Global Business Engineering

Contribution to a Concept for Successful Production and Business Development in Emerging Markets

Masterthesis

Department Maschinenbau und Produktion
Studiengang Master Produktionstechnik und -management

Prüfer:
Prof. Dr.-Ing. Dipl.-Math. H.-J. Germer
Prof. Dr.-Ing. E. Kuhn

Student:
Dipl.-Ing. (FH) Martin Kalka
Matrikelnu.: 1732018

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Martin Kalka

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List of Abbreviations

R&D	Research and Development
B2B	Business to Business
B2C	Business to Customer
IT	Information Technology
CRM	Customer Relationship Management
MNC	Multinational Company
LCC	Low Cost Country
EoS	Economics of Scale
HCC	High Cost Country
SME	Small and Medium Sized Company
BU	Business Unit
TLC	Total Landed Costs
GPF	Global Production Footprint
NPV	Net Present Value
ROI	Return on Investment
OEM	Original Equipment Manufacturer
HRM	Human Resources Management
SCM	Supply Chain Management
JIT	Just in Time
JIS	Just in Sequence
FOB	Free on Board (trade term international logistics)
LSP	Logistic Service Provider
CIP	Continuous Improvement Process
VSM	Value Stream Mapping
RFP	Request for Proposal

1. Introduction

The world is changing. Our world as we know it, is about to change. This change isn't going to be as quick and dramatic as some prophets want us to believe. But, it will change! Most of these changes aren't to happen in our world – the 1th world – it will change the bottom of the pyramid – the 3th world. But the western country will have to face some dramatic changes, too. It will come to a migration from the high-tech industry to a service industry, earning most of its profit by using their knowledge.

Globalization is not a phenomenon. Working in **internationalized supply chains** with **worldwide, cross functional collaborations** is the state of the art.[1] Globalization is accelerating by low cost of communication and decreasing costs of shipping and transfer all over the globe. International integration is growing and rising exponentially since the 1980s. It is heated by a huge technical progress and the fall of trading barriers and custom duties. Since them, companies went over to work in cross organizational networks, learned to source and sell globally.

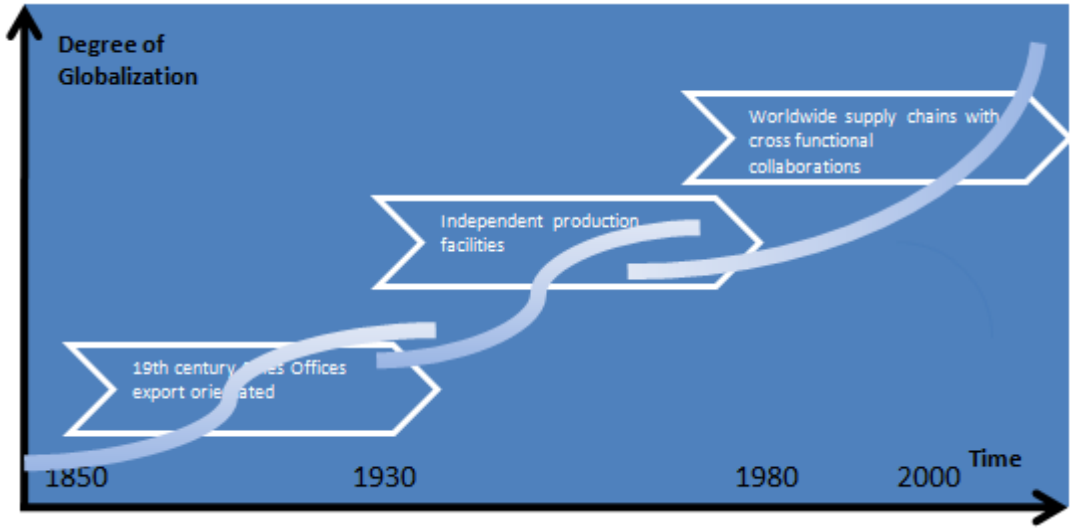


Figure 1: Development of Globalization[2]

By the beginning of the 21th century this trend changed in to a high of accelerating the growth of collaboration. Customers no longer change goods through borders, they change

[1] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.1
[2] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.4

stuff, work on global projects from different continents on a 24/7 base. Reducing the time to market and lever the potentials of different locations.

Functions, like HR, R&D, production and marketing, are well spread throughout the world. But this isn't the challenge of or new world, it is to work in **corporative functions**, to adapt and lever always the best of each location. It is time to manage this summery of global locations as a network, using digitized technology to connect the advantages of know-how clusters to create a global knowledge network. **- This development has just begun, and is leading to a new century of information -**

1.1 The world is changing throughout global trends

The future is unpredictable – is a common statement of or time. Everything is changing faster and faster, nobody alone is able or has the capability to predict the future. But the performance of prognostic and especially the performance of predicting mega-trends aren't as bad as it may seams. Fulfill forecasts are boring, because they appeared to be true and are now a part of our everyday life.[3]

Germany is a special area for future trend scouting. Everybody is specialized in his own field of production. It's a land of specialists. But specialization makes us blind for future trends. Predicting the future by using only forecasters of the own special field can lead to a disastrous result. Innovations normally appear in weak signals out of the own industrial business. After a period of unknowingness, these innovations have a big breakthrough to the own business. Companies not prepared for this, could miss the chance of being at the pole position. They could end up in the role of the follower or totally miss the game in a new business.

But technology innovation is not the biggest driver of changes of our today's future. It is the social change and the connection of information. It is more and more about social relationships, education, personalization, individualization and the access to information, like knowhow, data and specialists, worldwide.

So it is the most important role for our industries to analyze this trends and have always an eye in different industries not related to the own, and relocated and adjust the business to ongoing developments in the market.

[3] Cf. Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007) p. 15

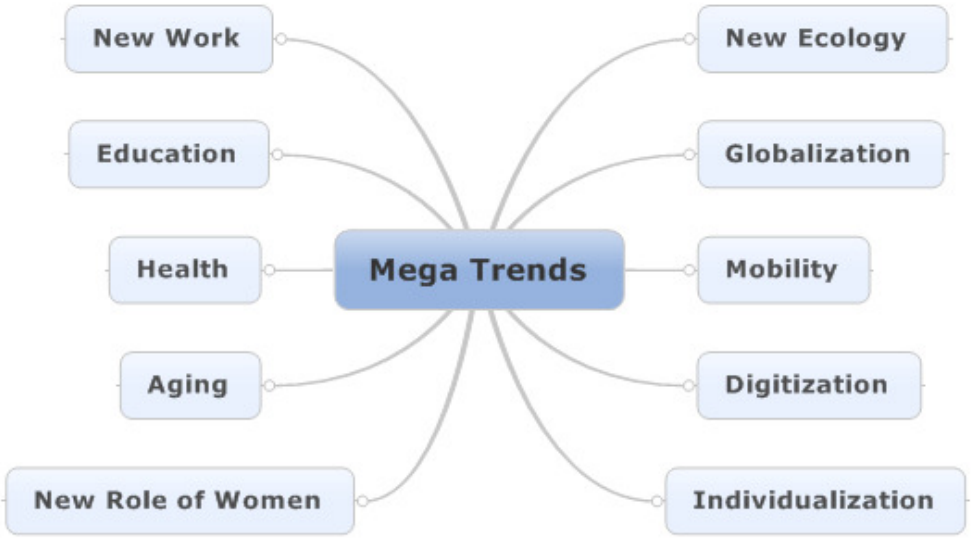


Figure 2: Mega Trends[4]

These trends should be faced by every company worldwide. Not all and not at the same time, but they have to be observed and taken into account in every overall strategy meeting. The five yellow market trends are going to have the biggest impact to our future business. All of these trends transcend to smaller steps and can be broken down to the core business of every company.

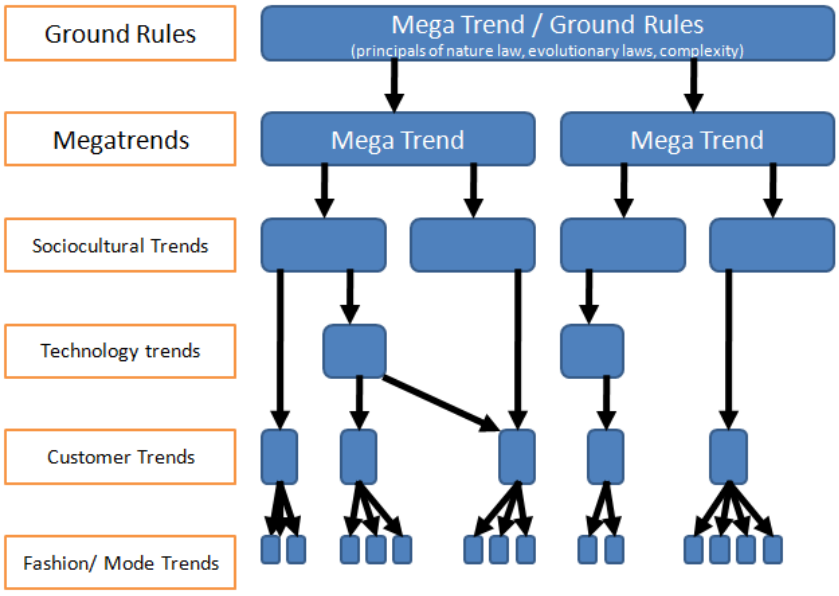


Figure 3: Trend Typologies[5]

[4] Cf. Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007) p. 36

These trends should be identified, filtered, evaluated and implemented in today business strategies. However, they can be used as new ways to innovation and define key strategies for future markets.
So these trends will have huge importance to our next step of business and a major impact to the industrial production footprint.

1.2 Growth of the lower end (the 3th world)

One of these trends is the now accelerating globalization with a major development of the 3th world. Up to the year 2015 there will be 7.2 billion people on earth, and two thirds will be out of poverty, that's nearly 2 billion more than now, this means that in 5 years there will be a new lower mid-class of about 2-3 billion people. Throughout this, there will be billions of people who want to buy their first car, there first TV, there first house, and there first vacations. This people will have a high influence to business and production. Production and business will develop or migrate to this country of demand. 2-3 billion new customers will lead to a market 24-time larger than the German.

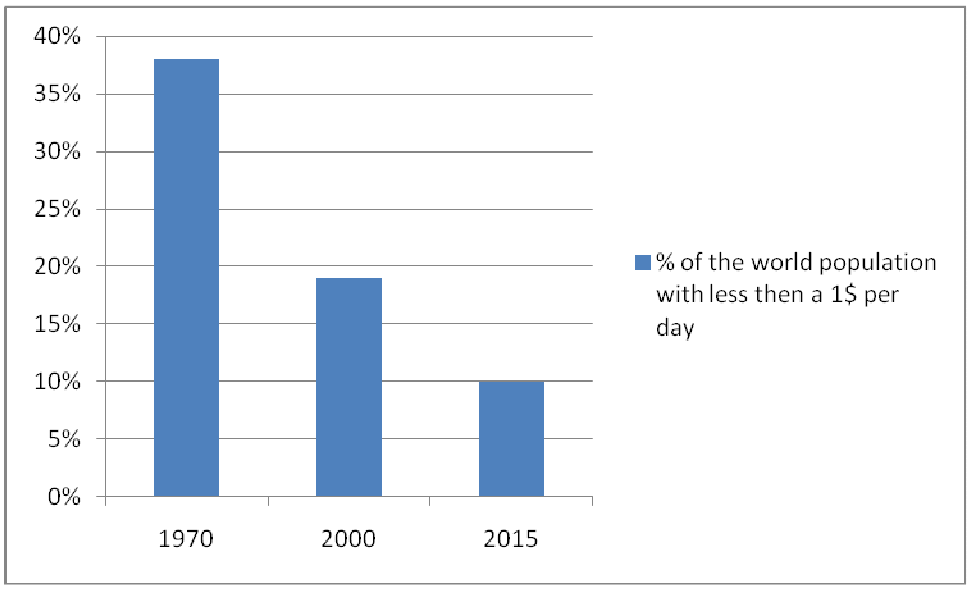


Figure 4: Decreasing poverty[6]

[5] Cf. Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007) p. 31
[6] Cf. Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007) p. 121 ff.

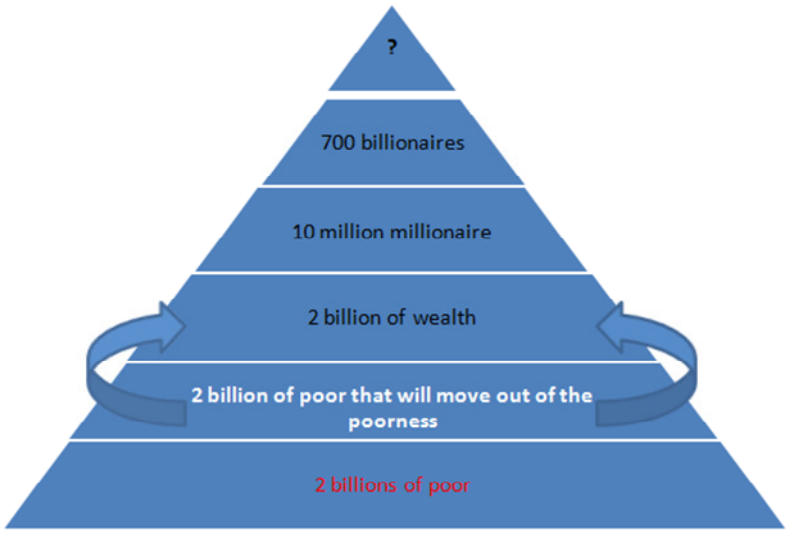


Figure 5: The Economic Pyramid[7]

Now it would be a mistake to think that western industries could deliver these markets from their home base. These are total different markets with different needs and habits. These markets have to be seen as new source of demand and innovation. **But, how can you enter a market, that magerial exists, in whom the purchasing power isn't high enough to buy any of western products?** The solution is empowerment of the customers. Customers have to be empowered in all of their problems, purchasing power, knowhow, skills and abilities. Companies how want to make business, have to help their customers to gain new strong business. There are several good examples like of the firm ICICI in India[8], or the firm CEMEX in Mexico, how empower their customers and helped them through new business innovations.

