifecycle management**'s responsibilities are usually regarding the implementation of the operative execution when the strategic decisions are specified. Standard conditions can already be worked out once the target country is assigned, while other duties and responsibilities like document management or training are accompanying ones.

Duties and responsibilities for the **supply chain management** department are both strategic and operative. The basis for a structured decision making concerning the selection of materials respectively material groups for local procurement is the outcome of an ABC-analysis for the concerning product. This analysis identifies the most cost-intensive materials, which is one of several criteria for the prioritization of goods for localization. Another criterion is the estimated potential and ability for local sourcing in the target country. To cull the products that should be localized prioritized a combination of these two criteria is advisable for the final ranking and decision-making.

In this matter also make or buy decisions have to be made respectively reassessed, as the decision criteria may change in a localization project compared to usual business execution. In addition the outcome of the decision instruments will change and therefore will have to be revaluated. In combination with localization 'Buy' means an acquisition of material in the target country and 'Make' assumes both a provision of the concerning material by the proprietary company as well as in-house production. Another important aspect in this matter is that risks due to fluctuation of currencies are decreasing the more local content is achieved.

An evaluation of logistic concepts that are considered for the execution of the selected business model should be made in adhere coordination with the **supporting controlling** as there may occur complex legal regulations regarding customs, importation regulations, taxes and accounting. The controlling department in general plays a role in strategic- and financial planning and controlling as well as in supporting all involved departments in commercial matters.

Depending on the pressure of time a stepwise localization is advisable respectively may be necessary. As a first step it is usually easy to transfer the final assembly to the target country, whereat the product will be de delivered semi-knocked-down (SKD). Once the final assembling process is solid, the extent can be increased up to total assembling in connection to a completely knocked down (CKD) dispatch of goods and materials.

Parallel to the dislocation of assembling processes 'simple parts' should be sourced local preferred at the beginning of a localization project. Depending on the disposability the extent of local sourced parts can be increased stepwise by know how transfer. A know how transfer must cause a non-disclosure agreement (NDA) to protect the company of an illegal use of know how.

For a significant evaluation of the different feasible possibilities for executing a localization project, a detailed business case calculation has to be compiled. All possible aspects and impacts have to be considered respectively evaluated numerically. Finally, the outcome of the business case serves the main decision criterion for the top management to decide if the localization project will be executed at all, how it should be implemented and what benefits will emerge for the company.

