Technical University of Denmark

DTU

Successful global product development
A Guide for Industry

Herbert-Hansen, Zaza Nadja Lee; Ahmed-Kristensen, Saeema

Publication date:
2011

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

DTU Library
Technical Information Center of Denmark

Successful global
product development:

A Guide for Industry

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INDEX

PARTICIPATING COMPANIES

WHITESTONE, LLC your bridge to value creation

SAUER DANFOSS

TM-Innovation

Thrane & Thrane

And:

Windex

EHVIID - Consulting

Force Technology

LEGO

FLSMIDTH

novozymes

DESIGN THIS WAY

attention

HEMPEL

Valcon

DANCHIP

GlobalConnect

Danfoss

Vestas

Design Ideas

COMSOL

novo nordisk

IPU

RADIOMETER

KAPACITET.AS

SIEMENS

GN Netcom

ALECTIA

nne pharmaplan

Demeco

ARTLINCO

ROCKWOOL

DISSING | WEITLING architecture

Introduction

Advances in technology (e.g. the internet, telecommunication) and political shifts (e.g. the collapse of the Soviet Union, fewer trade barriers and an enlarged European Union) have led to increased global competition and new markets. Companies in Denmark and around the globe are increasingly being pressured on price and for a faster time to market. At the same time new markets are appearing and many companies are seeing changes and shifts in their main markets.

These factors have enabled the rapid growth of companies globalising various business activities throughout the product development process from research and development (R&D) to production.

Global product development is when a company has their product development activities globally distributed. Today many companies have all elements of the product development process, from R&D to production, globally dispersed. When talking about a global product development process and global product development in this guide, we therefore refer to the whole development process as the following definition shows.

Global product development process
The globalisation of tasks and activities throughout the product development process, from the start of the process of the fuzzy front-end and R&D to manufacturing and maintenance activities.

This is often done through offshoring and outsourcing.
Several definitions of these terms exist. In this guide the following definitions will be followed:

Offshoring
Moving a task or function to a facility owned by for example a Danish company to a low-cost country (e.g. India, China, Brazil).

Outsourcing
Moving a task or function to a facility owned by another company – often a local company to a low-cost country (e.g. India, China, Brazil).

The challenges within global product development lie in the coordination between the different external and internal organisational units that make up the global product development process.

This guide is based on a review of available global product development literature and methods proposed in consultancy companies and in academia. Furthermore, it is motivated by case studies carried out in Danish and international companies (Hansen, 2011), and is based on a series of workshops with Danish companies carried out in 2011. While the best practice examples are fictitious: these are based on experiences observed in the companies which have participated in this research project.

We hope you will find this guide useful,
Zaza Nadja Lee Hansen and Saeema Ahmed-Kristensen

Aim with this guide

"How can a company ensure success and competitive advantage in the new global product development process?"

This is the fundamental question companies are faced with today. Globalisation impacts all aspects of the product development process. How teams work together, how to communicate and how to lead in the new global development process.

This guide presents a way of thinking about and handling global product development, which is targeted at decision makers, practitioners, product managers and team leaders.
Use of the guide will aid in managing the global product development process and view it in a holistic manner while keeping the overall business goals of the company in mind.

The guide will help to create an overview of what global product development entitles, identify the key challenges and, create consensus in the company about how to achieve this.

By following the guide, you will be led through a detailed approach where you can identify the management style and approach which is best suited to fulfil your company's goals with global product development.

Who is this guide for?
The guide is aimed at daily managers, practitioners and decision makers involved in the decision making, implementation and management of a global product development process. It provides information on best practices within global product development as well as on common pitfalls. Furthermore, it provides details on the current trends and patterns in global product development for Danish companies.

This guide offers a detailed framework from which a company can decide on key strategies for global product development as well as planning, implementation and evaluation of these activities. The framework was motivated by a number of industrial case studies (PhD research Hansen, 2011) and a funded project specifically to detail this framework to a useable guide. The guide aims to address the challenges found within the current approach to globalising product development. This guide therefore delivers new knowledge on current practices as well as how to improve these.