With Empowerment to Business

Realize the new growth opportunity of the private sector and the huge potential for innovation at the bottom of the pyramid. Old solution will not create markets at the bottom of the pyramid. [9] If you want to get strong position in the market, you will have to implement services out of your core products and services. Services stepping out to empower the poor,

[7] Copyright © 2007 Campus Verlag, Frankfurt a.M./ Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007, CD Anhang zu Kapitel 5), Abb. Arm und Reich global – die >>Globalen Aufsteiger<< kommen
[8] Cf. Prahalad, Krishnan(The new age of innovation, 2008) p.60 ff.
[9] Cf. Prahalad (The Fortune at the Bottom of the Pyramid, 2005) p.3 ff.

creating sustainable improvements for the people you are bringing service to. Therefore you need understanding and sympathy for the specific and emotional situation the people living in.[10]

One of the best examples for this empowerment of the poor is the firm ICICI, who is giving micro credits to self-help groups. First they teach them how to save money, **- learn to save -** , by saving per woman 1 Dollar a month, up to 120 Dollar inclusive interests in sum. In the second step than they learn how to lend money to others, **- learn to lend what you have saved -**, in the most cases for medical emergencies. By taking these two steps the groups qualifies for the final step. The group is taking a credit over 5000 Dollar (250 for each person), **- learn to borrow -,** for buying cattle, land or open a small shop.

This concept is so successful that the ICICI have a 99 repayment rate and makes the ICICI to one of the major players in the Indian market.

1.3 Business Transformation

Forget by digitization, ubiquitous connectivity, and globalization, there is a fundamental transformation of business underway. This will radically alter the nature of companies and how they create value. No industry is immune to this mega trend. It will impact traditional industries such as education, insurance, health care, automobiles, as well as new emerging industries such as life extension, social networks, and augmented reality. Coming to terms adoption of this changes is critical for survival and growth. The main transformation will be based on two basic pillars:[11]

- Value will be based on unique, personalized experiences of customers. Firms have to learn to focus on one personal customer at the time, even if they serve thousands at the moment. The customer has to be the center of individuality.
- No company will be big enough in scope and size to satisfy customers experience at the time. Companies have to learn how to act in a global ecosystem, using and accessing resources from a wide variety of other big and small firms. The focus will change from ownership of resources to an access orientation of resources.

[10] Cf. Horx, Huber, Steinle, Wenzel (Zukunft machen, 2007) p. 126
[11] Prahalad, Krishnan (The new age of innovation, 2008), p.10

That means to companies:

1. Companies have to move from selling a product to selling a service. The value is the service, where therefore the product is reduced to an integral part of the service.
2. Companies have to move from a transactional relationship with a customer to a service relationship with the customer. That means that companies have to move to service, solution, and a superior experience for individual customers.
3. Furthermore companies serving a B2B organization will have to act like a B2C organization in a more and more converge way.

In general, that means the value of a product will shift from the physical product to solutions to experiences. The B2B and the B2C coverage for the individual customer experience. Companies will not have all the resources they need to create unique personalized experiences. Therefore, it will be crucial to open up an access to talent, components, products, and services from the best sources worldwide. Internal management has to be adjusted to a flexible system, for more flexibility in continually configuring resources in a global ecosystem. But the main task will be to develop the organizational abilities to focus on one customer from the millions, that implements every part of firms structure (IT, R&D, CRM, etc.)

1.4 Cross cultural leading

The world is now seeing a new dramatically increasing connectivity around the globe. Manager and organizations have to expand their repertoires of skills in a global context. International management is no longer a limited jet setting troubleshooting or expatriatel management of global located businesses. Businesses are now working in international supply chains and cross functional collaborations.[12] This makes it difficult to identify a product which is not somehow influenced by an international supply chain. International contacts and responsibilities are directly linked with different cultures without even leaving the office. Changes in economics, politics, and technology lead to a new kind of international

[12] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2018)

managers, facing new tasks and functions of globalization in terms of economic, legal, political, technological, and cultural elements. [13]

The most underestimated and neglected part is the cultural aspect of different nations. It is the biggest cause for failing business with international partners. Managers have to face new and total different cultural than their own. Working with that, managers needs to have broad soft skills and cultural awareness in every possible manner. For example, in Asian countries people understand the fact of being copied as a great honor to them personally; in western countries it is always seen as product piracy. Or, working with Indian stuff, you cannot let work different casts working together as a team, with equal rights, or making someone from a lower cast leading the team. However, that might change but only in “generations or decades”, but now it is the normal way of doing business. So, dealing with foreign countries is not as easy as it might first appear, there can be a great variety in understanding of contractual terms, copyrights, and habits.

1.5 The requirement of going global

Why is it a necessity to go global?

Globalization is not a new mode; it is the biggest and most persistent trend which will affect all of or lives. Globalization has taken a new pace, scope, and scale in the 21st century. Since we know from be building up of the European Union, the wage gap, between newly industrialized and developing countries, is not going to close soon. The factor of costs and growth are widening the disparity in the attractiveness of different production locations. Liberalization of markets and the reduction of trade barriers also lead to new centers of economic. Declining transaction costs for transport and communication, promotes the globalization in accelerating speed.[14]

[13] Cf. Thomas (Cross-Cultural Management, 2008)p. 3 ff.
[14] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.9

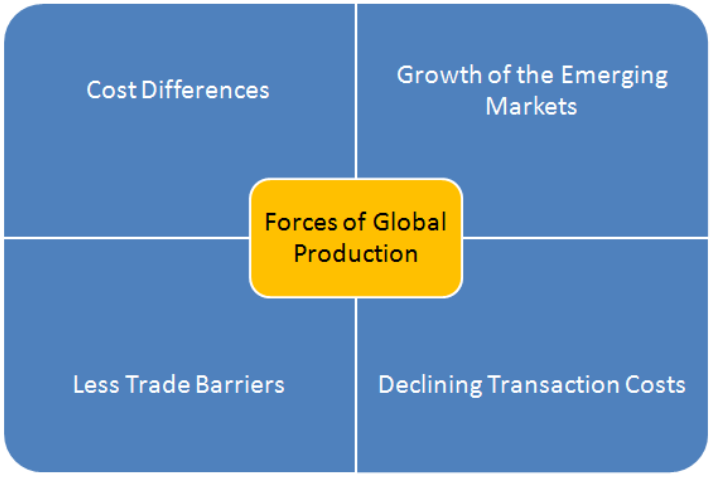


Figure 6: Forces of Global Production

Cost Differences

Looking on the factor cost, the main disparity arises from the labor costs. Labor cost in developing and nearly industrialized countries are curbed and only rising in a long term. Large parts of the worlds which have been, or still are, under the communistical system, are now arising to a new industrialization. But as we saw it in Europe with the start of European Union, the wage level could not compensate till now, and there is a doubtful future.

Out of the high and sustained growth of the last decades, labor costs in industrialized nations are very high, making it unavoidable to use these vast cost differences.

In medium and short terms direct and indirect labor costs, with greatly influence the price of sourced materials, will have a great influence for production locations and there profitability.[15]

[15] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.9 ff.

Growth of the Emerging Markets

The main activity in home markets of industrialized countries is to gain market shares from concurrent companies. Emerging markets therefore experience a high sustainable growth in market volume. These markets are becoming more and more attractive as a result. This growth has now become the key motivator for the globalization of production.[16]

Figure 7: GDP Growth in 2008[17]

Declining Transaction Costs

Transaction cost of any kind like transport costs or information transfer, has moved down to a low in costs, and is still decreasing. Historically the transportation cost has been the biggest cost factor for global trading. Nowadays, it can be efficient to move goods with a low value density through the world. Ships and harbors are getting bigger and bigger, fighting for transshipment, automating everything in the chain, and minimizing the crew. Cost of fuel, salaries and fees are spreaded on more and more containers.
But none of these barriers for the globalization had such a great influence like the progress in communication. Today's communication is based on real time, sending R&D blueprints through the world in a second, controlling and steering remote locations with a direct response. And this technology is still in its infancies.[18]

Less Trade Barriers

The political changes of the last two decades changed the world in accessibility and liberalization as never known before. Eastern Europe, Russia and China have become attractive markets for all kinds of goods. Exports and imports are more and more increasing. This countries are liberalizing there trade, improving their protection of intellectual rights, eliminating custom fees and quotes. In this development emerging markets are getting more

[16] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.9 ff.
[17] www.cbs.nl
[18] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.9 ff.

attractive and competitive in the globalization process. But sill, there are a lot of areas deregulation have not reached yet, protecting their own national companies from competition.

India and China as the biggest countries, and the biggest beneficiaries of the globalization, have started some big initiatives to reduce regulations and protections. Today protection is getting a danger for the growth of markets. Companies are not anymore interested only in quick profits, to make in a market; they try to gain a sustainable a business. Custom duties have been historically a source of governmental income. Now governments have to deregulate to generate or develop business at all.

Regional economic alliances, like free trade zones and customs unions, with zero tariff on the moved goods, and standard tariffs for non-members, aim to create a win-win situation for all their members. So that members get a better access to markets and can better use the economics of scale in higher production volumes.

2. Global Production and Business Engineering

Global Production and Business Engineering

The process of building up a new production in an emerging market can mainly be divided into 4 Phases:

- **1th phase:** After a previous phase of generally generating an ambition to go global, the 1th phase starts. This is a pre-phase of definition to analyze the initial or starting situation, setting target aims and tasks, assessing alternatives and making pre-decisions.

- **2nd phase:** The 2nd phase is the framing or the structure creation process of the company's global footprint by modeling and recreation of holistic business processes and strategic location concepts.
- **3rd phase**: In the 3rd phase the production ramp-up phase, it is to avoid potential mistakes and lever all potentials you can get.
- **4th phase:** The last phase 4, can be described as a after or sustainability phase, using further strategies in management by applying best-practice, levering the potentials of sourcing and aligning the global R&D (research and development) interface.

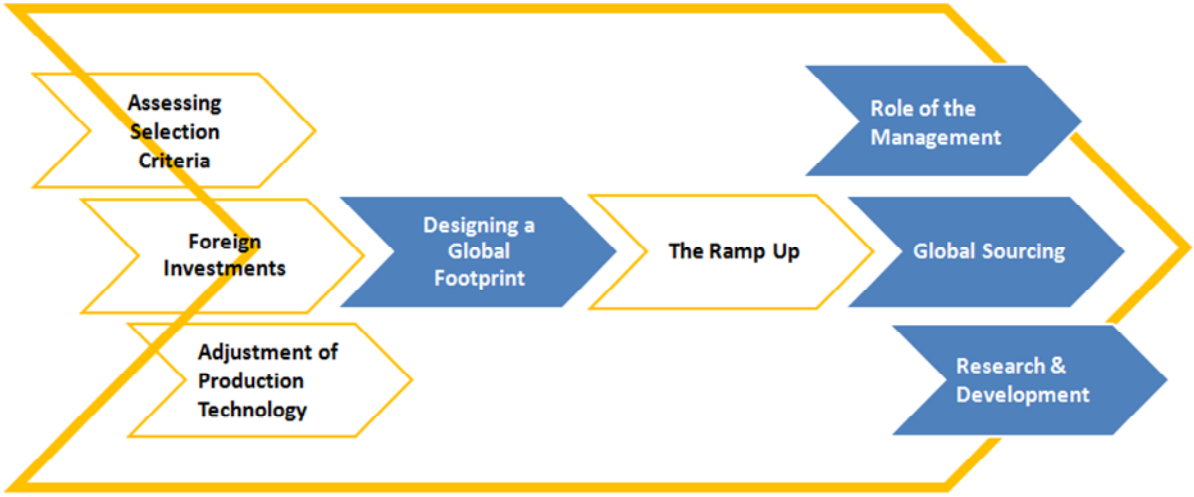
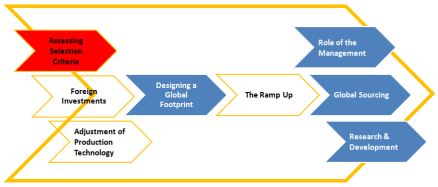


Figure 8: Global Production Engineering Process

2.1 1th Phase – Pre-Phase

2.1.1 Assessing the Selection Criteria[19]



As all companies, no matter in which specific area of business, have their on specific processes of operations to fulfill customer needs, every company has to define their own business objectives for building up a new production site in an emerging market customized to their own business and the strategic goals. Therefore, there are multiple factors, for with location is best for producing a product. Setting this up can be a very complex task facing different economies and cultures.

This makes it necessary to work with facts over specific countries, creating road-maps, enabling decision makers to find the right key-factors for or against a specific location. Often companies neglect the most of the existing key-factors, only looking to the wage level. This leads to desperate migration and poor success stories of the most companies in emerging markets. Key-factors like the availability of qualified stuff, logistic costs, exchange rates, and lots more.

To evaluate specific production locations it is a necessity to evaluate the howl network, location parameters and process parameters can be really different. This two distinctions help to understand the economics and the operational aspects. Analyzing a product or a product line by individual available locations, including process parameters could reveal high cost potential and lead to better or the optimal strategic decision.

[19] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.35 ff.

Location parameters		Process parameters (product- and production-related factors)	
Factor costs	Labor costs (by skill level) Cost of capital Cost of materials	**Input factor volumes**	Labor time (by skill level) Capital employment (plant and equipment) Purchased parts/ raw materials Parts (made in-house) Space requirements (land and buildings)
Productivity	Labor productivity Capital productivity		
Other quantitative factors	Distance from relevant markets Potential restructuring and closure costs Freight rates	**Other quantitative factors**	Volume and weight delivery time requirements Maintenance costs
Qualitative factors	Availability of land, infrastructure, and right and ownership Protection of intellectual property Regulations, work safety, guidelines	**Qualitative requirements**	Process complexity Know-how intensity Environmental requirements

Figure 9: Site Selection Factors[20]

Location parameters are characteristics for geographic locations and show the attractiveness of a "specific process" of a product. **Process parameters** picture the manufacturing process and the special characteristic of a product.
These parameters can be very useful in the pre-selection process of possible countries and locations. Qualitative parameters, because of their often subjective view, should be listed at the very end of such a comparison enabling transparency for managers.

Perspectives are varying between locations, regions, industries, products, processes, and the company itself and can affect the importance of different locations. Companies with a strong brand name can attract more skilled employees than other, but are expected to pay more. Vice versa, companies without a strong brand name poorly attack skilled workers.

However, productivity and quality are generally more depending on the company than the location. To be successful companies should first estimate there capability of influencing global productions, their ability to train stuff and to create the business environment they need. Successful global players, confident in there global abilities, primarily use the

[20] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) fig. 2.1

opportunity to reduce costs via lower labor expenses and increase sale with greater market proximity.[21] But also behavioral patterns from the country of origin influence the importance of considered parameters.

Figure 10: Relevance of Location Criteria[22]

As the number of parameters can be extreme and vary greatly, analyses should be divided in levels of geographical scope, preselecting and determine in each step. It should start with a global view and been broken down to a short lists with detailed information's to specific locations.