E   Annex

1   Total bill of material

Res.	Cum. qty.	Value [€]	Qty.	Unit	Unit	Pot. l. c.	Est. cost red.	Value loc. [€]	Value [%]	Cum. value	ABC	Category of material
R1	0,51%	1.900,00	1	ST	pc.	1	20,00%	1.520,00	22,46%	22,46%	A	welding and metallic parts
R2	1,01%	950,00	1	ST	pc.	2	10,00%	855,00	12,63%	35,09%	A	welding and metallic parts
R3	1,52%	910,00	1	ST	pc.	2	20,00%	728,00	10,76%	45,85%	A	pneumatic parts
R4	2,02%	703,00	1	ST	pc.	3	0,00%	703,00	10,39%	56,24%	A	separate BoM
R5	2,53%	520,00	1	ST	pc.	1	20,00%	416,00	6,15%	62,39%	A	welding and metallic parts
R6	3,03%	380,00	1	ST	pc.	1	20,00%	304,00	4,49%	66,88%	A	welding and metallic parts
R7	3,54%	253,02	2	ST	pc.	3	0,00%	253,02	3,74%	70,62%	A	pneumatic parts
R8	4,04%	220,87	1	ST	pc.	3	0,00%	220,87	3,26%	73,88%	A	pneumatic parts
R9	4,55%	269,00	1	ST	pc.	1	20,00%	215,20	3,18%	77,06%	A	welding and metallic parts
R10	5,05%	198,32	1	ST	pc.	2	10,00%	178,49	2,64%	79,70%	A	pneumatic parts
R11	5,56%	157,32	4	ST	pc.	2	10,00%	141,59	2,09%	81,79%	B	standard parts
R12	6,06%	87,42	3	ST	pc.	3	0,00%	87,42	1,29%	83,08%	B	pneumatic parts
R13	6,57%	95,40	2	ST	pc.	2	10,00%	85,86	1,27%	84,35%	B	welding and metallic parts
R14	7,07%	81,92	4	ST	pc.	3	0,00%	81,92	1,21%	85,56%	B	pneumatic parts
R15	7,58%	87,00	1	ST	pc.	2	10,00%	78,30	1,16%	86,72%	B	spring, damper
R16	8,08%	63,50	1	ST	pc.	3	0,00%	63,50	0,94%	87,66%	B	welding and metallic parts
R17	8,59%	63,50	1	ST	pc.	3	0,00%	63,50	0,94%	88,60%	B	welding and metallic parts
R18	9,09%	58,84	4	ST	pc.	3	0,00%	58,84	0,87%	89,47%	B	standard parts
R19	9,60%	67,31	2	ST	pc.	2	30,00%	47,12	0,70%	90,16%	B	welding and metallic parts
R20	10,10%	49,42	2	ST	pc.	2	10,00%	44,48	0,66%	90,82%	B	standard parts
R21	10,61%	33,65	1	ST	pc.	2	30,00%	23,56	0,35%	91,17%	B	welding and metallic parts
R22	11,11%	24,88	4	ST	pc.	1	10,00%	22,39	0,33%	91,50%	B	electrical parts
R23	11,62%	24,11	1	ST	pc.	2	10,00%	21,70	0,32%	91,82%	B	rubber parts
R24	12,12%	21,20	1	ST	pc.	1	10,00%	19,08	0,28%	92,10%	B	standard parts
R25	12,63%	20,57	8	ST	pc.	1	10,00%	18,51	0,27%	92,37%	B	electrical parts
R26	13,13%	20,57	8	ST	pc.	1	10,00%	18,51	0,27%	92,65%	B	electrical parts
R27	13,64%	18,56	1	ST	pc.	1	10,00%	16,70	0,25%	92,89%	B	standard parts
R28	14,14%	16,04	1	ST	pc.	3	0,00%	16,04	0,24%	93,13%	B	pneumatic parts
R29	14,65%	16,22	2	ST	pc.	1	10,00%	14,60	0,22%	93,35%	B	welding and metallic parts
R30	15,15%	14,53	0,200	KG	kg	2	0,00%	14,53	0,21%	93,56%	B	
R31	15,66%	15,16	2	ST	pc.	2	10,00%	13,64	0,20%	93,76%	B	standard parts
R32	16,16%	12,41	1	ST	pc.	3	0,00%	12,41	0,18%	93,95%	B	standard parts
R33	16,67%	13,16	1	ST	pc.	1	10,00%	11,84	0,18%	94,12%	B	welding and metallic parts
R34	17,17%	11,46	2	ST	pc.	2	10,00%	10,31	0,15%	94,27%	B	spring, damper
R35	17,68%	12,52	2	ST	pc.	1	10,00%	11,27	0,17%	94,44%	B	standard parts
R36	18,18%	10,99	1,187	M	m	3	0,00%	10,99	0,16%	94,60%	B	pneumatic parts
R37	18,69%	12,13	1	ST	pc.	2	10,00%	10,92	0,16%	94,76%	B	shafts
R38	19,19%	12,06	1	ST	pc.	1	10,00%	10,85	0,16%	94,93%	B	welding and metallic parts