"

A guide is a great tool but it won't substitute for your own experiences. When you interact with a foreign culture you should make room for errors in your planning. It is difficult to make a flawless plan for something you do not know well.
Therefore, create an iterative process, appreciate your mistakes and learn from them. This is what you will be building your future success on.

Nils Toft, Director of Design Idea

Background and motivation

Globalising the product development process is a result of two main factors: (1) changes in markets and; (2) changes in geo-political conditions. These changes can overall be called globalisation. The first relates to the fact that new and emerging markets like China and India have risen in power and influence, that time to market for most products are increasingly becoming shorter and that greater cost pressures have arisen. Furthermore, many customers are more demanding in relation to product features, environmental concerns and innovation in each product generation. The second factor relates to the changes on the political scene where the fall of the Soviet Union, the rise of the European Union, changes in politics in emerging markets resulting in Foreign Direct Investment and other market investments, as well as technological changes e.g. the Internet, telecommunications and other media enabling quick and easy file sharing and communication across vast distances. These two factors combined have created possibilities for companies to globalise their activities; from R&D to production.

Globalising the product development process can bring significant benefits to an organisation.

Financial benefits
• Lower costs in relation to salaries
• Lower project cost
• Lower logistic costs

Locations close to markets and suppliers can reduce transportation and other logistics costs. While salaries vary between countries, these are often only a small part of financial expenses so reduction of other expenses will often show the most significant benefits from globalisation.

Colorbox

Operational benefits
• New competencies
• Resources with knowledge of the local market
• Increasing innovation heights
• Better resources
• Scalability and flexibility of resources

Globalisation gives a company the opportunity to acquire the best resources no matter where they are located. Furthermore, the company can in essence 'work around the clock' with product design or production continuing in a new location when one organisational unit leaves for the day. Offshore resources can also be used to increase innovation height. By getting additional resources at a cheaper price the company can explore new or more options for the local or global markets. Instead of driving only one concept forward, the extra resources can be used to drive several concepts forward. This maks room for a more risk-tolerant approach and hence, 'new' ideas are given a chance to survive.

Market benefits
• Close to local market knowledge
• Close to local suppliers, customers and competitors

Many companies are experiencing growing markets outside of their previously established markets. A strong local presence may be beneficial due to logistics and local market knowledge. These new markets in emerging economics often have several requirements to products which can include a certain percent of the product being produced in their country or a certain amount of parts being locally sourced. A local presence is therefore often needed. Furthermore, in some emerging markets, infrastructure and communication quality may still vary which means it would be beneficial to stay within a technological 'cluster' in that market to avoid delays and misunderstandings caused by these issues.

" *Outsourcing can be used as investment risk mitigation, for example new product categories with uncertain market potentials, where risk is shared with the outsourcing partner*

Claus Herrild Holm, Product Sourcing Manager, GN Netcom

The global company
Global by strategy or global by default?

For a company to be truly global it must develop a global strategy. As figure 1 shows a global strategy must address how to obtain a global culture, processes, structures and people (Yip et al., 1988).

To create a global strategy changes need to be made to structures, processes, people and the culture of the company in order to encourage and support the strategy. This change should follow change management practices. Using Kotter's eight step model for planned change as an example, change management consists of the following steps (Kotter, 1996):

1) **Increase urgency (create a 'burning platform')**
   → Inspire people to move, make objectives real and relevant.
2) **Build the guiding team**
   → Get the right people in place with the right emotional commitment, and the right mix of skills and levels.
3) **Get the vision right**
   → Get the team to establish a simple vision and strategy, and focus on emotional and creative aspects necessary to drive service and efficiency.
4) **Communicate for buy-in**
   → Involve as many people as possible, communicate the essentials simply, and appeal and respond to people's needs. Declutter communications - make technology work for you rather than against you.
5) **Empower action**
   → Remove obstacles, enable constructive feedback and lots of support from leaders - reward and recognise progress and achievements.
6) **Create short-term wins**
   → Set aims that are easy to achieve - in bite-size chunks. Keep numbers of initiatives manageable. Finish current stages before starting new ones.

7) **Do not let up**
   → Foster and encourage determination and persistence - ongoing change encourage ongoing progress reporting - highlight achieved and future milestones.
8) **Make change stick**
   → Reinforce the value of successful change via recruitment, promotion and make new change leaders. Weave change into culture.