Figure 11: Scope of Analysis and Relevance of Location Parameters[23]

Input parameters can be shortly divided into two sections the **static perspective** and the **dynamic perspective.** The static perspective is looking at network operating costs, which influence the landed costs of products. The dynamic perspective focuses on the costs of transition or migration, on costs that apply to the transition phase.

[21] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 38
[22] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 39
[23] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 40

	Perspectives	Parameters
Static	**Markets and trends**	• Market - Size - Structure - Maturity • Trends - Growth - Demand - Competitors
	Factor Costs	• Labor costs • Capital Costs and depreciations • Material Costs
	Productivity and Economics of scale	• Economies of scale, synergies, and alternative production technologies • Skills and physical productivity
	Logistics	• Transportation costs • Costs of inventory
	External factors	• Subsidies and taxes • Customs duties and non-tariff trade zones • Exchange rates and other risks
Dynamic	**Transition financials**	• Investments • Production ramp-up costs • Restruction costs

Figure 12: Assessing Parameters[24]

Markets and Trends

Countries and there demand for specific goods always develop along a very similar curve, only the time frame are unknown. That makes it possible to identify a good point for the entering of the market, enabling companies to get the best possible access to the relevant sources of supply and demand. Companies using this have to be aware the fact, that an early market presence does not ensure a long-term success. **Comparisons of facts on countries do not provide much insight on local habits and requirements.**

Companies going the way of globalization have to build up the capabilities in understanding the needs of customers abroad, assessing the market size, growth potential, structure, and competitive conductions. That may need new abilities; emerging markets may require more

[24] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 41

product types and variants, significant changes in R&D and manufacturing, and the ability to fight with aggressive competitors, low-cost countries usually have.

Factor Costs

- ***Labor costs***

Developing and newly industrialized countries have a very significant labor cost advantage, and therefore an enormous advantage on the cost of goods manufactured.[25] This fact is often overlooked for the price of sourced goods, and can lead therefore to a major advantage in the capital costs and the utility of investment.
Companies with a high demand of skilled work force should be aware of high wage differences in LCCs (low cost country) markets. A variation from 1 USD per day for an unskilled, to 100 USD per day or more, for a skilled person is normal. This can vary through countries, regions, industries, and skills needed. This trend is expected to continue for the next 20-30 year, for china and India it is more likely to be 50 years.[26]

Figure 13: Example for Labor Cost Differences

Only MNC's (multinational companies) have a better position in stuff recruitment. Out of their brand names these firms can attract young high qualified management stuff, which want to further their careers.

- ***Costs of capital and depreciation***

As investments are always a risk, cost of capital are not simply to measure. Political stability and social conditions can jeopardize the payback of such investments. As these conditions can vary through regions and locations, the varying depreciation rate should be calculated and factored in as a location parameter. Avoiding multiple investment risks and calculations, there can be used country-specific cost-of-capital rates.

[25] Cf. Gutenberg (1965)
[26] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 50 ff.

Figure 14: Country-Specific Cost of Capital/ Risk Premiums[27]

- ***Material costs***

Generally material cost amount 50-80 percent of costs of goods manufactured. This can be distinct between product specific materials from suppliers, standardized materials, and raw materials. Companies should be aware of the fact that they may have to develop suppliers, or because of know-how lakes, materials and products are not available at regional markets and have to be imported. As well as the cost according to the availability, state regulations and taxation, can lead to high cost deviations, like for energy, water and steel. For some raw materials the price can differs globally up to the factor 10.

Figure 15: Comparison of Raw Material Costs[28]

Productivity and Economics of Scale (EoS)

To lever the best of each location, harmonizing the choice of location and manufacturing technology is crucial. As experiences showed, world-class firms virtually achieve high quality and productivity anywhere in the world, **so that productivity depends most on the company and location is only secondary.**

But still, companies investing in emerging markets focusing on productivity and EoS have to be aware the facts of **low labor and capital productivity** (which are directly depending on each other), low **availability and quality of skilled stuff and mangers**, low possibilities of supply and demand, and poor **infrastructure**. Therefore, more **non-complex manufacturing** will have to be implemented, and adjust to the level of education and infrastructure. This means, that product design, manufacturing and processes have to be adapt to the location. Complex production technology has to be simplified or exchanged to non-complex systems with similar properties.

[27] McKinsey (Global Production, 2008)
[28] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 60

Adapting these non-complex systems makes it often possible to simplify the production technology, which can have a high impact to the fixed costs using less machinery and automation. About that, this leads to minor quantities and more flexibility.

Figure 16: Impacts through Productivity and EoS[29]

Logistics

Logistic is one headword of or time due to the globalization. Thus to the increase of global trading logistic cost exploded in there relevance. There are two main costs of logistics, direct and indirect costs. Direct transportation costs are costs for fright rates, sea or flight transport, handling, distribution and warehousing. Indirect costs are costs of the inventory like tied capital, depreciation, cost of extended delivery times, obsolescence and lost sales (due to stock outs).

Calculating logistic cost accurately on the **expected long-term costs** is not only crucial in the decision phase on a future location; it is also for the profitability of the howl production network. Bottom-up costing or statistical analyses are two methods for determination of these costs.

Long term analyses showed that transportation is not necessarily more expensive from LCC's (Low Cost Countries) than from HCC's (High Cost Country) and that freight rates are declining in long term.

Logistics often have an untapped optimization potential due the high changes of logistic processes, like **parallel multi-modal transportation** or **serial multi-modal transportation (Appendix 2).**

External Factors

Going the way of globalization means to go through opportunities and risks at once. New knowledge and skills are required to face these risks. The reduction of this risk should be one top point on the agenda. The common way to reduce external risks is negotiate on

[29] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) Table 2.2

benefits for location decisions, like subsidies in form of taxes (for sales and earnings), custom duties. These negotiations should be made parallel with different locations right up to the end of the decision on a location, gaining most possible direct subsidies.

But also, external factors like exchange rate effects, changes in tariffs and non-tariff trade barriers, violation of intellectual property rights, and the risk of the unknown and unforeseeable, have to be taken into account. Professional risk-management is therefore a crucial necessity.

Figure 17: Risk-Management Cycle[30]

Risks types	Focus
Subsidies and taxes	-Parallel conduction with federal and local governments
Custom duty	-Optimizing product design -Non-tariff trade barriers -Selection production location
Exchange rate effects	-Change rate fluctuations -Duration of transport and lead time -Market price for intermediate products -Market prices for own products -Exchange rates are interdependent
Measures:	
Static	-Elimination: Adjusting cost and sales footprint

[30]Cf. Prof. Dr.-Ing. Randolf Isenberg, SS10 Production Management in TI-MuP HAW

	-Transfer: Price adjustment clauses in contracts
Dynamic	-Production: Temporary relocation of production -Sourcing: Temporary relocation of costs -Sales: Increase efforts to improve sales in markets with better value currencies -Product selection: Combine previous points and push products with attractive production, sourcing and sales structure

Figure 18: Risk Types / Focus / Measures[31]

Transition Financials

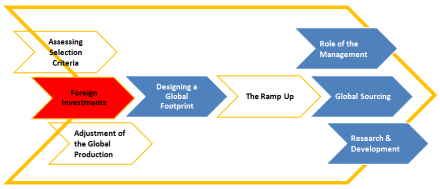
Building up a new facility in a foreign country usually needs a lot of money. Companies normally finance this on their free cash flow, selling old facilities and tangible assets in their home country or by borrowing this investment. But generating cash flow in a ramp-up phase often does not work, selling of intangible assets can take a long time and borrowed money, once it is lend, it is hard to get more.

Ramp-ups phases are normally very cost intensive, and can lead in the worst case of delays to a breakdown of the howl investment. The key factor is ramp-up speed. Firms should be aware of this, make adequate reserves, spend a lot in the planning phase and push the ramp-up to gain cash flow.

Figure 19: Structure of ramp-up costs[32]

[31] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.90 ff.
[32] McKinsey (Global Production, 2008)

2.1.2 Foreign Investments



The most neglected thing in evaluating investment decisions is the evaluation itself. The key reason why companies fail to capture the full anticipated potentials of global investments and there network reconfiguration is the weakness in strategic planning and there overestimation of factor costs and operational improvement. A good level of detailed accuracy and a more granular analyze can provide more success or the success at all.
A survey of McKinsey/PTW showed that more than two-third of the companies consider only three or less locations and use none standardized tools or processes in investment decisions.

Figure 20: Method and Scope of Analysis for Selecting Locations[33]

Companies should select an approach or a model that best matches their information they need to reduce complexity and capture the full potential of a global reconfiguration.

Methods chosen for the evaluation should envelope three elements:

1. The evaluation technique used should be one hand appropriate to determine the target structure and on the other hand be action-oriented and lead to steps of implementation.
2. The evaluation must include the significant upstream suppliers and customers, which include mainly a big share of total manufacturing costs.
3. Because of evaluations can take a great deal of time and can be much cost intensive, the proportion between costs and benefits have to be right.

Three Basic Models[34]

[33] McKinsey/PTW (ProNet analysis)
[34] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.104 ff.

The next figure shows a simple guideline which method can be used by a company based on their constellation and objectives.

Figure 21: Models for location selection[35]

- **Knockout Process**

This method is most suitable for SME's (small and medium sized companies) with a clearly defined product portfolio and production volumes. Knockout processes are reducing options step by step, and therefore only suitable for a small number of locations and interfaces.

Pro's	- Simplicity - Limited effort required - Quick realization - Various evaluation techniques can be combined at different levels
Con's	- No guarantee of correct prioritization - Synergy losses between factories - Higher materials costs due to lack of coordination with purchasing - Higher transaction costs (transportation, warehouses, customs duties) - Synergy losses due to uncoordinated choice of manufacturing technology - Suboptimal use of economies of scale

Figure 22: Pro's and Con's Knockout Method

- **Portfolio Analyze**

The portfolio analyze is most suitable for big sized companies with independently working BU's (Business Units) with overlapping businesses. The objective is to identify those BU's with the greatest potential for globalization and relocation.

Pro's	- Analysis of the entire company - Application of the same evaluation methods for all Bus - Relatively simple

[35] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.105

	- Helps organization to focus on biggest opportunities
Con's	- Synergy losses between factories - Higher materials costs due to lack of coordination with purchasing - Higher transaction costs - Synergy losses due to uncoordinated choice of manufacturing technology - Suboptimal use of economies of scale

Figure 23: Pro's and Con's Portfolio Analyze

- **Strategic Location Concept**

The strategic location concept is an integrated concept that includes a diversity of products, production step, and locations, accounting al relevant interactions. This allows it to reorganize and optimize the howl production network from the bottom.[36]

Pro's	- Integrated analysis of many products, manufacturing steps, and locations - Synergies fully tapped - All transaction costs taken into account - Integrated globalization strategy for production and purchasing
Con's	- Complex modeling and evaluation required - Could overstrain company's financial/human resources and change capabilities

Figure 24: Pro's and Con's Strategic Location Concept

Dimensions

But also, where different evaluation methods exist there are lots of different existing perspectives of views on one and the same thing. Perspectives like long or short term 5, 7, or up to 30 years perspectives like that are valid, there suitability depends on the investment and the investor.

Investment alternatives can be assessed by a wide range of different aspects and criteria. Companies should therefore choose a number of indicators and dimension depending on its specific situation. For better comparison to management criteria should be kept the same in (similar) investments enabling a better comparison.

[36] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.104

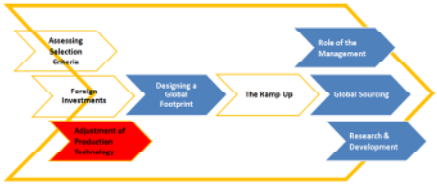
Dimension	Values	
Scope along functions	**Non-production functions** Sales/distribution Finance R&D management	**Production in a broader sense** Production capacity per product per factory Transport/inventory management Procurement planning (in collaboration with purchasing)
Planning horizons	**Tactical** Capacity adjustments Time horizon: > 1 year and < 3 years	**Strategic** Opening/closure of locations Target value: present value of net inflows
Time perspective and corresponding financial indicator	**Static/single-period** More long-term, steady-state conditions Target value: costs or profit	**Dynamic/several periods** Development over time Target value: present value of net inflows
Scope of analysis	**Single-stage** One manufacturing step Decoupled view of several manufacturing steps	**Multi-stage** Integrated analysis of several manufacturing steps Higher complexity due to interdependencies, e.g., inventory Mapping of dependencies, e.g., using bills of materials
Type of analysis	**Qualitative** Nominally or ordinal scaled characteristics, e.g., “good” infrastructure Knockout criteria, analysis of locations along strengths and weaknesses	**Quantitative** Metrically scaled attributes, e.g., sales, production volumes Landed cost analysis, NPV calculation of redesign of network configuration
Granularity	**Macro-environment** Example: high political stability Analysis of groups of issues/summary indicators	**Micro-environment** Example: costs per effective hour worked Analysis/evaluation based on detailed individual factors
Uncertainty	**Deterministic/certainty** Parameters are regarded as certain	**Stochastic/risk** Parameters are subject to uncertainty
Problem-solving precision	**Exact** The solution definitely represents the global optimum	**Heuristic** The solution only represents the global optimum by chance
Problem-solving	**Simulation**	**Optimization**

method	Achievement of target value(s) Extension via stochastic choice of profit parameters Result specified	Determination of the result by optimizing the target value(s) using an algorithm

Figure 25: Dimensions of Location Decisions[37]

Companies successfully going the way of globalization should be familiar with the most appropriate approaches, analysis techniques, and tools. Redesigning the production network will be the most improving competitive and sustainable method in the future. However, existing investment analyses fail to adequately consider network effects emerging out of the interdependencies between global products and plants.

2.1.3 Adjustment of the Production Technology[38] (Reengineering)



Setting up new production locations abroad should not mean one-to-one transfer of company's manufacturing technology. Using the same manufacturing methods and product design as at home to try to ensure fast, risk-free production of high volumes can lead to false economy.

Selecting production technology for global manufacturing sites ought to balance the advantages of standardization against those of local adaptation. Tailoring production technology to different locations can be highly profitable. It enables manufacturers to **use cost differentials more effectively**, **adjust production complexity to employee skill levels**, and **match plant and machinery to the unit volumes** required at that site. Production technology may also need adapting to allow **changes to the work-piece design**, such as to suit local taste or customs regulations.[39]

[37] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.114
[38] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.192 ff.
[39] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.192

Figure 26: Different Strategies for Low-Cost Countries[40]

The trouble is that this adjustment to the local productions broadens the portfolio of product, variants, and technologies a company has to maintain, that creates new complexity and drives costs. Therefore, companies should carefully manage the number of variants and production technologies they have.