R39	19,70%	11,34	4	ST	pc.	1	10,00%	10,21	0,15%	95,08%	C	standard parts
R40	20,20%	10,92	2	ST	pc.	2	10,00%	9,83	0,15%	95,22%	C	standard parts
R41	20,71%	9,51	3	ST	pc.	3	0,00%	9,51	0,14%	95,36%	C	standard parts
R42	21,21%	10,39	1	ST	pc.	1	10,00%	9,35	0,14%	95,50%	C	welding and metallic parts
R43	21,72%	10,30	1	ST	pc.	2	10,00%	9,27	0,14%	95,64%	C	shafts
R44	22,22%	10,09	1	ST	pc.	1	10,00%	9,08	0,13%	95,77%	C	bolts, screws, nuts, bushes
R45	22,73%	10,94	2	ST	pc.	2	20,00%	8,75	0,13%	95,90%	C	welding and metallic parts
R46	23,23%	8,85	1	ST	pc.	1	10,00%	7,97	0,12%	96,02%	C	electrical parts
R47	23,74%	8,58	1	ST	pc.	2	10,00%	7,72	0,11%	96,13%	C	bolts, screws, nuts, bushes
R48	24,24%	7,71	2,050	M	m	3	0,00%	7,71	0,11%	96,25%	C	
R49	24,75%	8,56	1	ST	pc.	2	10,00%	7,70	0,11%	96,36%	C	bolts, screws, nuts, bushes
R50	25,25%	9,30	2	ST	pc.	2	20,00%	7,44	0,11%	96,47%	C	welding and metallic parts
R51	25,76%	7,02	3	ST	pc.	3	0,00%	7,02	0,10%	96,57%	C	
R52	26,26%	7,45	1	ST	pc.	2	10,00%	6,71	0,10%	96,67%	C	welding and metallic parts
R53	26,77%	6,68	4	ST	pc.	3	0,00%	6,68	0,10%	96,77%	C	
R54	27,27%	6,53	2	ST	pc.	3	0,00%	6,53	0,10%	96,87%	C	
R55	27,78%	6,47	1,721	M	m	3	0,00%	6,47	0,10%	96,96%	C	
R56	28,28%	7,55	5	ST	pc.	1	20,00%	6,04	0,09%	97,05%	C	welding and metallic parts
R57	28,79%	5,61	1	ST	pc.	3	0,00%	5,61	0,08%	97,14%	C	
R58	29,29%	6,18	1	ST	pc.	2	10,00%	5,56	0,08%	97,22%	C	bolts, screws, nuts, bushes
R59	29,80%	6,17	1	ST	pc.	2	10,00%	5,55	0,08%	97,30%	C	bolts, screws, nuts, bushes
R60	30,30%	6,02	2	ST	pc.	2	10,00%	5,42	0,08%	97,38%	C	bolts, screws, nuts, bushes
R61	30,81%	5,40	3	ST	pc.	3	0,00%	5,40	0,08%	97,46%	C	
R62	31,31%	6,70	7	ST	pc.	1	20,00%	5,36	0,08%	97,54%	C	welding and metallic parts
R63	31,82%	5,26	1,400	M	m	3	0,00%	5,26	0,08%	97,62%	C	
R64	32,32%	4,94	2	ST	pc.	3	0,00%	4,94	0,07%	97,69%	C	
R65	32,83%	4,78	1,270	M	m	3	0,00%	4,78	0,07%	97,76%	C	
R66	33,33%	4,47	3	ST	pc.	3	0,00%	4,47	0,07%	97,83%	C	
R67	33,84%	4,44	4	ST	pc.	1	0,00%	4,44	0,07%	97,89%	C	bolts, screws, nuts, bushes
R68	34,34%	4,44	4	ST	pc.	1	0,00%	4,44	0,07%	97,96%	C	bolts, screws, nuts, bushes
R69	34,85%	4,35	3	ST	pc.	3	0,00%	4,35	0,06%	98,02%	C	
R70	35,35%	4,78	5	ST	pc.	1	10,00%	4,30	0,06%	98,09%	C	welding and metallic parts
R71	35,86%	4,15	1	ST	pc.	3	0,00%	4,15	0,06%	98,15%	C	
R72	36,36%	4,53	3	ST	pc.	1	10,00%	4,08	0,06%	98,21%	C	welding and metallic parts
R73	36,87%	3,90	5	ST	pc.	3	0,00%	3,90	0,06%	98,26%	C	
R74	37,37%	4,11	1	ST	pc.	1	10,00%	3,70	0,05%	98,32%	C	welding and metallic parts
R75	37,88%	4,07	1	ST	pc.	1	10,00%	3,66	0,05%	98,37%	C	welding and metallic parts
R76	38,38%	3,92	2	ST	pc.	2	10,00%	3,53	0,05%	98,43%	C	rubber parts
R77	38,89%	3,28	8	ST	pc.	3	0,00%	3,28	0,05%	98,47%	C	
R78	39,39%	3,28	8	ST	pc.	3	0,00%	3,28	0,05%	98,52%	C	
R79	39,90%	3,12	4	ST	pc.	3	0,00%	3,12	0,05%	98,57%	C	
R80	40,40%	2,97	1	ST	pc.	3	0,00%	2,97	0,04%	98,61%	C	
R81	40,91%	3,28	2	ST	pc.	2	10,00%	2,95	0,04%	98,66%	C	rubber parts
R82	41,41%	2,72	2	ST	pc.	3	0,00%	2,72	0,04%	98,70%	C	
R83	41,92%	2,68	4	ST	pc.	3	0,00%	2,68	0,04%	98,74%	C	
R84	42,42%	2,60	1	ST	pc.	3	0,00%	2,60	0,04%	98,77%	C	
R85	42,93%	3,14	2	ST	pc.	1	20,00%	2,51	0,04%	98,81%	C	welding and metallic parts