Structure
• Centralisation of global authority
• Absence of domestic and international split

Management processes
• Cross-country coordination
• Global planning
• Global budgeting
• Global performance review and compensation
• International groups and forums

Ability to develop and implement a global strategy

People
• Use of foreign nationals
• Multicountry careers
• Frequent travel
• Actions and statements of leaders

Culture
• Global (vs. national) identity
• Worldwide employment
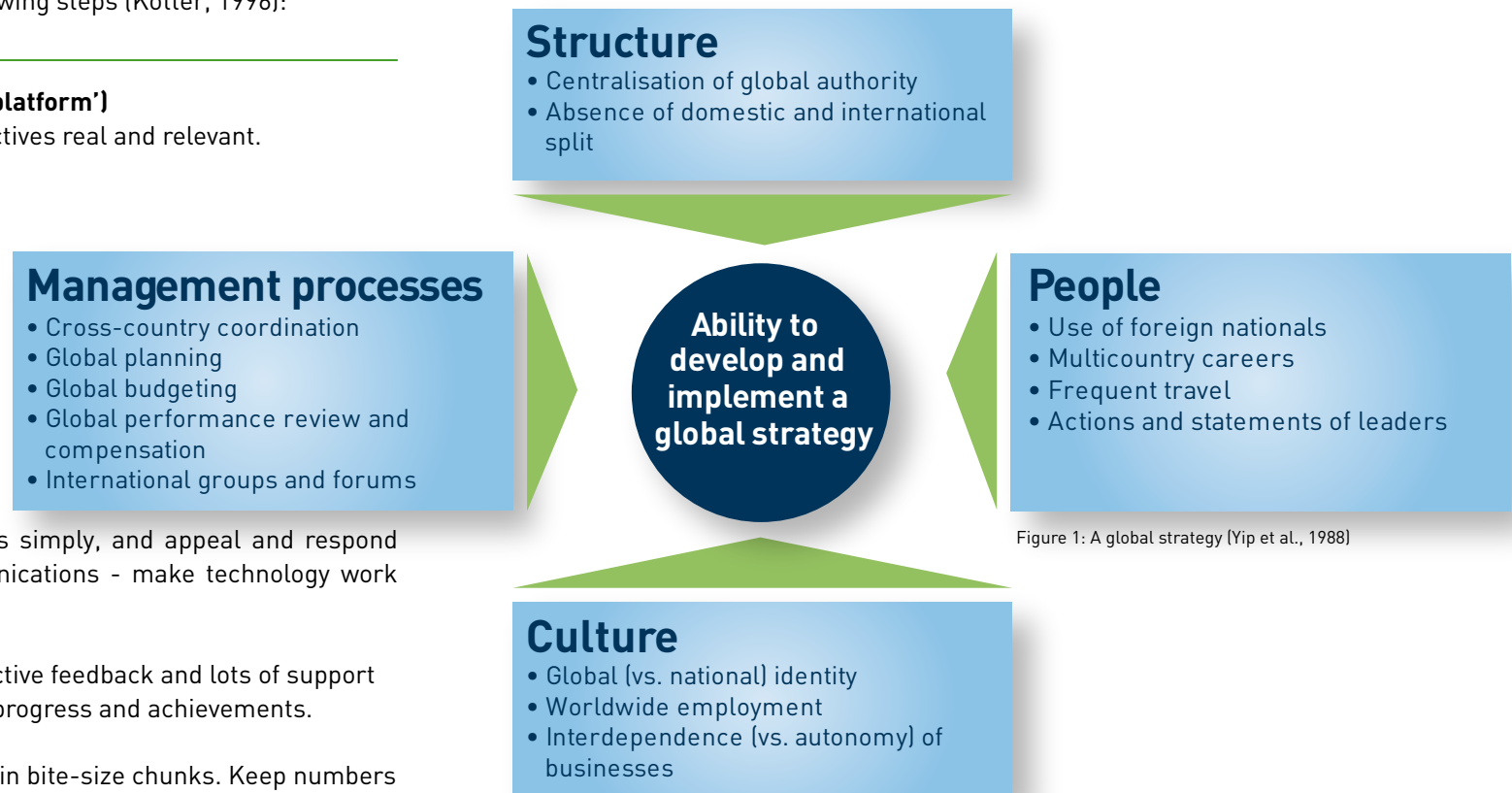• Interdependence (vs. autonomy) of businesses

Figure 1: A global strategy (Yip et al., 1988)

To implement a successful change it has to be implemented not only in the organisation's strategy but also in its processes, technology and people as detailed in figure 3 (Leavitt, 1965).