Three Basic Options of Adjustment:

1. Complex technologies with high development costs should stay unchanged through global locations.
2. Less complex and with a grater scope of reconfiguration in technology, firms should first use legacy or proven processes, without modification of the product design. For example work piece handling and transport, or process changes that did not change or affect product characteristics.
3. The next option or a further step could be the change to the work-piece design; this often allows using easier technology or even total different manufacturing methods and machinery.

The next figure shows how the automation level can significantly decrease cost of goods if the automation level is adjusted to the locations general ability. An adjusted automation enables local stuff to gain economies of scale and enhance the learning by doing.

Figure 27: Advantage of Adjusting the Automation for Low-Cost Countries[41]

No matter for what reason a company is planning to move, be it for cost reasons or for developing new markets, companies should consider adoptions to gain advantages of costs effects and production volumes. It can be unwise to transfer existing products and production techniques, without a previous test of feasibility. Different languages mean different worlds;[42] local markets require modifications in functionality, design, and price. That all lead to changes in production and the related cost.

[40] Dubbel, 1994; McKinsy/PTW (ProNet analysis)
[41] McKinsey/PTW (ProNet analysis)
[42] Based loosely on Richerd D. Lewis (When Cultures Collide, 2009)

This makes it necessary to adopt at least two different forms of production technology: One for high-cost countries with a high capital intensive production and one for low cost countries with a flexible, simple, and labor-intensive production.

Transferring the same production technology and design to low-wage countries can result in a production that is too high automated and thus too capital-intensive, complicated, and inflexible.

The next framework should help companies integrate a side-specific manufacturing technology into their globalization strategy.

Factor costs	- Low labor cost make labor-intensive manufacturing more profitable than Capital-intensive
Skills & qualifications	- Lack of qualified stuff lead to use easier production methods
Unit volume and flexibility	- Lower volumes make different production technologies more attractive, and vice versa
Customer requirements and local supplies	- alternative materials, new tolerances, different features, piece is often more preferred than quality (overall simpler products)
External conditions and risks	- requirements for product parts and assembly sequences, prevent know-how drain and product piracy

Figure 28: Extent of Adoptions to Local Requirements

Companies should not underestimate this five facts and there effects through their business. Some of them can cause costs, but other can hinder the market access, further, other can destroy the howl competitive advantage or build up new competitors. This effect can be mostly seen in China or India, where not only product and processes are copied, howl production facilities and distribution ways are copied and rebuild. Company can only avoid this by making sufficient measures in the pre-process of migration to a new location, especial in emerging markets where fast moving competition can be found, willing to go every possible step to gain market share.

Entering new markets mean quite always specific functionalities or designs, depending on the industry, product, regions, cultures, and markets as well. Products have to meet local expectations, mostly based on the product price. Therefore, companies have to make their product more affordable for lower-income customers. Entry prices have to be very low, sometimes for western countries unbelievable low, what can lead to an underestimation of the price target, **which has to be met**. Emerging to a LLC (Low Cost Country), companies have aggressively to stick to their target unit cost, by defining their product features to it.

Options for Adjustment

- **Alternatives for Manufacturing Processes**

For every "basic" manufacturing process there are multiple alternatives available, with similar or variable process parameters.
For example joining: Assembling, Filling, Pressing against/into, joining by metal forming, joining by welding, gluing and so on.

- **Adjustment of Existing Processes**

Adjusting existing processes can have important effects and implications. Changes in manufacturing technology and product design are interdependent. This will inevitably alter the product's characteristics and should be adequately analyzed by the management. That means that you may end up creating new variants, products with maybe small changes, but they will be different and they will create one-time costs and more complexity in products and equipment.

Level of adjustment	Production Technology	Product Design
Low	Adaptation of materials flow • Automation of materials flow and handling • Storage technology Linking of work stations	Adaptation of auxiliary parts • Mounting elements • Covering elements • Fastener
	Adaptation of quality control • Scope and automation of quality control	
Moderate	Adaptation of work piece handling • Loading and unloading of machines • Automation of work piece mounting and assembly	Adaptation of product design (core components) • Material • Shape • Tolerances • Surface • Quality
	Adaptation of jigs and tools • Adaptation to local supply • Adaptation to local requirements	

	Adaptation of process control and parameters • Computer-controlled vs. manual processing • Processing parameters	
Comprehensive	Adaptation of the production technology and process chain • Altered machinery and plant • Alternative manufacturing process • Alternative process sequence	Adaptation of product functionality and value to the customer • Modified functional principle • Change in size and capacity • Modified area of application

Figure 29: Ways to Adjust Production technology and Product Design[43]

Adjustment Concepts

There are three basic concepts of adjustment:

1. **Adapting the production technology "without" changes to the design**

This Strategy is mainly used to reduce capital intensity or automation in LCC's by using for example simple and manual workstations for assembly. This Strategy allows low production volumes and competitive costs by variation the level of automation.
But OEM's (Original Equipment Manufacturers) have to make some additional work in this process, to ensure high process reliability. Manual work needs new additional guidelines, process descriptions, and quality control cards. As well as in the ramp-up phase, there have to be taken major changes to the production technology, the budget, and the time due to the preparation of manufacturing notes and examples for training.

"Simplicity = Productivity",[44] this equation is especially true for low-wage locations. That also applies for control mechanisms. Checklists, tallies, and control cards are better than correlation diagrams and regression calculations. In general the usage of all, easy to use, Japanese lean production techniques. But this has to be adequately developed, planed and tested **in advance.**

[43] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008)
[44] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008)

Figure 30: Automated vs. Manual Assembly[45]

2. Adapting the production technology "with" changes to the design

Allowing changes to the product design opens up adaptations to the core manufacturing processes. That gives production engineer a broader flexibility to adopt the product to a specific location. But Management has to be aware of one-time costs, more product variants and lacks to standardization. Changes to the design, especially in the automotive or aviation industry, need to be approved audited, that can be expensive and time-consuming.
For example, it can be used **integral design** than **differential design:** Simpler joining for connection (forming or gluing than welding), simpler test devices for quality control (Poka-Yoke) and simpler sometimes poor tolerances.

Figure 31: Manufacturing Alternatives[46]

3. Global Standardizing

In other industries customer requirements are fairly similar worldwide; quality guidelines are strict and prohibit changes to product design and process technology. In this industries using different designs and production processes can lead to a significant disadvantage in competition. The key is to adopt dominate production methods and meet future standards as quick as possible to gain strategic competitive advantage as a fast mover with best quality and costs of goods manufactured.

Assessment and Selection

To find the optimum in the production technology portfolio, mainly the level of automation, further adoptions have to be taken to determinate labor costs, capital costs, technical know-how, and the number of variants. To find the right production technology there have to be build up further knowledge about the trade-offs, staff capabilities and mindset.

[45] DS Engineering, McKinsey/PTW (analysis)
[46] McKinsey/PTW (ProNet analysis)

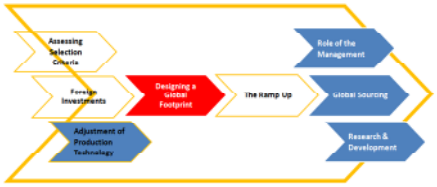
First there should be transparency around the trade-offs clarifying the advantages and disadvantages of adapting process to a specific location, the trade-offs throughout customer expectations and the capabilities of the company's own stuff. The next step would be to analyze the impact of the adaption whether an existing production technology is suitable and what the opportunities of adaptation are. The last step would be to analyze the howl production network in a broader context. If adaption is required for a specific location, but reengineering is too expensive, expanding existing production locations could contain more advantageous.

Transparency throughout the Trade-Offs	Opportunities	- Substitution of labor by capital and vice versa - Adjustment of production complexity and requirements to local conditions - Adjustment of production volumes - Adjustment of product specifications to local market requirements and preferences
	Cons	- Location adjustments can cause costs, especially in a holistic perspective - Local adaptations hinder standardization - Process and product redesign entail one-off costs - Adaptations take time - Changes entail market risk

Figure 32: Transparency throughout the Trade-Offs[47]

[47] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 222 ff.

2.2 2nd Phase - Designing a Global Footprint[48]



Optimization of the global production footprint can lead to long-term saving from up to 20 percent and 40 percent for companies with old or legacy structures in western countries. This savings are based on the TLC[49] (total landed costs) which therefore led to a major impact of the firms' competitive advantage. But also, optimizing of the global production footprint creates new opportunities in production, sourcing, and more important, it can open up new markets.

Using all benefits of an optimized GPF (global production footprint) means to implement an integrated perspective that involves multiple factors along the value chain and include impute factors, factor from labor costs and productivity, materials, energy, logistics, as well as customs, taxes, and exchange rates. But these factors are aging and altering in ongoing economics, so that these perspectives have to be measured in a new quantitative way.
However, these new approaches does not mean that every western location have to be closed and migrated to emerging markets. Management should take improvement measures like lean manufacturing into account and work always with a transition plan which is aiming to the target structure focusing on speed and the sequence of migration. That means that a global adjustment always sees the howl network and their interactions to optimize net present value (NPV) and return on investment (ROI).
The challenge is to create an integrated approach folding production into a global operations and growth strategy, with the key performance on dynamic reactions to market changes. This has to be proactive developed by the management in regularly reviews and measures.

Up till now, companies with new manufacturing locations make on average a 13 percent saving on cost of goods manufactured, a very low figure. **How is that possible?** 13 percent cannot be enough to make up the increasing logistic costs, inventory, cost of capital, and the

[48] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.140 ff.
[49] TLC includes manufacturing, materials, and logistic costs, customs, and duties up to delivery of the product to the customer.

additional work of management. **The problem is companies fall far short of their cost reduction aspirations when reconfiguring their global footprint; mostly they act too slow and only incrementally.**
The main reason is, as noted in Chapter 2.1.2, the use of conventional location planning techniques on foreign investments. This results in decisions that lead to higher cost of the interface. These costs have not been précised in the advance of the investment. Conventional approaches of evaluation do not contain these factors, so that companies tend to ignore these additional costs.

- **The Holistic Approach**

This new adjustment of the global production footprint is a new **holistic approach** through company's entire production network. The location selection is viewed as one integrated task with the procurement. Bundling multiple factors from labor costs through to customs duties, accounting there relevant interdependencies. The key goal is to minimize **total production network costs**.

This approach works with two different types of view, the **greenfield network** and the **brownfield perspective**. The Greenfield shows the ideal target structure (production network with the minimum landed costs) for supplying all relevant markets. It can be seen as the structure of a fast moving competitor with all his threats. The brownfield view take into account all existing facilities and assets, it represent a plan how to get from the given structure to the target. This is a more realistic view; it includes investments needed and the cost of changing. This view helps to get a feeling for the speed and sequences needed.

However, this approach will take a lot of time and great deal of effort in analyses and evaluation. This makes it only worthwhile for medium sized companies, employing hundreds of employees, with a great will and intention to change.

- **Redesigning**

The integration and optimization of the total production and supply chain has a much higher cost impact, in real, it can achieve nearly twice as much as a standalone optimization.[50] Integrated optimization has a major impact to the labor cost factor, as labor costs go throughout the entire value chain.

Figure 33: Comparative of Integration Depth and the Affect on the Labor Costs

Looking at this, the labor costs affect the material cost, which have mainly a large share of overall cost. This can lead to a direct increase in profitability.
As well as the labor costs, the adaption of the production technology to the new location can have a significant high cost impact. That means to use simple or outmoded production steps. This of course, is dependent on the industry, the product concerned, and the market expectations to the product. The next figure shows one possible way to down turn the cost by reducing the automation. This also has a big positive influence on flexibility (design changes, quantities etc.), leveraging labor cost effects, one-off expenditures, relocation and migration costs, and the skill level needed.

Figure 34: Example Adaption of Production Technology[51]

Another step into this is to redesign the location structure, proactively ahead of the globalization for relevant market. That means to move before all others and relocate production capacity there where the costs are at a minimum. Companies acting on this will always have a strategic edge – the first mover advantage.

- **Strategic Location Concept**

Redesigning a global footprint, need an approach that ensure systematic planning and focus on the elements and parameters that have the greatest leverage on financials and operations.

[50] Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p.142
[51] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008)

This approach can be divided into 4 phases that can help to manage complexity of redesigning a network. The 1th phase is a determination of essentials. It helps to identify urgencies and strategic objects, and is therefore the groundwork for following comparisons. The phase 2 is generally the comparison and analyses of the current state of the production network and different scenarios of possible future models. Out of this, the strategic location concept is developed in phase 3. Phase 4 shows the importance of the implementation and the managemental abilities.