R86	43,43%	2,44	4	ST	pc.	3	0,00%	2,44	0,04%	98,85%	C	
R87	43,94%	2,44	4	ST	pc.	3	0,00%	2,44	0,04%	98,88%	C	
R88	44,44%	3,02	2	ST	pc.	1	20,00%	2,42	0,04%	98,92%	C	welding and metallic parts
R89	44,95%	2,34	1	ST	pc.	3	0,00%	2,34	0,03%	98,95%	C	
R90	45,45%	2,18	0,580	M	m	3	0,00%	2,18	0,03%	98,99%	C	
R91	45,96%	2,14	3	ST	pc.	1	0,00%	2,14	0,03%	99,02%	C	bolts, screws, nuts, bushes
R92	46,46%	2,10	2	ST	pc.	1	0,00%	2,10	0,03%	99,05%	C	bolts, screws, nuts, bushes
R93	46,97%	1,96	4	ST	pc.	3	0,00%	1,96	0,03%	99,08%	C	
R94	47,47%	1,95	1	ST	pc.	3	0,00%	1,95	0,03%	99,11%	C	
R95	47,98%	1,95	3	ST	pc.	1	0,00%	1,95	0,03%	99,14%	C	bolts, screws, nuts, bushes
R96	48,48%	1,93	1	ST	pc.	3	0,00%	1,93	0,03%	99,16%	C	
R97	48,99%	1,80	1	ST	pc.	3	0,00%	1,80	0,03%	99,19%	C	
R98	49,49%	1,75	0,189	M	m	3	0,00%	1,75	0,03%	99,22%	C	
R99	50,00%	1,73	2	ST	pc.	3	0,00%	1,73	0,03%	99,24%	C	
R100	50,51%	1,86	2	ST	pc.	1	10,00%	1,67	0,02%	99,27%	C	welding and metallic parts
R101	51,01%	1,67	0,180	M	m	3	0,00%	1,67	0,02%	99,29%	C	
R102	51,52%	1,64	4	ST	pc.	3	0,00%	1,64	0,02%	99,32%	C	
R103	52,02%	1,63	1	ST	pc.	3	0,00%	1,63	0,02%	99,34%	C	
R104	52,53%	1,57	1	ST	pc.	3	0,00%	1,57	0,02%	99,36%	C	
R105	53,03%	1,68	1	ST	pc.	1	10,00%	1,51	0,02%	99,38%	C	welding and metallic parts
R106	53,54%	1,49	1	ST	pc.	3	0,00%	1,49	0,02%	99,41%	C	
R107	54,04%	1,47	0,390	M	m	3	0,00%	1,47	0,02%	99,43%	C	
R108	54,55%	1,45	1	ST	pc.	3	0,00%	1,45	0,02%	99,45%	C	
R109	55,05%	1,38	2	ST	pc.	3	0,00%	1,38	0,02%	99,47%	C	
R110	55,56%	1,34	1	ST	pc.	3	0,00%	1,34	0,02%	99,49%	C	
R111	56,06%	1,30	2	ST	pc.	3	0,00%	1,30	0,02%	99,51%	C	
R112	56,57%	1,22	2	ST	pc.	3	0,00%	1,22	0,02%	99,53%	C	
R113	57,07%	1,04	5	ST	pc.	3	0,00%	1,04	0,02%	99,54%	C	
R114	57,58%	1,03	1	ST	pc.	3	0,00%	1,03	0,02%	99,56%	C	
R115	58,08%	0,95	5	ST	pc.	3	0,00%	0,95	0,01%	99,57%	C	
R116	58,59%	0,93	0,100	M	m	3	0,00%	0,93	0,01%	99,59%	C	
R117	59,09%	0,91	1	ST	pc.	3	0,00%	0,91	0,01%	99,60%	C	
R118	59,60%	0,91	1	ST	pc.	3	0,00%	0,91	0,01%	99,61%	C	
R119	60,10%	0,91	1	ST	pc.	3	0,00%	0,91	0,01%	99,63%	C	
R120	60,61%	0,91	1	ST	pc.	3	0,00%	0,91	0,01%	99,64%	C	
R121	61,11%	0,86	1	ST	pc.	3	0,00%	0,86	0,01%	99,65%	C	
R122	61,62%	0,83	0,220	M	m	3	0,00%	0,83	0,01%	99,66%	C	
R123	62,12%	0,82	2	ST	pc.	3	0,00%	0,82	0,01%	99,68%	C	
R124	62,63%	0,82	2	ST	pc.	3	0,00%	0,82	0,01%	99,69%	C	
R125	63,13%	0,80	2	ST	pc.	3	0,00%	0,80	0,01%	99,70%	C	
R126	63,64%	0,78	1	ST	pc.	3	0,00%	0,78	0,01%	99,71%	C	
R127	64,14%	0,76	4	ST	pc.	3	0,00%	0,76	0,01%	99,72%	C	
R128	64,65%	0,76	4	ST	pc.	3	0,00%	0,76	0,01%	99,73%	C	
R129	65,15%	0,76	4	ST	pc.	3	0,00%	0,76	0,01%	99,75%	C	
R130	65,66%	0,69	5	ST	pc.	3	0,00%	0,69	0,01%	99,76%	C	
R131	66,16%	0,64	4	ST	pc.	3	0,00%	0,64	0,01%	99,77%	C	
R132	66,67%	0,64	4	ST	pc.	3	0,00%	0,64	0,01%	99,78%	C	
R133	67,17%	0,60	2	ST	pc.	3	0,00%	0,60	0,01%	99,78%	C	
R134	67,68%	0,59	4	ST	pc.	3	0,00%	0,59	0,01%	99,79%	C	
R135	68,18%	0,59	4	ST	pc.	3	0,00%	0,59	0,01%	99,80%	C	
R136	68,69%	0,59	4	ST	pc.	3	0,00%	0,59	0,01%	99,81%	C	
R137	69,19%	0,57	1	ST	pc.	3	0,00%	0,57	0,01%	99,82%	C	
R138	69,70%	0,55	4	ST	pc.	3	0,00%	0,55	0,01%	99,83%	C	