Theoretically companies can be in different stages of globalisation of product development activities , these are:

Stage 1: None
At this stage the company has no global operations. Few companies will be in this stage today.

Stage 2: Ad-Hoc
At stage 2 the company will have some global activities spread throughout the product development process but without any clear focus or strategy for the global activities. Most offshore activities will be of low-cost and routine assignments. Often decisions are localised and approaches to the global operations can vary between organisational units and departments.

Stage 3: Discrete Services
At stage 3 an increasing number of high-value tasks and activities are moved offshore. Furthermore, a more comprehensive strategy are often formulated from top management.

Stage 4: Co-development
At stage 4 companies co-develop with own and foreign units for more high-level tasks like product design.

Stage 5: Transformational
At stage 5 the company globalises throughout the product development process in a systematic way. In this manner, the whole organisation is transformed and becomes a truly global company.

Case studies of Danish companies have shown that today many companies are globalising throughout the product development process and increasingly more value-adding activities are sent abroad. In other words, the activities are often reaching stage 3 and 4. However, the management of these activities is often ad-hoc as described at stage 2.

Figure 2: An effective global company.

This guide will assist companies in determining their current approach to global product development and provide a systematic way to align the globalisation stage with the strategic, operational and tactical approach so that the organisation can gain the most from the possibilities with globalisation. (See figure 2)

"

A best practices for Global Product Development will be an important tool especially for companies having limited experience in the field as it is far from trivial running multisite projects

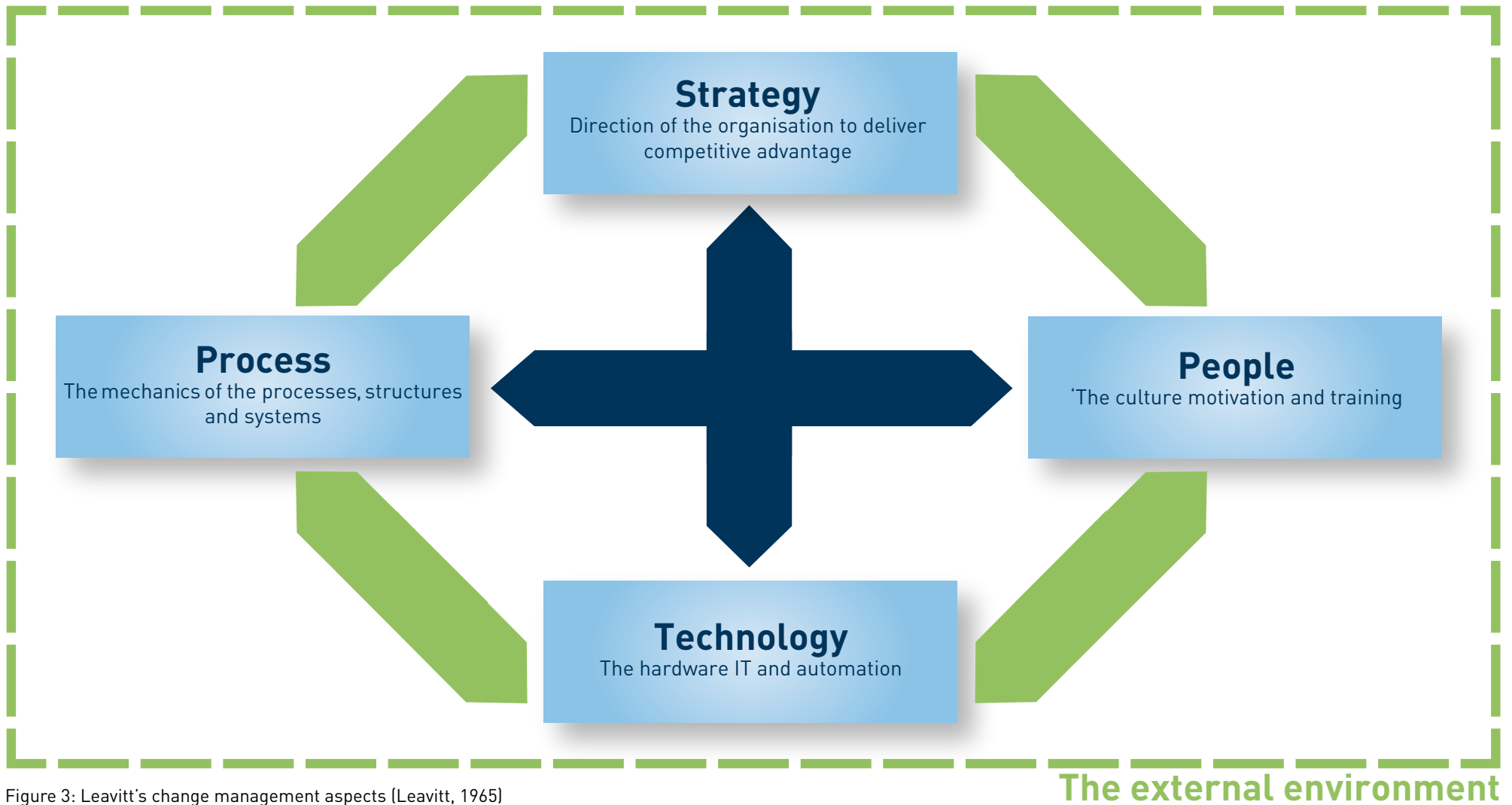Tommy Bysted, R&D director, Radiometer Medical ApS