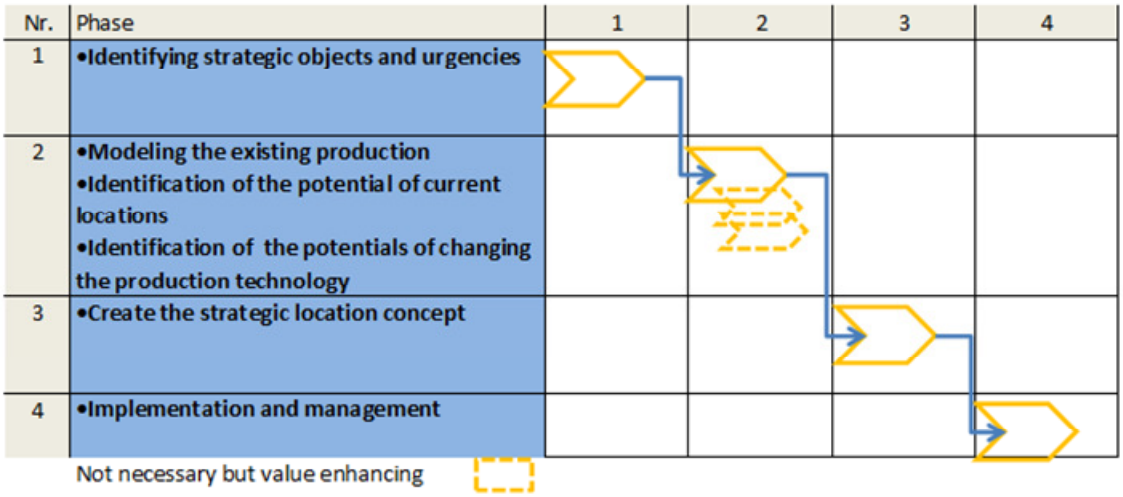


Figure 35: Integrated Strategy for Globalization

Phase 1

There has to be a need out of the company's strategic objects of redesigning the network. Objects like market share (segments and regions), technology aspirations (leader or follower)[52], or first mover, should be followed in new location selection. This phase want to reveal the urgency of redesigning the global footprint.[53]

The next table shows a list of the most important object and urgencies in this first phase:

Identifying Strategic Objects and Urgencies			
adi ng Ind ica	New markets and	Short term	• Attractiveness of current product portfolio

[52] Cf. Porter 1980
[53] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 144 ff.

	revenue shifts		• Future new product launches
		Mid-term	• Market size fluctuations (product aging vs. Innovations) • effects on order volumes → capacity planning
		Long-term	• absolute size of markets and there structural age • industry cost curve • Prices
	Skills and Clusters	Education	• standard of education →indicator for location's future attractiveness
		Technology	• technology shifts of competitors → indicator of local skills – Regional capabilities (skills, qualified suppliers, etc.)
		Clusters	• high importance in dynamic industries → high possibility of lead role in production → high-tech production in low wage countries possible • Innovations driver • Scale effects • observation proactively
Coinciding Indicator	Revenues and cost shares per region	Unbalances	• Unbalance in production, procurement and sales volumes signals a need of reconfiguration • Long distances between production and markets → costs, flexibility • Imbalance between currency zones → profit, cash flow • high cost advantages for new market players in low-wage countries
	Changes in competitors location structure	investigation	• changes in location (expansion or substitution) • new competitors (globally) → revenues, customer base, skills
Lagging Indicator	Rise in imports from low-wage countries significant, long-term drop in prices	investigation	• Correlation between price share and imports • high importance for mass markets→ early global production is the only way to survive

Figure 36: Identifying Strategic Objects and Urgencies

Phase 2

This phase is divided into 3 main sections, (1th section) the first and most important is to get a model of the current product and process portfolio. It aims to group out steps with a similar cost structure and complexity. The result provides the underlying structure needed for a new location configuration. The next task is to collect the process parameters like energy or time needs. The 2nd section is to assess the improvement potential of current locations. Means, companies should analyze their potential on lean manufacturing. But also consider the value that existing sites contribute to, like the total production network including economics of scale and R&D. Adapting the production technology is the next section (section 3), it examines whether alternative production technologies and product design might be more cost effective in other locations.[54]

Phase 3

This phase includes all previous indicators and parameters of phase 2 for the calculation and development of the new strategic location concept. It starts with the ideal target structure using comparisons:[55]

- How many new locations are needed?
- Where should which manufacturing steps for which product be located?
- What are the effects for the own facilities, and for those of the suppliers?
- What would the cost position of an optimal production network be?

The second step is an overall planning of the network, optimizing the return on investment, like:

- Capacity plan: Create or reduce capacity for which process and which location
- Trends: Which trends should be factored in, sales volumes or other factors which affect the production network or the cost position
- Financial effect: Star-up costs, spending on restructuring, or capital requirements

[54] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 155 ff.
[55] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 160 ff.

Developing the Target Structure	Blueprint	• Model of lowest-cost location structure
	Analysis of global conflicts	• Comparison of total costs, time restrictions, currency imbalances, critical manufacturing steps
	Detailed design	• Validation and check of the critical assumptions like cost structure and production volumes
Planning the Network Migration and Optimizing ROI	Migration planning	• Determination and scheduling the steps from the starting position to the target structure
	Skills (Organization and Individuals)	• Skills have to be compared with the needs of the project
	Action plan	• Planning of specific actions in line with the targeted structure

Figure 37: Generating a Strategic Location Concept

Phase 4

Decision makers should prevent and be aware of a lake in resources and skills needed for a relocation project, right of the beginning of the implementation. A better allocation of resources, adaption of an implementation plan, and target structures can ensure an easier and faster implementation.[56]

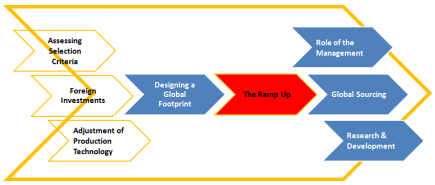
Besides this, regional and individual locations need further activities relating to the production network (next table).

Further Local Level Activities	Selection Processes and Implementation at a local level	• Building up, expanding, or acquiring production capacity • Setting up joint ventures • Relocating by outsourcing
	Creation of the organizational skills	• Internal and for external suppliers • Quality management, management processes, information systems • Best practice implementation (from the first step, the ramp-up)

[56] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 162

Figure 38: Implementation and Management

2.3 3rd Phase - The Ramp Up



Surveys show that companies with little experience internationally need more time and have greater costs in establishing new sites abroad.[57] Out of this there had been extracted clear success factors and taps to avoid. Companies going global should not overestimate there capabilities in this process. Companies should carefully align their skills and resources and carefully identify pre-requirements and complexity of the undertaking. Apparent mismatches have to be proactively handled by reducing complexity or by additional experienced stuff.
Companies with the capability to transfer best practice from one location to another can achieve rapid ramp-up in there targeted structure and quality. They also need painstaking foresight to ensure reliability and capacity utilization, before and during the move. Furthermore, they need a phased start-up with a sequential introduction to reduce downtime from technical faults.

2.3.1 Improvement Potentials

The key to success is perfect planning! Surveys showed that companies using much more time and expenditure on planning and preparation can save up to 50 percent of there on costs and can set up their new location in half the time required by average competitors.
There are two major factors:

- **Complexity** has a major impact on time and one-time costs, caused by the location, manufacturing process and product range. All this facts dictate requirements and should be minimized.

[57] MCKinsey/PTW (ProNet analysis)

- **Operational excellence and risk management** is another factor through this. A perfect project management reduces costs, time and effort needed in establishing a new location. This includes an effective site selection, an excellent personnel policy and high product quality (even in the start-up phase).

Emphasis of global leader in their crucial success factors:

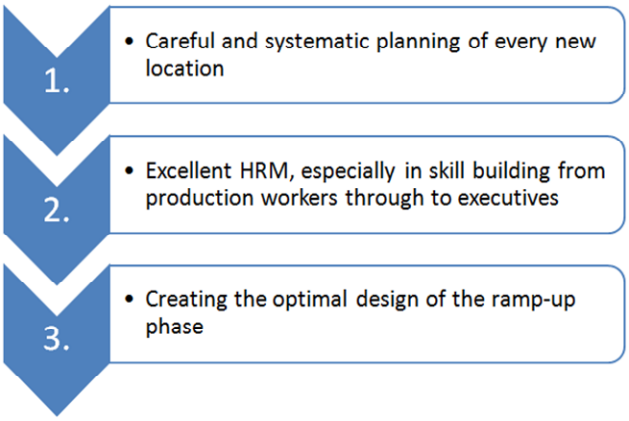


Figure 39: Emphasis of Global Leaders[58]

The next figure shows the advantages of market leaders in the process of setting up new locations and reveals significant differences in the cost and time they had required.

Figure 40: Advantages of Market Leaders[59]

2.3.2 Regional Planning

Setting up a new location makes it vital to have precise analyses of local conditions. These conditions have to be coordinated and balanced to company's own skills and plans. Keys are the complexities the new location can deal with, skills available at the location (and which skills can be provided by other locations), and the way of going it (partnerships, licensing, acquisition).

[58] Own figure; HRM (Human Resources Management); Cf. Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008)
[59] McKinsey/PTW (ProNet analysis)

- **Complexity vs. Capabilities**

Companies should not only consider successful models from high-wage locations. Mainly these models are too complex, too vertical integrated and the product range is too wide. But complexity is not responsible for the success of a new location. It is more about the skills and the abilities, out of the determinate experiences, which enables companies to handle with complexity. The key is to align skills and complexity throughout this multiple factors.

Ways to manage complexity and capabilities:

- Systematically identifying weaknesses and approaches to reduce complexity
- Soft start of the new location with a limited product range
- Taking along established suppliers
- Different location with a richer supply of qualified staff
- Local partnership
- Early-on assembling of local qualified staff

- **Site Selection**

To decide about the exact location for the new site in a country or region three investment relevant criteria should be analyzed caused of the varying investment conditions: human resources, costs, and logistics. Projects with a high impact to the local labor market or project in the high-tech field, will always find an open ear at local public authorities. Negotiations therefore can be very lucrative and can significantly reduce the risk of investment. Furthermore firms should play local sites off against to each other, up to the very final decision point.

Figure 41: Criteria for Site Location[60]

- **Alone vs. Partnering**

[60] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 242

The most common way for opening up new locations abroad is to go the way alone. But it can be useful to involve old familiar or local partners in joint ventures, acquisitions, or sub contractions. Partners can support and simplify the process in many different ways. Furthermore, it can be very promoting for the own business to follow or enhance a customer in globalization. Most companies following a customer can open up new markets, and find new local customers.
The next figure shows when a local partner could promote or even enable business in foreign markets.

Figure 42: Indicators that Support is needed

However, companies should be very carefully in selecting a partner and use every possible legal safeguard to prevent any surprises. To minimize surprises, especially where legal systems are not very reliable, companies should always use three measures to prevent this:

- **Control:** Companies should have a minimum 50 percent share, install a third party as a neutral mediator, or have de vacto or veto rights
- **Management and leadership:** Companies should fulfill positions of influence with people they trust and who are familiar with local conditions.
- **Collaboration incentives:** Incentives beyond the joint venture can safeguard the commitment of the partner.

In **Appendix 3** is a short story about why to choose the right partner.

2.3.3 Human Resources Management (HRM)

The primary task of the HRM at new facilities is to recruit as many local suitable personal at low cost with the requested skills. But technical and management expertise mostly in emerging or new industrialized countries is very rare and can lead to big problems.

As a result companies send a high amount of expatriates to the new location and this often exceeds over the ramp-up phase. This procedure is very costly and takes a high share of investment. The question therefore is how to achieve a good ratio of assigned local staff? The key is to spend much more on training of local stuff than average. The ProNet study[61] showed that successful companies spend twice as much than less successful ones do on spending into local trainings as expatriates.

Figure 43: Additional Staff Expenditures for a Site Star-Up Abroad[62]

Filling skilled and executive positions need some fundamental staffing strategies to meet local conditions and should be right mixed on a case-by-case basis. Therefore firms can adopt three basic strategies filling skilled and executive positions:

Expatriate-oriented staffing	Jobs staffed by experienced managers from the parent company (expatriates)	- When initially ramping up production - When taking over manufacture of products or manufacturing processes from home factories - When using the location to supply other markets and factories (parts manufacture)
factories (parts manufacture)	Jobs staffed by (newly recruited) local managers	- For simple or locally adapted manufacturing processes and products - When production is already up and running - When using the location to supply the local market
Cross-country staffing	Jobs staffed by experienced managers from a branch in another country	- When taking over products and manufacturing processes from locations in other countries - When using the location to supply other countries - At multinationals

[61] McKinsey/PTW (ProNet analysis)
[62] McKinsey/PTW (ProNet analysis)

		- When suitable staff are available for posting internationally

Figure 44: Approaches to Staffing New Locations Abroad[63]

Higher level positions should be filled with a more detailed mindset and positions should be tailored to each new location:

Criteria	Advantages of local managers	Advantages of expats/managers from other countries
Personnel Costs	- No foreign service pay or reimbursement of costs for trips home, etc. - Low salary level in LLC's	- Potential lower salary level from other countries
General Skills and Qualifications	- Better knowledge of local customer requirements and business practices	- Skills and qualifications conform to standards and management techniques in the home country - Better availability of qualified and experienced staff
Product and Manufacturing Know-How	- Better knowledge of manufacturing processes suited to local circumstances	- Knowledge of existing processes (important to ramp-up phase) - Knowledge of company-wide best practice
Integration and Communication	- Development of local specifics, and supply of information about local requirements to company HQ	- More efficient communication with corporate HQ and home factory - Better contact with central departments
Management and Control	- Stronger tendency to develop independence	- More efficient involvement in centralized decision-making processes - Typically high loyalty level because intend to return home
Personnel Development	- Creation of a local management team	- Targeted further development of most suitable staff possible

Figure 45: Assignment of Local Managers[64]

[63] Figure based on McKinsey/PTW (ProNet analysis)
[64] McKinsey/PTW (ProNet analysis)

Selecting of suitable staff for work abroad is difficult and can be solved or alleviated by implementing a targeted recruitment and a human resources development program via systematic planning. Expatriates should therefore suit following points:

- Functional expertise with a broad technical knowledge
- Ability to built a company and relationship network
- High level of intercultural skills and awareness, as well as the local language
- Personal situation (family, stress tolerance)
- Suitable job profile with specific strengths and weaknesses

However, high-quality preparation is crucial to the success of any assignment abroad. Any weakness found in the selection process should be worked out in suited training programs, like trainings in the language, country specific information's, or collections of documents for best practice or meetings with expatriates in the region. Preparing expatriates for the heavier functional and cultural demands they will face, is a worthwhile investment. An action plan for this should be started 3 months in advance and acquire location specific knowledge.

Figure 46: Staff Preparing Schedule for a Posting Abroad

A good way to get local skilled workers and executives up to the company's standards is to work in mixed teams at the new facility on one position. That means to allocate one position with two persons simultaneously – one an expatriate, the other a local manger. Temporary tandem or mixed management means local knowledge can be retained and know-how transferred, both at the same time.

To attract suitable employees in LLC's it takes fare more effort than the standard HR management initiatives in HCC's. Standards of education are usually lower and even qualified candidates tend to be unfamiliar with advanced technologies and management processes. Further points are a high staff fluctuation and the attractiveness companies have for potential candidates.

2.3.4 Ramp-Up of the Production

The aim in a ramp-up phase is to achieve full capacity and the usual quality as fast as possible. Companies going through this have to expect, losses, downtimes, and delays in the production process.
The quickest companies manage to reach their quality and production targets in just 4 months, slower ones do the same on average in 14 months and some companies need up to 3 or 4 years. Global leaders in the ramp-up phase plan this phase carefully beforehand by evaluating the situation and taking the right strategy and measures.

Winners are working through questions in advance:[65]

- What is the best way to organize the start of production?
- Which equipment should be adopted from the other location?
- Who is responsible for what? (packaging, transport, un-packaging, building-up, installment)
- How can delivery failures be avoided? And so on…

However, delays are inevitable, especially when new persons, new suppliers, or even new products are provided. The ProNet survey showed that 5 percent in delay should be calculated with.