R139	70,20%	0,51	1	ST	pc.	3	0,00%	0,51	0,01%	99,83%	C	
R140	70,71%	0,48	4	ST	pc.	3	0,00%	0,48	0,01%	99,84%	C	
R141	71,21%	0,45	3	ST	pc.	3	0,00%	0,45	0,01%	99,85%	C	
R142	71,72%	0,44	4	ST	pc.	3	0,00%	0,44	0,01%	99,85%	C	
R143	72,22%	0,42	2	ST	pc.	3	0,00%	0,42	0,01%	99,86%	C	
R144	72,73%	0,41	1	ST	pc.	3	0,00%	0,41	0,01%	99,87%	C	
R145	73,23%	0,41	1	ST	pc.	3	0,00%	0,41	0,01%	99,87%	C	
R146	73,74%	0,40	4	ST	pc.	3	0,00%	0,40	0,01%	99,88%	C	
R147	74,24%	0,40	4	ST	pc.	3	0,00%	0,40	0,01%	99,88%	C	
R148	74,75%	0,37	2	ST	pc.	3	0,00%	0,37	0,01%	99,89%	C	
R149	75,25%	0,36	4	ST	pc.	3	0,00%	0,36	0,01%	99,90%	C	
R150	75,76%	0,36	4	ST	pc.	3	0,00%	0,36	0,01%	99,90%	C	
R151	76,26%	0,35	4	ST	pc.	3	0,00%	0,35	0,01%	99,91%	C	
R152	76,77%	0,35	4	ST	pc.	3	0,00%	0,35	0,01%	99,91%	C	
R153	77,27%	0,30	2	ST	pc.	3	0,00%	0,30	0,00%	99,92%	C	
R154	77,78%	0,30	2	ST	pc.	3	0,00%	0,30	0,00%	99,92%	C	
R155	78,28%	0,30	2	ST	pc.	3	0,00%	0,30	0,00%	99,92%	C	
R156	78,79%	0,30	2	ST	pc.	3	0,00%	0,30	0,00%	99,93%	C	
R157	79,29%	0,28	2	ST	pc.	3	0,00%	0,28	0,00%	99,93%	C	
R158	79,80%	0,26	2	ST	pc.	3	0,00%	0,26	0,00%	99,94%	C	
R159	80,30%	0,24	1	ST	pc.	3	0,00%	0,24	0,00%	99,94%	C	
R160	80,81%	0,24	4	ST	pc.	3	0,00%	0,24	0,00%	99,94%	C	
R161	81,31%	0,24	4	ST	pc.	3	0,00%	0,24	0,00%	99,95%	C	
R162	81,82%	0,24	2	ST	pc.	3	0,00%	0,24	0,00%	99,95%	C	
R163	82,32%	0,24	4	ST	pc.	3	0,00%	0,24	0,00%	99,95%	C	
R164	82,83%	0,21	1	ST	pc.	3	0,00%	0,21	0,00%	99,96%	C	
R165	83,33%	0,20	2	ST	pc.	3	0,00%	0,20	0,00%	99,96%	C	
R166	83,84%	0,20	2	ST	pc.	3	0,00%	0,20	0,00%	99,96%	C	
R167	84,34%	0,20	2	ST	pc.	3	0,00%	0,20	0,00%	99,97%	C	
R168	84,85%	0,18	2	ST	pc.	3	0,00%	0,18	0,00%	99,97%	C	
R169	85,35%	0,16	2	ST	pc.	3	0,00%	0,16	0,00%	99,97%	C	
R170	85,86%	0,15	3	ST	pc.	3	0,00%	0,15	0,00%	99,97%	C	
R171	86,36%	0,14	2	ST	pc.	3	0,00%	0,14	0,00%	99,98%	C	
R172	86,87%	0,13	1	ST	pc.	3	0,00%	0,13	0,00%	99,98%	C	
R173	87,37%	0,12	2	ST	pc.	3	0,00%	0,12	0,00%	99,98%	C	
R174	87,88%	0,12	2	ST	pc.	3	0,00%	0,12	0,00%	99,98%	C	
R175	88,38%	0,10	4	ST	pc.	3	0,00%	0,10	0,00%	99,98%	C	
R176	88,89%	0,10	1	ST	pc.	3	0,00%	0,10	0,00%	99,98%	C	
R177	89,39%	0,10	1	ST	pc.	3	0,00%	0,10	0,00%	99,99%	C	
R178	89,90%	0,10	2	ST	pc.	3	0,00%	0,10	0,00%	99,99%	C	
R179	90,40%	0,09	11	ST	pc.	3	0,00%	0,09	0,00%	99,99%	C	
R180	90,91%	0,08	1	ST	pc.	3	0,00%	0,08	0,00%	99,99%	C	
R181	91,41%	0,08	4	ST	pc.	3	0,00%	0,08	0,00%	99,99%	C	
R182	91,92%	0,08	6	ST	pc.	3	0,00%	0,08	0,00%	99,99%	C	
R183	92,42%	0,07	4	ST	pc.	3	0,00%	0,07	0,00%	99,99%	C	
R184	92,93%	0,07	4	ST	pc.	3	0,00%	0,07	0,00%	99,99%	C	
R185	93,43%	0,07	4	ST	pc.	3	0,00%	0,07	0,00%	100,00%	C	
R186	93,94%	0,05	4	ST	pc.	3	0,00%	0,05	0,00%	100,00%	C	
R187	94,44%	0,05	4	ST	pc.	3	0,00%	0,05	0,00%	100,00%	C	
R188	94,95%	0,04	2	ST	pc.	3	0,00%	0,04	0,00%	100,00%	C	
R189	95,45%	0,04	1	ST	pc.	3	0,00%	0,04	0,00%	100,00%	C	
R190	95,96%	0,03	2	ST	pc.	3	0,00%	0,03	0,00%	100,00%	C	