Figure 3: Leavitt's change management aspects (Leavitt, 1965)

The external environment

Trends and patterns in Danish companies today

From our case studies and workshops several trends and patterns were noticeable in the way companies use outsourcing and offshoring as well as how the globalisation process is conducted (Hansen et al., 2011; Hansen & Ahmed-Kristensen, 2011).

Outsourcing is often conducted when the task is well-known and can be easily decomposed, the product can be easily separated into modules and can be easily communicated through explicit knowledge. It is also often conducted to gain specific competencies not found in-house or which are of better quality or price from outside providers.

Offshoring is used for many different types of assignments. It has the advantage of better IP security and the same organisational culture. Table 1 illustrates these trends.

> I am confident the principles in this guide will prove to be very useful in most aspects of off-shoring and out-sourcing for many types of organisations. While there is significant uncertainty in off-shoring and out-sourcing a strong feedback system is often needed and the GDM framework allow for this.
>
> Some experienced business leaders may read this framework and think to themselves 'this is nothing more than common sense', however, the struggles most companies experience with making globalisation work for them clearly indicates that common sense is not always so easy to implement in the moment; even if it may be clear in hindsight

Niels Erik Hansen, M.Sc.,Ph.D, President & CEO, Intelligent Hospital Systems

	Business aspect	Technical features	Motivation
Offshoring	Value-adding activity	Any	Any
Outsourcing	• None core competencies • Competencies not held in-house	• High degree of modularity	• Lower fixed cost • Specific resources • Flexibility • Scalability

Table 1: Trends for choosing offshoring or outsourcing

The globalisation process

Companies often globalise activitivies starting from the back of the development process, beginning with manufacturing moving to R&D, with low value adding activities mainly being outsourced and higher value adding activities often being offshored. In many companies this will mean the front-end activities are offshored and the back-end activities are outsourced (see figure 4). Exceptions are when outsourcing is done to gain specific competencies.

A company often changes from outsourcing to offshoring to gain better IP security or to regain core competencies which can be lost to the outsourcing partner. Whereas, moving a task from offshoring to outsourcing is often to gain flexibility, mobility and lower fixed costs.