Figure 47: Planned and Actual Ramp-Up Curve[66]

Some examples for causes of delays:

Loss of production:

- Rejects due to incorrect operation of the NC machining center

[65] Abele, Meyer, Näher, Strube, Sykes (Global Production, 2008) p. 261
[66] Mckinsey/PTW (ProNet analysis)

- Interrupted supply of utilities (electricity, gas, water, etc.)
- Logistical obstacles to the supply of materials (e.g., accidents, delays at customs)

Ramp-up delay:

- Delays in coordinating with additional production line
- Training of machine operators scheduled at short notice
- Delay in commissioning transferred machine
- Sample production for customer approval

Production downtime:

- Design changes
- Poorly reassembled machine
- Insufficient supply of spare parts
- Materials held at customs
- Late discovery of quality defects in materials supplied

Developing a strategy to the ramp-up phase complexity and sequential introduction should be focused. A sequential introduction of products and manufacturing steps can reduce deviations, better detected and solved. Due to preselection of the product portfolio and production technologies complexity can be significantly reduced in the ramp-up.

Ramp-Up Variants

- **Mode 1 – Sequential product launch**

If applicable, this mode enables staff and suppliers to prepare themselves successfully for new requirements due to the products. This mode should be preferred for mass products, production lines with long setup times or general for more complex portfolios.

Figure 48: Sequential Product Launch[67]

- **Mode 2 – Parallel Ramp-Up**

In this strategy all products are launched simultaneously. This needs simple products, high skilled and trained staff; therefore it is only applicable in very specific cases, like sport shoes, household appliances and simple polymeric products.

Figure 49: Parallel Ramp-Up[68]

- **Mode 3 – Minimum Complexity and an Out-Leveled Ramp-Up**

This mode reduces the complexity of every step to a minimum and enables a successive employee training. This approach should be used for very demanding processes and products. However, this mode includes a very long ramp-up and therefore only a late realized economies of scale.

Figure 50: Out-Leveled Ramp-Up[69]

- **Mode 4 – Sequential Process Launch**

This mode introduces production steps sequentially but products simultaneously. This Ramp-up therefore enable manufacturer to in traduce very complex and divers manufacturing processes with high quality requirements and it also enables a simultaneous market launch. This method it especially used in cell phone production migration starting with the end of the value chain. The new production is therefore producing high-quality right from the start.

Figure 51: Sequential Process Ramp-Up[70]

[67] McKinsey/PTW (ProNet analysis)
[68] McKinsey/PTW (ProNet analysis)
[69] McKinsey/PTW (ProNet analysis)

To decide about the right ramp-up phase, is overall crucial to the howl success of investment. Once the ramp-up strategy is chosen, further other value levers should be taken:

- Enlist active support from suppliers
- Choosing local equipment manufacturers for repair and spare parts
- Involving suppliers in the quality assurance process
- Staff trainings at home location (cutting corners)
- Linking wages to reject rates
- Binding careers to the location performance

2.3.5 Equipment Transfer or Purchase

One of the main effecting points to the costs of a new location is weather the equipment should be shipped from the old location or purchased. To decide this we have to distinguish between standard machinery, automated systems and complex system of the process industry.

For no more needed standard equipment it is usually cheaper to transfer it, as to sell it and buy new at the new location. Automated systems could, if applicable, be bought at local supplier. In some countries like China or Malaysia, thus to governmental subsidies, there are a lot of good suppliers available. Complex systems of the process industry should be shipped, to avoid surprises in the production and for long term utilization. Production downtimes can cause significant losses and high costs.

Figure 52: Comparison of Machine Transfer and Purchase[71] [72]

Once the decisions are taken of transfer or purchase, additional steps have to be taken:

[70] McKinsey/PTW (ProNet analysis)
[71] McKinsey/PTW (ProNet analysis)
[72] Standard mashine center, transportation from Germany to China

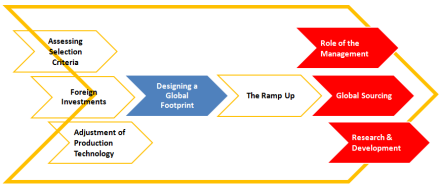
Process steps	Tasks	Success factors
Planning	- Inspection of halls and machinery - Detailed removal plan	- Planning of optimal export and import sequence - Mobile workshop - Traffic route planning
Disassembly	- Documentation - Dismantling - Cleaning	- Machine overhaul - Machine status report
Transport	- Packing - Loading - Fastening - Shipment by truck/sea/rail - Unloading	- Individual packing where necessary - Presence of special hoisting equipment - Insurance
Reassembly	- Placement - Alignment - Installation	- Modification to local condition (elect., air etc.) - Monitoring by foreman from disassembly team
Internal/external acceptance	- Performance test - Acceptance inspection - Machine capability - Process capability	- Experienced staff on site

Figure 53: Transfer Steps of Equipment and Machinery[73]

Companies in this process should be aware the loss of production and should initiate necessary steps. Companies have to plan additional capacities and bridges due to these losses, like to increase capacity in advance (extra shifts), built reserves, or use fluctuations in demand for short-term downtimes.

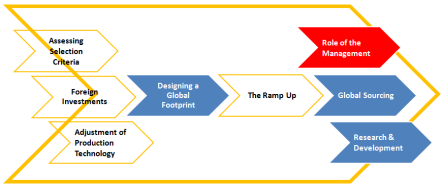
[73] Cf. McKinsey/PTW (ProNet analysis)

2.4 4th Phase – Sustainability-Phase



This phase mainly contribute to large enterprises, because of the large number of approaches, functions, and tasks. It should help companies to adopt the right structures, processes and give additional thoughts for the mature phase of a new location.

2.4.1 Role of the Management



Making a decision about a potential new facility abroad is not just a decision about the strategic design and the systematic setup. Operations and tactical management is just as crucial and becomes more and more important in a growing globalization. The new location has to be integrated into the network and crucial decisions have to be made. This should be done in a step-by-step approach, leading to a totally independent and accountable strategic business unit.

The globalization makes a professional SCM (supply chain management) necessary, as well as, it increase distances, service and quality level expectations, the number of variants, and the costs of inventory. Companies working with a proficient SCM can achieve significant competitive advantages and can reduce their costs by optimization their distribution network and managing their transportation intelligently.

Implementing **best practice** in a global context, because of the physical proximity, which makes it hard to overcome cultural and language barriers, **means to implement a uniform standard of how things are done**. Best practice means to establish a standard language for communication in the operational process or guidance for managers globally in standard procedures and problem solving techniques. Best practice is also the creation of the right KPI's (key performance indicators) and their rigorous tracking.

Designing the Organizational Structure

The most common organizational structure in today's world is the divisional model. There are several more complex models like the matrix organization or a hybrid organization with strategic business units. However, all this models have to be adapted to the new location; and as more complex they are, the more complex it get. This is so important to the fact that small projects often do not get the needed attention of the top management, leading to slow solving in case of problems and slow decision making.

Avoiding this, companies can implement a three-phase adaption of the organizational structure.

1. **In the ramp-up**: The **top management** should be responsible for planning and implementation of the new location. As a direct response, they have to be connected without any between steps to the local managers with regular reporting's and committee meetings. This approach is fastening the decision process and can reduce the conflict of interests between production, purchase, and R&D. This critical phase may also require a bundling of responsibilities, by putting one person in charge of the entire project or region.

2. **In the stabilization phase**: With the start of production the requirements through the organization are changing. Cost target are getting into the focus reducing scrap rates, improving the processes and quality by riding the economies of scale. In this phase competences and responsibilities should be slowly passed to **local mangers**, by simultaneously implementing a supporting management system.

3. **In the Mature phase**: In this phase the requirements of the new location are align with the requirements of established locations – profitable growth. This mainly means companies develop new products, to open up new customers and segments. Companies should therefore swift to a more **entrepreneurial structure** and get more competences, to work as an **individual division** and develop cross-functional skills.

	Phase and Level of Integration	Location	Operations
1.	**Focus: Regional/Ramp-Up** Ensure the ability to develop new markets and swiftly capture factor cost advantages	- Flat hierarchy - High degree of top management attention	- Low level of technical expertise - Inefficient due to high level of decentralization - Very close to customers, individual problem solving
2.	**Focus: Functional/Stabilization** Stabilize and utilize global synergies; grow rapidly	- Focus is solely on production: no focus on market requirements	- Incentives to tap economies of scale
3.	**Focus: Divisional/Maturity** Return to original structure (divisional)	- Low level of responsibility: no top management	- High level of technical expertise - Conflict of interests minimized

Figure 54: Phased Organizational Structure[74]

However, companies should as well define the level of independence of their new factory. This has multiple causes, but the most important are to reduce conflicts, short-term risk and the level of ability to work independently. Working on this requires organizational changing abilities of the new location and the empowerment abilities to change of the home organization. The simplest form of organization is the service center, with a minimum of independence, and the most independent, is the strategic business unit, which can be legally and logistically separated from the all other businesses.

[74] Own figure, Pictures: Global Production 2008

Degree of independence	Service Center	Cost Center	Profit Center	Strategic Business Unit
Criteria	- Criteria are always fulfilled	- Costs can be allocated efficiently and with reasonable accuracy - Expected to utilize freedom to make cost cutting decisions/ maximize efficiency	- Revenue and costs can be allocated efficiently with reasonable accuracy - Expected to utilize freedom to make decisions - Free market exists and is accessible	- Must already be competitive - Expected to fully utilize freedom to make decisions - Business unit can be separated legally and logistically
Advantages	- Corporate synergies can be tapped without conflicts of interest between the centers	- Greater motivation to control and reduce costs	- Greater motivation to increase revenues	- Greater performance pressure/ competitiveness provided by external market participants

Figure 55: Selection Matrix for the Degree of Independence[75]

The core behind this selection is to reduce costs. Global leader use this matrix to decide about centralization of the product design to gain R&D synergy and economies of scale in machinery procurement/ purchasing.

Global production leaders are generally more centralized to lower their costs via synergies and economies of scale. The next figure shows the results of the ProNet survey to the degree of dependence.

Figure 56: Degree of Dependence[76]

SCM – Supply Chain Management

[75] Own figure; Cf. McKinsey (Global Production 2008)
[76] McKinsey/PTW (ProNet analysis)

As production and the howl network's footprint grow, the demand for supply chain management is going to climb. Managing the global production network does not only means to create structures; it also includes designing organizational processes. Therefore supply chain management plays a key role as informational coordination becomes much more difficult in a global context.

The main task in SCM is to coordinate the flow of materials and information between (material) sources, (internal and external) production steps, and the customer. So that SCM mainly focus on relationships between the logistical structure, transport management, the exchange of data within the network, and cross-factory production planning.

SCM Challenges

The three main drivers in growing the demand of SCM:

- **Transport costs rise**: Due to more and longer transportations the cost of tied up inventory and transactions are growing. As well as, customers are getting higher in there demands of flexibility and robustness, which can lead to more costly transportations and supply commitments.
- **Complexity**: Due to the increase of operational control and planning and due to varying conditions in different countries, complexity becomes a major factor. The logistic chain becomes more prone to disruptions driven by more transactions (more loadings/unloading, varying transport charges and cross-border routes).
- **Language and cultural barriers**: This is usually to most underestimated topic. Cultural and language problems can lead to significant problems in speed of bureaucratic between parties involved or in the process of finding a solution for an existing problem.

That means that in a more globalized world, transportation leads to an increase in inventory of transits, and therefore to less flexibility, reliability and speed of customer supply. Supply chains are getting less robust, due to growing geographical distances. Furthermore safety inventories are getting higher and higher.

In a world where terrorism is growing, a small attack to global supply chains can lead to significant delays or interruptions throughout all existing supply chains.

However, Logistic costs as a share of total landed costs is increasing by more than the transport costs alone, it is furthermore a global parameter in economics of scale. Managing economics of scale in transport and inventory can considerably reduce costs and capture synergies for company-wide integration.

Supply Chain Portfolio Management

This portfolio is roughly divided into three sections sourcing, production, and distribution over a strategic or tactical basis:

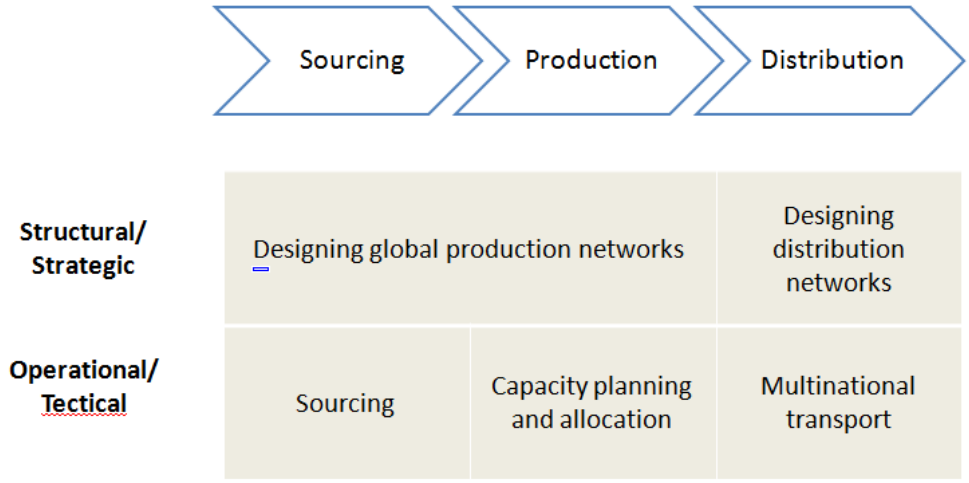


Figure 57: Optimization of the Global Supply Chain[77]

Designing global production networks is the object of the chapter 2.1 and 2.2 and will not be further discussed. Sourcing in the context of operational and tactical design will further be the topic of chapter 2.4.2.

[77] Source: McKinsey (Global Production 2008)

Designing Distribution Networks

Ensuring high ability and performance of customer supply makes efficient design throughout distribution networks essential weather in internal or external distribution logistics. The key is to develop a strategic planning and to evaluate the various options. Analyzing and optimization normally reveals 15 to 30 percent reduction potentials over the howl system. But this needs a strict and rigorous implementation because of the rapidly growing markets and fast changing conditions.

To measure the level of performance in distribution network, adequate key indicators have to be implemented. The most important are how customer's deadlines and volume requirements are fulfilled. These are indicators "normally" customer rate their suppliers:

- Customer delivery lead times
- Reached service level
- Delivery reliability

Due to Volume structures, economies of scale, delivery requirements, and product characteristics the key question is which products or services are best delivered to the customer by which way. There are some main characteristics:[78]

- **Resource-to-order**: Resources will only be installed, rented, called in when there is an actual need/ demand e.g. contractor projects
- **Make-to-order**: Resources are mostly in place, the start of production is trigger by the customer order.
- **Assemble-to-order**: Subassemblies are pre-produced and are finally assembled according to an actual customer order.
- **Make-to-stock**: Production lead times being longer than customer's expectations to delivery lead times, goods are make to stock.