R191	96,46%	0,03	1	ST	pc.	3	0,00%	0,03	0,00%	100,00%	C	
R192	96,97%	0,03	3	ST	pc.	3	0,00%	0,03	0,00%	100,00%	C	
R193	97,47%	0,02	1	ST	pc.	3	0,00%	0,02	0,00%	100,00%	C	
R194	97,98%	0,02	2	ST	pc.	3	0,00%	0,02	0,00%	100,00%	C	
R195	98,48%	0,02	2	ST	pc.	3	0,00%	0,02	0,00%	100,00%	C	
R196	98,99%	0,00	0,000	M	m	3	0,00%	-	0,00%	100,00%	C	
R197	99,49%	0,00	0,000	M	m	3	0,00%	-	0,00%	100,00%	C	
R198	100,00%	0,00	0,000	M	m	3	0,00%	-	0,00%	100,00%	C	
								6.767,41				

Table 33: Total BoM

All the undefined parts in view of the material category are standard parts.

2 Expenditure of time

Date	From	To	Time	Activity
22.01.2014	16:00	17:00	1,00	Introduction meeting Co. Melecs
24.01.2014	15:00	17:00	2,00	Introduction Mr. Kube, Holding
29.01.2014	09:00	17:00	7,00	Search
03.02.2014	09:00	15:30	6,00	Manufacturing Inspection, SWL
03.02.2014	15:30	16:00	0,50	WK Linz
04.02.2014	10:00	11:00	1,00	Telephone conference, WK Wien
05.02.2014	09:00	16:00	6,00	Literature search
06.02.2014	10:00	11:00	2,00	Exposé
11.02.2014	09:00	14:30	5,00	Concept compilation Step 1, SWL
11.02.2014	18:00	21:00	3,00	Concept compilation Step 1
12.02.2014	09:30	17:00	7,00	Presentation preparation Kick-off
13.02.2014	09:00	15:30	6,00	RU-Kick-off, Coordination meeting
14.02.2014	09:00	14:00	5,00	Meeting Ms. Fischer, work place introduction
15.02.2014	15:00	17:00	2,00	Exposé
17.02.2014	10:00	18:00	7,00	Cost calculation logistic concepts
18.02.2014	09:00	14:00	5,00	Cost calculation logistic concepts
18.02.2014	15:00	16:00	1,00	Coordination Ms. Nemeth
19.02.2014	09:00	18:30	8,50	Preparation WKO-appointment, meeting Mr. Ortner
20.02.2014	10:00	11:00	1,00	WKO-appointment, Ms. Egger, Mr. Ortner

20.02.2014	12:00	15:00	3,00	Custom tariff., accountment
21.02.2014	09:30	17:00	7,00	Concept preparation, Linz
22.02.2014	13:00	16:00	3,00	Concept description for UL
24.02.2014	12:30	13:00	0,50	Meeting Linz, Mr. Kube, Mr. Ortner
24.02.2014	16:00	19:00	3,00	Concept description
25.02.2014	10:00	18:30	8,00	Info writing WKO-Infos
26.02.2014	09:00	17:00	7,00	Handling WKO-Infos
28.02.2014	09:30	17:00	7,00	Handling WKO-Infos, search
01.03.2014	13:00	18:00	5,00	Literature search
03.03.2014	09:00	19:00	9,00	Preparation variant WKO
04.03.2014	10:00	18:00	7,50	Concept creation
05.03.2014	09:00	17:30	8,00	Concept creation
10.03.2014	13:00	20:00	7,00	Introduction business case
11.03.2014	08:30	12:00	3,50	Literature search
11.03.2014	13:00	18:00	5,00	Service contract Melecs-Selena
12.03.2014	09:00	17:00	7,50	Sales planning
13.03.2014	13:00	18:00	5,00	Argumentation line for UL
14.03.2014	10:00	15:00	5,00	Consultation Linz
17.03.2014	13:00	18:00	5,00	Literature search
18.03.2014	11:00	12:00	1,00	TelCon, Kube
18.03.2014	13:00	19:00	6,00	Literature search
20.03.2014	12:00	18:00	6,00	Business case, search
21.03.2014	10:00	12:00	2,00	Discussion bus.case., Ms. Fischer
21.03.2014	13:00	18:00	5,00	Business case
23.03.2014	13:00	18:00	5,00	Search
24.03.2014	10:00	19:00	8,00	Presentation for UL, Bus.case
25.03.2014	09:30	18:00	8,00	Search, business case
26.03.2014	09:00	18:00	8,00	Bus. case, Info Selena
27.03.2014	09:00	11:00	2,00	Discussion of potentials in RF
27.03.2014	11:00	13:00	2,00	Preparation presentation for meeting
27.03.2014	13:00	15:00	2,00	Meeting with management board