Globalising the product development process often consists of four phases:

1. Motivation and strategy

2. Preparation phase

3. Implementation phase
   a) Complications
   b) Operational solutions to complications

4. Managing the process
   a) Complications
   b) Operational solutions to complications

Stages a) and b) were iterative as new problems were found and needed to be addressed. Therefore, for each activity moved abroad this process came into play. All these stages were influenced by the company's characteristics and the external context the company operates in (see figure 5).
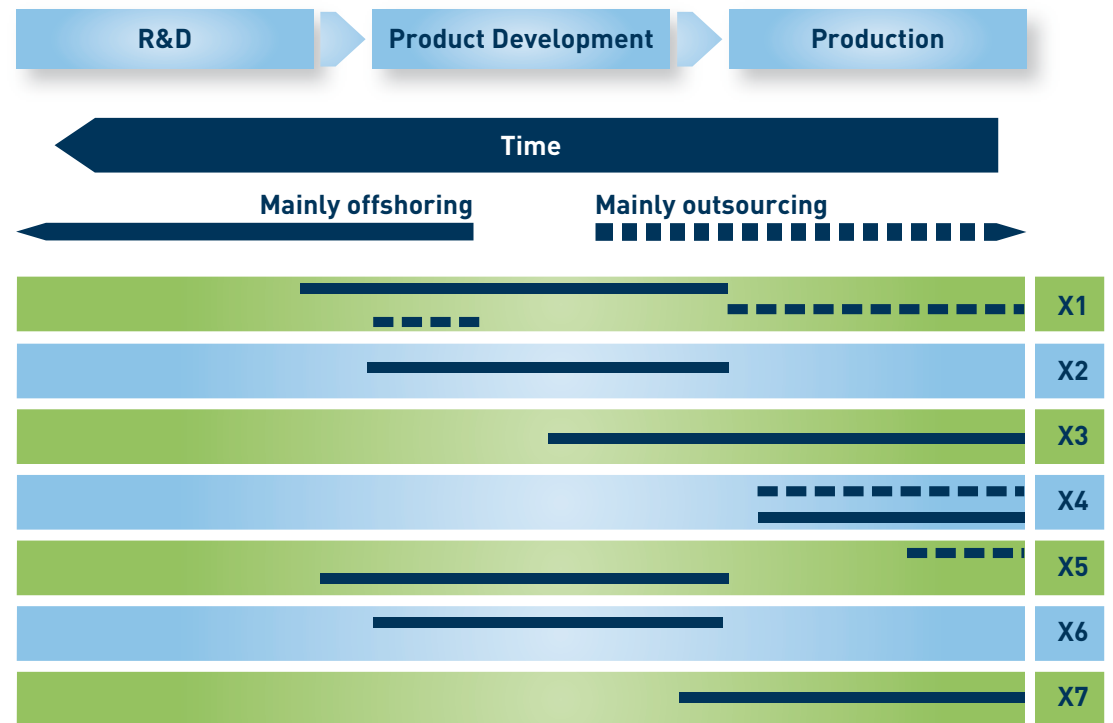
Figure 4: The globalisation process together with the patterns in the seven case studies (Hansen, 2011)

External factors which seem to have the most influence on the globalisation process are:
• Industry conditions
• Market conditions
• Motivation for globalising the given task or function
• Cultural differences between e.g. Denmark and the host country

The company characteristics which seem to be the most influential on this process are:
1. Organisational factors
    a. Experience with offshoring and outsourcing
    b. Organisational culture
    c. Organisational structure, including processes and leadership