Longer delivery times allow greater flexibility, decrease depreciable costs, and enable a better control of the production.

However, there are more factors which influence the options for transportation:

[78] The World of Operations (Hieby Consulting, 2009)

- **Volumes per customer:** Combined use of different transportation shipments (lorry, truck, etc.), ensuring cost-efficient transport.
- **Economies of scale:** General increase in volumes should be planned in, as transport cost decrease per unit.
- **High requirements:** Customer more and more rising there expectations due to the transport (Just in Time JIT, Just in Sequence JIS, etc.), this demand can lead to uneconomical transportation.

Furthermore the transport network has to be measured and proved to vehicle efficiency, capacity utilization, detour factor, and the number of handling events. To identify the best form and mix of transportation the best way is to make a clustered analysis of products and their key characteristics. That means to analyze the number of consolidated levels of transactions between production sites, warehouses, and logistical suppliers; and the inventory level of consider products. Out of this companies should operate their own transport network, even so, when using logistical providers' transport. This cluster analyze is high complex and should be made by companies specialized on this.
Global acting companies know the painful fact that distribution networks include tied-up capital costs, which can be often higher than the actual transport costs. Therefore, transport management is a necessary task in every supply chain. But this task can be easily switched to external services, which implement routing and all operational tasks.

Strategic Capacity Planning

As companies usually are used to plan their production in advance, this, especially in global productions, should be also implemented in a strategic global production program. This should be a system to manage complexity in a global production planning and should be therefore be distinguished into three planning horizons:

4. **Strategic planning:** Planning over years or decades (target planning)

5. **Tactical planning:** Planning over months (production program planning)

6. **Operational planning:** Planning for the actual period (Shop schedule or detailed plan).

This strategic capacity planning enables an advanced adaption of the SCM to the howl production network, avoiding surprises by the inclusion of unforeseeable events. This method is known from technology managemental programs – the technology roadmap. Fundamental to this proceeding is the choice of the right target parameters for capacity planning.

	Interval	Planning horizon	Unit of time	Product	resources
Strategic planning	Yearly	10 years	Month	**Series**	**Factory**
Operational Planning	Yearly	3 years		**Design**	
Short-term planning	Monthly	current year			
Monthly production plan		1 month	10 days		**Section/ area**

Figure 58: Global Production Program Planning[79]

Special Logistics in Emerging Markets

The landscape of logistic providers in emerging markets is highly fragmentized. Only in China, there are more than 5 million registered trucking companies and much more are

[79] DaimlerChrysler / McKinsey (Global Production, 2008)

unregistered. That means more than 2/3 of the logistical providers are small companies with less than 5 trucks. Thinking about the traffic situations in China or India, the size of the mainland in China, you can get a feeling for the challenge of managing logistics are in this fast growing countries.

Figure 59: Commercial Vehicle Ownership Structure in India[80]

Companies who want to enter the market should study the market structure in detail and implement a new approach in pioneering and development of logistical providers, or should empower them in optimizing there structures.

However, delivering in HCC's is not the same like in LCC's. Delivering customers in LCC's, means a multi-layer system, sometimes with more than 10 or more steps from the manufacturing to the customer. These steps can contain one specific way of transportation with different third-party logistics (providers, carrying, and forwarding).
Furthermore, a save transportation often cannot be guaranteed, due to the fact that this small companies will mainly overload there truck to gain most as possible utilization and cost reduction. This proceeding includes unpredictable events with high dangerous impacts through the production company.

Divergences in logistical operations to LCC's:

- Much higher share of manual labor (packaging, transportation, loading, unloading, low level of standards and safety).
- Overloading (cause of quick truck payback and tough competition): Serious concerns for international companies due to accidents, road damages, and unreliable transportation.

Distributers in emerging markets are not only logistic providers. As most shops and businesses are small and family-owned, they function as credit providers. As well as, distributors, retailers and shopkeepers are typically very close and have developed very well established business practices. These businesses are normally in-transparent to outsiders.

[80] Source: Asian Development Bank estimates / McKinsey (Global Production, 2008)

Companies should be patient in developing new distribution ways in emerging markets and should follow a more differentiated approach, remembering that markets mature at different points of time. Mainly this structures in retail and there distribution change with de development of the GDP per captia.

Figure 60: Development of Organized Retail[81]

Key Issues and Best Practice in the Logistic of Emerging Markets:[82]

- **Overloading:** Overloading is a hazard and illegal. However, it is difficult for companies to act alone to enforce compliance. Enforcing compliance is generally difficult: It can make distribution costs 50 to 100 percent higher than those of local competition and will still not provide any guarantee that truckers actually do not overload and use the higher freight rates to boost their profits. This problem should be address to industry associations and government lobbyists.

- **Palletization:** Start introducing pallets for handling in your own and directly controlled warehouses and movements between your own and directly controlled locations. Be prepared for palletization, but **do not try to be the first** to introduce pallets and other loading devices. Customers are not used to it and will not be able to handle them and will often not return empty pallets.

- **Unorganized retail:** Small shopkeepers and street businesses will require credit, and only pay for goods once they have been sold to the end user. This process is very difficult to handle for international companies. Most companies will have to rely on local distributors with experience in the sector.

- **Distributors and stockists:** Do not underestimate the role of distributors, which goes beyond logistics in areas such as **credit management**. Often these distributers are a form of underground criminality. How hold the howl business of supply of an area in their hand. Develop a plan and gradually eliminate layers of distributors. If

[81] Morgan Stanly, Mckinsey (Global Production, 2008)
[82] McKinsey (Global Production, 2008)

distributors or stockists are organized in industry associations, manufacturing companies should align their actions. Trying to break the power of these associations alone can have disastrous consequences. Manufacturers may find their products boycotted or restricted by the government.

- **Exports from LCC's:** Aim for "ex-works" or "FOB (free on board)" trade terms with vendors and consolidate goods in the country of origin. Locate as many value-adding activities as possible in the emerging market to capture the maximum cost advantage, e.g., labeling, packaging. Optimize container loading and routing. **Deliver direct** to the store or customer in the destination country wherever possible.

- **Imports into LCC's:** Aim to locate value added in the country of destination. Make trade terms dependent on which organization can obtain better rates with forwarders or carriers.

- **Supply chain management: Categorize goods** and **supply chains** to define the optimal mode of transport, consolidation structure, and inventory holding points. Use criteria such as value density (the USD value per unit of weight), demand volatility, and criticality to determine the optimal mode of transport and supply chain structure. Define clear switches between local supply chain management in the LCC location and the management of international volume flows. Local distribution requires local management up from the ground. Better to outsource local distribution as a whole if such supply resources are not available. Ensure that both your own organization as well as logistics service providers communicate well along trade lanes at an operational level for international transport flows.

- **Selection of logistics service provider (LSP):** Invest time to understand the capabilities of providers and how they are integrated with their subcontractors. Make sure your provider actually has control over critical parts of the transport chain. Use a scorecard with multiple decision criteria, rate, reliability, ease-of-use, speed or inventory reduction, innovativeness of provider or helpfulness in developing new solutions that assist in reducing costs.
  Place greater emphasis on reliability and innovativeness than price when bidding for comprehensive logistics solutions in LCC's: A provider that supports you in

optimizing inventory and flow, handles your goods carefully, and prevents them from getting lost, can be worth a lot and more. Companies that require special logistics services such as cold chain logistics or the transport of valuables should plan way ahead. Testing the solution before “going live” should be a common practice in these cases.

- **Contracting:** Monitor the spending by service type, local warehousing and distribution, airfreight, ocean freight, air express, trucking, etc., and by trade lane. Bundle volumes and bid for them by region and service type. Enforce compliance with the framework agreement to remain credible in negotiations with logistics service providers and realize lower rates. Allow local organizations to opt out of the framework agreement only to realize innovative logistics concepts, the use of international trucking instead of airfreight. Otherwise, strictly enforce and stick to compliance.

- **Expand your reach:** Use an LSP to jointly enter attractive areas of the product value chain, spare parts, return and repair services. Combine OEM brand with the LSP’s reach and capabilities to achieve a unique competitive advantage.

Managing supply chains in emerging markets need therefore two advantages. **First**, management needs the right people and contacts with the access to know how to make things work in a non-transparent and chaotic environment. The topic to this is how much control can be delegated to local staff of time. **Second**, management has to be prepared for changes and be ready for the next phase of development. This needs a good knowledge of the local market and the ability to draw parallels to the past developments of other market spaces.

Establishing Standards in the Production System

As global companies know, exchanging knowledge, experience, and best practices among global locations is really challenging. Physical distance, cultural, and language differences have to be overcome. Everything from the level of automation and staff training has to be

adapted to local conditions to gain best practices. Management has to work as an intermediate between different locations to ensure the development of process improvement abilities, transfer and implementation from one location to the other.

The most important way to do so is to implement to the global production system a lean manufacturing system, to aim to eliminate all existing non-value-adding steps (waste or muda (Jap.)) in kaizen activities developed by Taiichi Ohno, this process is also called continuous improvement process (CIP).
To implement a successful production system are mainly tree steps to go:

1. Develop the production system itself (technical requirements for processes and production technology).
2. Build in and development of the skills and experience needed to apply the production system.
3. Implementation of the system throughout the howl global factory.

The best way to implement a production system is to start a lean transformation project in two phases: a design/ pilot phase and a rollout phase.

Design and Pilot

In this phase companies have to develop their own customized system tailored to its own company-specific structures, concepts, and terminology. It starts with detailed blueprint and working models of highly efficient manufacturing processes, to be rolled out across the howl production chain. This requires a lot of time and a systematic analyze of the current production system and operating data, in combination with a launch team of engineers and experts. The analyzed opportunities within the specific processes and technologies are than combined with the relevant tools and techniques of the production system. The goal is to maximize the benefits of the howl system. The key is to avoid waste of any kind.

Another further step to improve the production process is to analyze the flow; it helps to identify current waste and is a vital prerequisite for designing a production system. The measurement throughout this shows weaknesses in the supply chain in which the production function is integrated.

The next figure shows an advanced business process mapping technology, also known as Value Stream Mapping (VSM). There are further more programs and technologies available. To name the most important, ARIS[83], and MEGA.[84]

Figure 61: Material and Information Flow Analysis (MIFA)[85]

Rollout

The rollout should be started with a stepped implementation, not all at the same time, to ensure a built-in time of implementation. This offers several advantages:

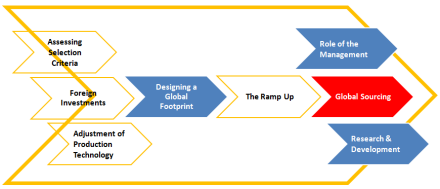
- Experienced managers can train staff and oversee the start-up, at numerous plants, and can self benefit from the learning curve
- But most important to this are the involvement of the staff. They have to be convinced of the importance of the effort and sustainably changed in there ingrained behaviors.

A leak in an appropriate implementation of staff can endanger the entire rollout. Therefore change management processes have to be communicated and appropriate measures have to be taken to ensure employees' identification with the project objectives without negative attitudes.

Ounce these methods of a new production system have been implemented, the main task is to ensure sustainability through continuous use to quality the results achieved. After all improvements should be recognized, and reworded to motivate and continually strive to improve the process. Measuring the performance of these process key indicators could be implemented in-line with corporate objectives.

[83] ARIS by IDS Scheer www.IDS-Scheer.com and the software AG
[84] www.MEGA.com
[85] McKinsey (global Production, 2008)

2.4.2 Global Sourcing



In most industrial production the material costs have the biggest share of total cost of the product. This means companies how want to use the howl potential of a global network, in addition to having their own manufacturing sites, have to source their materials most cost-efficient globally. Actually, this cost savings make foreign investments so attractive in the **long term**. But this task needs a lot of patients and intuition. Companies need to spend a lot of time in selecting and building up of new suppliers. Therefore a planned organized process is needed of identifying the potentials to realize this savings.

First companies have to develop an adequate sourcing strategy, beginning with segmentation of the material groups required. Over each group has to be decided; whether or not it will be sourced at the existing supplier. Furthermore, risks and process implications have to be factored into the decision criteria.

The process of local sourcing should be implemented in two phases. First, to realize quick wins, there have to be sourced the parts and materials who can be reliably supplied without intensive preparation and training. Secondly, starting when the production is smoothly running, more complex parts can be sourced locally. Companies in this process have to refine there capabilities in their own sourcing organization in the local environment as well as supplier skills.

Importance of Sourcing

As material costs make a large share of total products manufacturing costs, the integrated optimization of production also include the suppliers' network.

Share of product's manufacturing costs[86]	
Electronic products	70 - 80 %
Automotive industry	50 - 60 %
Pharmaceutical Industry	20 - 40 %

How greatly companies underestimate this topic, can be seen as only e few companies have implemented a systematically local sourcing. Companies normally obtain their suppliers from their home country, and taking therefore the home prices to the new location. Mainly it makes sense to build up local sourcing for parts with a low value density, where transportation costs quickly wipe out the advantages of the home base.

However, developing a local sourcing is often a more serious obstacle than setting up the production site itself, caused of the poor infrastructure, low qualifications and technology skills in products and processes, as well as, lack of international practices in expectations and aspirations. As a result, companies tend to use their known infrastructures, than to build up a new one.

Management attention should be therefore focused on building up new local sourcing, as global manufacturing locations only become attractive when a local supply base has been established, by evaluating opportunities and risks with the greatest care.

Potentials

The main motivation for local sourcing is the additional saving potential; which can boost the economic viability of the entire project. As high developed companies now all have used their in-house production potentials, operating costs cannot be reduced significantly. Out of this usually labor costs in HCC's have only a share of 5 – 15 percent of production costs and Material costs account for over more than 50 percent of manufactured goods.

Figure 62: Share of Material Costs for Production in HCC's (Example Germany)[87]

[86] Source: McKinsey (Global Production, 2008)

Moving both production and sourcing to a LCC can realize potentials of over 30 percent.

Figure 63: Cost reduction Potentials for an Automotive Supplier from Relocating[88]

Challenges

One big hurdle to source in local environments is the lack of insights, transparency, and sensitivity of or to local practices, businesses, and culture. As well as, often experience local suppliers are limited or not existing. Furthermore, there can be cultural or linguistic barriers, differences through technical equipment, or lacks of trust.

Building up suppliers in LCC's needs much more costs and time than at HCC's. Companies have to provide appropriate support through their suppliers, generally working close in operations using companies' engineers as direct contacts for feedback loops and direct problem tackling **without** long journeys and interpreters.

Figure 64: Time frame for Building Up suppliers (Example: Injection Parts)[89]

Systematic Sourcing

Developing a network sourcing strategy, materials should be beforehand divided in segments of material groups by be sourced short or medium term and be bought at the same supplier. The main criterion through this is the cost potential, and factors of risk and complexity.