27.03.2014	15:00	18:00	3,00	Concept description Selena
28.03.2014	11:00	12:00	1,00	Conf. call Selena, Rajic, Kube
30.03.2014	17:00	21:00	4,00	Business plan update
31.03.2014	09:00	10:00	1,00	Conf. call Selena, Mr. Rajic, Mr. Kube
31.03.2014	10:00	17:00	6,50	Business plan, sales potential
31.03.2014	18:00	20:00	2,00	Coordination Bus.pl. Hr. Kube
01.04.2014	09:00	16:30	7,00	Business plan
01.04.2014	16:30	18:00	1,50	Coord. bus.pl.; Ortner, Kube
02.04.2014	09:00	16:00	6,50	Argumentation line UL
02.04.2014	16:30	17:30	1,00	TelCon bus.plan Mr. Rajic, Mr. Kube
03.04.2014	10:00	17:00	6,00	Bus.pl.: change indirect costs and DBII
03.04.2014	17:30	19:30	2,00	Control and check bus.pl., Mr. Kube
05.04.2014	18:00	23:00	5,00	Bus.pl.: change indirect material costs
07.04.2014	09:30	17:00	7,00	Argumentation line UL
08.04.2014	12:00	22:00	8,50	Management-handout
09.04.2014	09:00	18:00	8,00	Management-handout
10.04.2014	09:00	14:00	4,50	Management-handout
12.04.2014	12:00	17:00	6,50	Management-handout
14.04.2014	10:00	18:00	7,50	Management-handout
15.04.2014	10:00	18:00	7,50	Categorizing BoM
16.04.2014	09:00	17:00	7,50	Categorizing BoM, bus.pl.
17.04.2014	09:00	12:00	3,00	Business plan
21.04.2014	19:00	20:30	1,50	TelCon Mr. Kube
23.04.2014	09:00	19:00	9,50	Bus.pl., license production
24.04.2014	10:00	18:00	7,50	Calculation license production
25.04.2014	09:00	10:00	1,00	TelCon Mr. Mironos
25.04.2014	10:00	12:00	2,00	Adaptation NDA Selena
26.04.2014	11:00	14:00	3,00	Update business plan
28.04.2014	10:00	18:00	7,50	Search, preparation thesis document
03.05.2014	16:00	18:00	2,00	TelCon Mr. Kube
05.05.2014	05:00	17:00	11,50	Training Linz, support

05.05.2014	17:00	20:00	3,00	Business Case update
06.05.2014	07:30	18:00	10,00	Training Linz, support
07.05.2014	07:00	17:30	10,00	Training Linz, support
07.05.2014	19:00	23:00	4,00	Customer care
08.05.2014	07:30	19:00	11,00	Training Linz, support
09.05.2014	10:00	15:00	5,00	Business Case, HOL
12.05.2014	10:00	16:00	5,50	Business Case
12.05.2014	17:00	20:00	3,00	WKO panel discussion 'Im Osten viel Neues'
13.05.2014	10:00	18:00	7,50	Search, documentation
14.05.2014	10:00	14:30	4,50	Business case
14.05.2014	14:30	15:30	1,00	Discussion business case, HOL
15.05.2014	09:00	17:00	7,50	Update business case
16.05.2014	09:00	18:00	8,00	Documentation comp. descr.
17.05.2014	13:00	17:00	4,00	Documentation pract. impl.
18.05.2014	20:30	21:00	0,50	TelCon discussion bus. case
21.05.2014	11:00	14:30	3,50	Update bus. Case
21.05.2014	14:30	15:30	1,00	Discussion bus. case (Loisel, Ortner, Kube)
21.05.2014	16:00	17:00	1,00	Consultation Russia-projects (Ortner, Rajic, Kube)
21.05.2014	17:00	18:30	1,50	Update bus. case
22.05.2014	11:00	17:00	6,00	Documentation pract. impl.
23.05.2014	08:30	15:00	6,50	Pract. impl., discussion bus. case
24.05.2014	10:00	16:00	6,00	Adaption bus. case
26.05.2014	09:00	17:30	8,00	Overhead calculation, BoM
27.05.2014	09:00	18:00	8,50	BoM, ABC-analysis
28.05.2014	09:00	17:00	7,50	Drawings compilation
30.05.2014	13:00	18:00	5,00	Literature search
02.06.2014	10:00	00:00	12,50	Make or buy
03.06.2014	10:00	17:00	6,50	Make or buy
04.06.2014	15:30	17:30	2,00	Appointment Mr. Kube
CW24			32,00	Market entry and sourcing strategies
CW25			30,50	Frame conditions analysis

CW26			41,00	Goods prioritization
CW29			34,00	Document management
CW30			15,00	Decision instruments MoB
CW31			18,00	ABC analysis pantograph, XYZ analysis
CW32			20,00	ABC analysis pantograph
CW33			8,00	Evaluation ABC analysis
CW34			10,00	Layout logistic concepts
CW35			4,00	Logistic concepts
CW36			15,00	Layout business case
CW37			31,00	Format, layout, directories
18.09.2014	17:30	18:30	1,00	Appointment Ms. Nemeth
26.09.2014	15:00	20:00	5,00	Correction
27.09.2014	10:00	18:00	7,50	Format
28.09.2014	13:00	19:00	6,00	Improvements
29.09.2014	19:00	23:30	4,50	Abstract
30.09.2014	19:00	22:00	3,00	Adaption Abstract
01.10.2014	19:00	23:00	4,00	Correction
02.10.2014	19:00	23:00	4,00	Correction
03.10.2014	18:00	00:00	6,00	Finalizing
			848,50	

Table 34: Expenditure of time[45]

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[45] Accuracy: 0.5h

F Directories

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2 List of Figures

3   List of Formulas

4   List of Tables

5　List of abbreviations

Abbreviation	Meaning
&	and
€	Euro
°C	degree Celsius
3D	three-dimensional
A	ampere
AC	alternating current
ADD	automatic dropping device
ann.	annual
AO	administrative overhead
ASS	after sales service
Ass.	assumed
AT	Austria
AV	added value
avg.	average
BAM	Baikal-Amur-Magistrale
bn	billion
BoM	bill of material
BU	business unit
bus.	business
bus.pl.	business plan
CCF	customs clearance fee
CEO	chief executive officer
CIP	continuous improvement process
CM	contribution margin
COCM	Center of Competence Mechanics
COCP	Center of Competence Pantographs
comp.	company
coord.	coordination
cum.	cumulative
DC	direct current
descr.	description
DF	discount factor
DMC	direct material costs
DO	development overhead
DPC	direct production costs
DR	Desiro RUS
DTA	double tax agreement
e.g.	exempli gratia (Latin: for example)
EBIT	earnings before interest and taxes
EBRD	European Bank for Reconstruction and Development
ECO	engineering change order
ed.	edition
eds.	editors

EIU	Economist Intelligence Unit
E-Mail	electronic mail
EMU	electric multiple unit
est.	estimated
et al.	et alii (Latin: and others)
etc.	et cetera
ETS	Schaltanlagenwerk Teplice (German: switchgears plant Teplice)
EU	european union
EUR	Euro
EURASEC	Eurasian Economic Community
EWG	Elektronikwerk Györ (German: electronical plant Györ)
EWS	Elektronikwerk Siegendorf (German: electronical plant Siegendorf)
fact.	factor
FAI	first article inspection
FCA	free carrier
G7	group of seven
G8	group of eight
GDP	gross domestic product
GmbH	Gesellschaft mit beschränkter Haftung (German: LLC)
GOST	Gosudarstwenny Standart (Russian: state standard)
h	hour
HOL	Holding
hp	horsepower
i.e.	id est (Latin: that is)
IAC	indirect administrative costs
IBRD	International Bank for Reconstruction and Development
ICC	International Chamber of Commerce
IDA	International Development Association
IFC	International Finance Corporation
IFRS	International Financial Reporting Standards
IMC	indirect material costs
IMF	International Monetary Fund
impl.	implementation
incl.	including
IPC	indirect production costs
IRIS	International Railway Industry Standard
IT	information technology
IVAT	importation value added tax
JSC	Joint-stock company
JV	joint venture
KG	Kommanditgesellschaft
kg	kilogram
km/h	kilometers per hour
km²	square kilometers
KMU	Kleine und mittlere Unternehmen (German: SMEs)
kV	kilovolt
l. c.	local content

LCC	life cycle costing
LLC	Limited Liability Company
loc.	local
LZ	Linz
m	meter
m.	million
MC	material costs
MFC	manufacturing costs
MGT	management
min.	minimum
mm	millimeter
MNE	multinational enterprise
MoB	make or buy
MOS	Moscow
MoU	memorandum of understanding
MR	material rate
MRO	Maintenance, Repair and Operations
MWW	Mechanikwerk Wien (German: mechanical plant Vienna)
N	Newton
NC	net costs
NDA	non-disclosure agreement
NPV	net present value
OEM	original equipment manufacturer
OH	Overheads
OOO	Obschestvo S Ogranichennoi Otvetstvennost'yu (Russian: LLC)
OSCE	Organization for Security and Co-operation in Europe
OT	Overheads total
P	probability
p.	page
p.a.	per annum (Latin: per year)
PC	production costs
pc.	piece
pdf	portable document format
PDI	power distance index
PG	pantograph
pop.	population
pot.	potential
pp.	pages
PPP	purchasing power parity
pract.	practical
PSP	project structure plan
Q	quarter
qty.	quantitiy
R	resource
R&D	research and development
RAMS	reliability, availabiltiy, maintainability, safety
RDO	research and development overhead

red.	reduction
requ.	required
res.	resource
RF	Russian Federation
RUS	Russia
RZD	Rossijskije Schelesnyje Dorogi (Russian: Russian Railways)
s.a.	sine anno (Latin: no year)
s.l.	sine loco (Latin: no location)
s.n.	sine nomine (Latin: no publisher)
sc.	sourcing
SCM	supply chain management
SET	Selena Elektrotransport
SEZ	Special Economic Zones
SG&A	selling, general and administrative expenses
SMEs	small and medium-sized enterprises
SO	sales overhead
SP	sales price
SPP	spare parts
stat.	static
step	standard for the exchange of product model data
SWL	Schaltanlagenwerk Linz (German: switchgears plant Linz)
T	time
TARIC	Intégré des Communautés Européennes
TCA	transaction costs approach
TelCon	telephone conference
UL	Ural Locomotives
UNCTAD	United Nations Conference on Trade and Development
UNICTRAL	United Nations Commission on International Trade Law
UNIDO	United Nations Industrial Development Organization
VAT	value added tax
Vol.	volume
VP	valve panel
WBS	work breakdown structure
WCO	World Customs Organization
WP	wear parts
WTO	World Trade Organization
y.	year

Table 35: List of abbreviations