Using this, sourcing can be assigned to 4 segments:

[87] Statistisches Bundesamt / McKinsey (Global Production, 2008)
[88] McKinsey Company data
[89] McKinsey (Gloabal Production, 2008)

- **Strategic partnerships**: Technical complex components that are related to company's intellectual property should be bought at trusted and established suppliers
- **Global sourcing**: Standard components of high-volume should be bought at best price by whatever supplier worldwide
- **Local quick wins**: Simple parts should be sourced as quick as possible directly at the new location
- **Local supplier development**: Complex parts with the potential of local sourcing (targeted local supplier development)

First Phase

In the first phase in gaining quick wins locally, a systematic approach should be implemented to avoid the most common problems western buyers mainly disregard or overlook.
The next approach shows a clear process to define the end product and the roles of everyone involved:

The key to this all is to implement and establish a local sourcing organization, which can properly develop the location. Its tasks include:

- Market analyses and selecting local suppliers
- Negotiation and concluding contracts with local suppliers
- Managing the site's sourcing
- Coordinating local logistics
- Implementing test plans for quality management

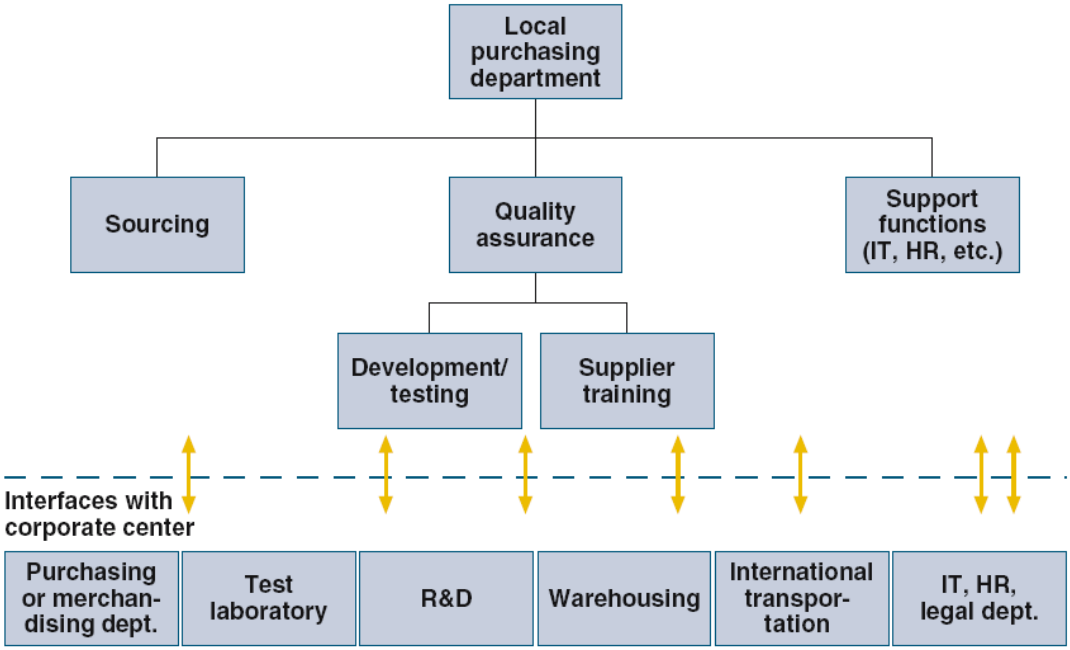


Figure 65: Typical Purchasing Organization in a LCC[90]

In the process of purchasing it can be worthwhile using external services providers for sourcing, because western companies are expected to pay an extra on sourced materials, cause of their known and expected fortune. This is also one of the main causes why LCC companies are so rapidly growing.

Second Phase

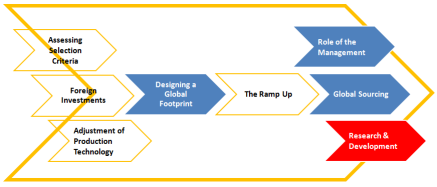
The second phase includes the sourcing of more complex parts and components once the local sourcing is one a solid footing. This phase will need both training of the local supplier and the own company, to gain the quality, reliability, and efficiency required for such a cooperation. Manufactures should also consider providing methodical training for local purchasers relating to production, quality, and management to tap potential saving in this phase. Furthermore, providing modern methods to local purchasers can create transparency on further cost reduction potentials.

Figure 66: Potentials from Supplier Development (India)[91]

[90] McKinsey (Global Production, 2008)
[91] McKinsey (Global Production, 2008)

Therefore, developing suppliers in LLC's can achieve fast, impressive results.

2.4.3 Research & Development (R&D)



As the R&D-expenses are not equal to the development of a company's turnover and R&D-projects getting more and more expensive with an unpredictable and low success, R&D has to change in a global context. The future is not driven by major technological innovations, changing the howl industrial situation; the future is about trends and about the innovative adaption of this.

Today R&D key factors are more about factor costs, market proximity, the access to top-caliber engineers and the knowledge about cluster. That is why the R&D of companies is currently not as globalized as production, enhancing the gap between production and R&D. This is also why managing the interfaces is becoming ever more important.

Therefore companies with a more complex manufacturing process and products with normal or high share of involvement of R&D should collocate there R&D and there production. Especially for more complex products, detailed analysis is required, to determine which aspects of the R&D process should remain centralized and which would bring more benefit from collocation.
But this process is depending on the local product design requirements and location specific production technologies, and therefore, various constellations are possible. Surveyed companies showed, that in a later period, it is advisable to expand from a pure production site to a center of competence with full product accountability.

In the future HCC's will continue to have high appeal for R&D. This is mostly to the established knowledge clusters of specific industries, mixed out of a high density of public and private research activities, together with suppliers, customers, competitors, and venture capitalists. However, this will change with the development of the emerging markets. HCC's

will continue to dominate product development in some industries, but others will see the shift of entire industries and clusters.

The next figure shows the development of the R&D in cumulated foreign investments with a sustainable trend and their main driving industries:

Figure 67: Cumulated Global Foreign R&D Investments[92]

Finding the Right Constellation

Any company opening up a global production structure has to consider how to integrate R&D. The interface between the two functions has to be balanced with the focused product strategy, target market and the production network.

Normally the R&D is located or implemented between knowledge clusters and markets, while production locations due to their factor costs are more globalized into LCC's.
The clue to this, the more intensive the interactions between R&D and production is, the more seriously collocation should be considered. There are two indicators in which collocation should be considered. First, a high level of product innovativeness, which frequently necessitates complex and detailed knowledge transfer between R&D and production, and there close feedback loops (Indicators: short product life cycles or many production ramp-ups). Second, the complexity of production processes, as high complexity always extent engineers interactions between development and production.

Designing the R&D Interface

R&D can be typically divided into 5 phases. All of these phases have a very different demand to the proximity to market and production. According to these phases there is a wide spectrum of possible solutions between a minimal and complete collocation of R&D and production. Choosing the right solution can lead to major development advantage in the

[92] McKinsey (Global Production, 2008)

global network and optimize efficiency and effectiveness in product innovation and complexity reduction.

Phase 1	Phase 2	Phase 3	Phase 4
Research	**Platform Development**	**Applications Development**	**Production Support**
	Process Development		
- Develop basic innovations (products, technologies, manufacturing processes)	- Development products platforms and standardized modules - Development manufacturing processes in parallel	- Adjust products to regional markets and customers	- Solve technical problems during ramp up - Optimize ongoing production

1. Option

Independent Networks with a Minimal Collocation: In this option, only a minimum of employees are based permanently or temporarily at the production location. This approach is particularly suitable for mature products which are already being manufactured at other locations.

Phase 1	Phase 2	Phase 3	Phase 4
Research	**Platform Development**	**Applications Development**	**Production Support**
	Process Development		
Indicators	- Products and manufacturing processes are not very innovative - Low complexity or limited number of manufacturing processes - Not much adaptation of products to specific requirements needed - Manufacturing processes are highly standardized		

2. Option

Collocation of the process development: The second option involves the developing production processes at the site itself. This is advised if processes need adaption to local circumstances, or are so complex that development support is needed even in ongoing operations.

<table>
<tr><td>Phase 1</td><td>Phase 2</td><td>Phase 3</td><td>Phase 4</td></tr>
<tr><td rowspan="2">Research</td><td>Platform Development</td><td>Applications Development</td><td rowspan="2">Production Support</td></tr>
<tr><td colspan="2">Process Development</td></tr>
<tr><td>Indicators</td><td colspan="3">- A cost-driven production site with site-specific manufacturing processes
- A independent development of products and manufacturing processes
- High complexity and high number of manufacturing processes
- Manufacturing equipment is different to other plants</td></tr>
</table>

3. Option

Relocation of application development: The next step is to transfer the application development. This approach is often used for highly market specific or customer specific products, and can be combined with option 2.

<table>
<tr><td>Phase 1</td><td>Phase 2</td><td>Phase 3</td><td>Phase 4</td></tr>
<tr><td rowspan="2">Research</td><td>Platform Development</td><td>Applications Development</td><td rowspan="2">Production Support</td></tr>
<tr><td colspan="2">Process Development</td></tr>
<tr><td>Indicators</td><td colspan="3">- Products need a adaptation to specific requirements
- Low complexity or limited number of manufacturing processes
- Manufacturing processes are highly standardized</td></tr>
</table>

4. Option

Relocation of platform development: Option 4 is to relocate product platform development to the same location, or the same region. This is relevant when the target market requires totally different product architecture (low cost product platform).

<table>
<tr><th>Phase 1</th><th>Phase 2</th><th>Phase 3</th><th>Phase 4</th></tr>
<tr><td rowspan="2">Research</td><td>Platform Development</td><td>Applications Development</td><td rowspan="2">Production Support</td></tr>
<tr><td colspan="2">Process Development</td></tr>
<tr><td>Indicators</td><td colspan="3">- Manufacturing processes and products are highly innovative
- High complexity and high number of manufacturing processes
- A constant need to adapt product architecture to local requirements</td></tr>
</table>

5. Option

Full collocation: Companies usually only reach for the full integration at long established locations that serve as a knowledge cluster for an entire sector.

<table>
<tr><th>Phase 1</th><th>Phase 2</th><th>Phase 3</th><th>Phase 4</th></tr>
<tr><td rowspan="2">Research</td><td>Platform Development</td><td>Applications Development</td><td rowspan="2">Production Support</td></tr>
<tr><td colspan="2">Process Development</td></tr>
<tr><td>Indicators</td><td colspan="3">- Time or location right for developing a new knowledge center of global significance
- Customer constraints require completely new solutions or products architecture
- Limited synergies within the research
- High synergies between research and production</td></tr>
</table>

Outlook

LCC's and HCC's already competing with another for the top scientists and researchers globally. Therefore, for new R&D locations should be chosen parameters like market requirements and local knowledge clusters to ensure a good amount of qualified staff. For example, Nokia and Motorola have set up a development centers in Chine's clusters with thousands of engineers to develop only specific mobiles for the Chine's market. As qualified staff in china and India is a tight up market, the wage level for high performers is nearly the same than in HCC's.
However, in some developing countries there is very large number and a good level of skilled engineers available:

Figure 68: Global Labor Market for Engineers[93]

As now emerging countries recognize, knowledge cluster like in HCC's have so far offered a better environment for development. Knowledge cluster create exponential dynamics through leading universities, state and private research institutions, specialized industry zones, and venture capitalists. Out of this self-reinforcing feedback, these clusters are difficult to replace anywhere else. To mention for example it the California's Silicon Valley for IT or the Stuttgart area for machine tool manufacturing.

As a conclusion to this, knowledge clusters will grow in their importance for future developments of howl industries, but other location factors will be even out. Therefore new markets will emerge in today's low-cost countries and education standards will converge. Countries have now the chance to develop region's leadership in a specific industry with further high potential for their future.

[93] McKinsey (Global Production, 2008)

3. Conclusion

Global Business Engineering will more and more become the reality at our todays live. Companies not adapting to the trend of globalization will face a disastrous consequences or the end. In mid- and long-term industrial manufacturing of goods will almost migrate to low cost countries. Companies ignoring this fact will lose their competitional power and will have to defend their own against fast moving and aggressive competitors from LCC's. Competition will get far more aggressive and totally unmerciful for those missing the trend.
Adopting Global Business Engineering is not an option; it is the only way for manufacturing companies to stay alive. Those who delay the process will be left behind and have to catch up with their more powerful competitors. Companies have to develop new capabilities and have to adapt to new circumstances out of the globalizational journey. Companies have to stick to transformation and have to have the sense of urgency and stamina to stay the course.
Companies realizing this will develop detailed metrics and measures through this organizational transformation both for the technical (Master Thesis) and the social infrastructures.

The concepts in this master's thesis need passion for value creation and the ability to convert concepts to detailed steps. This will bring up a new challenge in leadership, acting now with a precise look for the future.

Appendix 2

Parallel and Serial Multi-Nodal Transportation

Parallel: One part of the transport volume is shippt by one mode of transport, while the rest is sent by another. This parallel use of transportation can lead to a reduction of 50 percent for good with a middle high value desity[94] by reducing safty inventories.

Serial: One shipping mode is taken for on part of the way, while another method takes the goods the rest of the way. This is propebly used in every company, but only rarely in comparison to other transportational possibilities.

[94] Middle till high value density: EUR 15 - 80per kilogram.

Appendix 3

Choose your Friends Carefully: How an SME was Exploited by its Joint Venture Partner

A mid-sized mechanical engineering company established a plant in China as a fifty-fifty JV with a local partner in the 1990s. The two parent companies each appointed a director. The foreign company's director had no experience whatsoever of business practices in China. The Chinese partner was very quick to supply staff, but they all needed training. The partner also helped plan the manufacturing processes without actually contributing any know-how worth mentioning.

Within a matter of weeks after production had started, all the local employees handed in their notice and switched to a neighboring location belonging to the Chinese partner in the joint venture.

They had procured exactly the same machinery and plant without the knowledge of the foreign company. Production was able to start immediately with these now semi-skilled employees – without involvement of the foreign firm.

The foreign company failed in its attempt to assert its claims against the joint venture partner through the courts. It paid dearly for its lack of local experience: it had placed too much trust in its partner and had no effective means of applying pressure. What is more, it had failed to look for a partner without any conflict of interest.

Joint venture failures could be prevented by deploying an assertive managing director with appropriate intercultural skills, and giving the local partner an incentive to collaborate over the long term (by only gradually disclosing technical details).

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