2. Project factors
    a. Product modularity
    b. Process modularity
    c. Knowledge properties of the product

Company characteristics

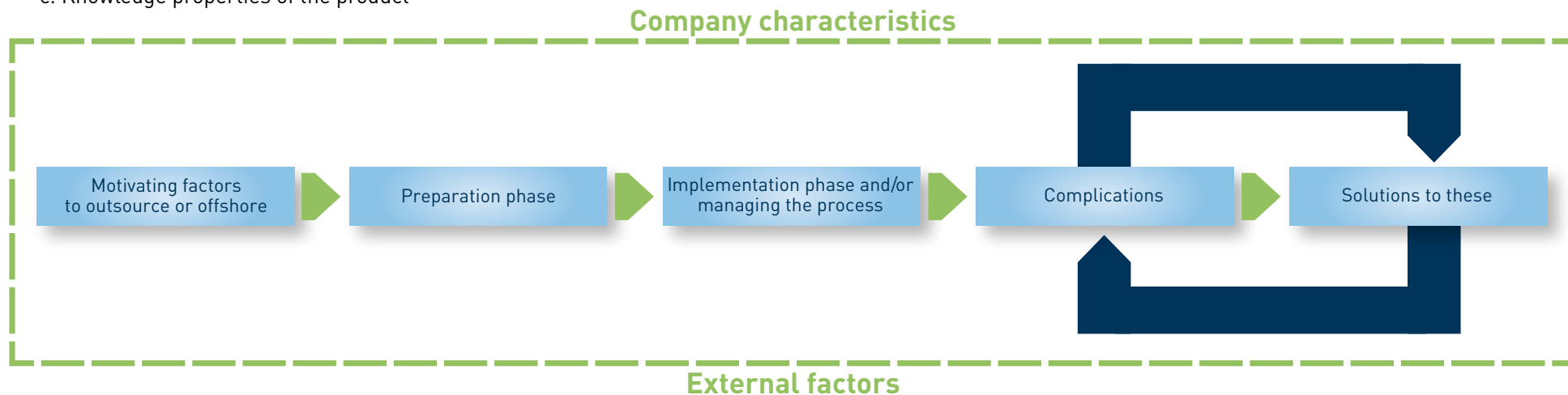| Motivating factors to outsource or offshore | Preparation phase | Implementation phase and/or managing the process | Complications | Solutions to these |

External factors

Figure 5: The current phases in the globalisation process observed from our case studies (Hansen, 2011)

Unsurprisingly, the easiest type of global activity to manage was when the cultural difference between Denmark and the host country was low and there was a high possibility for product and process modularity coupled with a low knowledge-intense product. This was due to the low number of interfaces which could all be explicitly explained and detailed. However, today increasingly more complex products and tasks are being globalised which indicates a need for an approach to also address complex global development tasks successfully.

The key challenges in globalisation are:
• Cultural differences
• Knowledge sharing
• Documentation
• IP rights and IP security
• Organisational changes
• Interfaces (organisational, technical and managerial)
• Lack of a common vision

These challenges can result in delays, low quality, misunderstandings and increased resource usage.
Certain challenges are more prevailent depending on the type of task or function that is moved abroad (see table 2).

Functional area	Challenge
R&D	• Staying innovative • IP issues
Product development	• Coordination • Knowledge sharing
Production	• Documentation • Knowledge

Table 2: Key challenges for selected functional areas

As can be seen from table 2, globalising R&D is prone to challenges relating to innovation and IP issues. Within product development, it is coordination and knowledge sharing which are the key challenges. For production it is often documentation and knowledge of how the current work process is carried out.

Some industries also have challenges which are more prevalent than others (see table 3).

Industry	Challenge
Electronic hardware	• Quality
Mechanical hardware	• Complexity
IT	• Work processes • Culture
Back office work	• Language • Cultural differences

Table 3: Challenges for different industries

For electronic hardware the key challenge is to obtain the desired quality level from the outsourcing supplier or from the company's own facilities. For mechanical hardware, complexity is often a problem. The more complex the mechanical elements are, the more difficult it is to explain them across physical and cultural distances and hencce there is a greater risk that the receiving staff does not understand the interfaces. For IT work the main challenges are a difference in work processes and culture. This influences communication and knowledge sharing and can create misunderstandings. For back office work, like payroll management, the key challenge can be the language – English is often a foreign language for all involved – and cultural differences, which means words and sayings can be misunderstood. It also influences how the work is done which means things which are taken for granted might not be understood the same way in different cultural settings. This guide first presents best practices on how to resolve the challenges within globalisation of the product development process. Hereafter, a framework which addresses these challenges in a holistic way throughout the entire globalisation process will be presented.

"

Challenges within global product development are in particular the cultural differences which can be observed in for example, upbringing, education and how to collaborate.

These barriers are not only present during the development of a product but also in connection with sales and marketing of the product.

On top of this is the physical distance between the product designers and product developers which makes collaboration even more difficult, in particular as most of this communication will take place in a language that is a foreign language for all involved.

Even though modern technology has opened many possibilities for virtual international collaboration, it still has not resolved the greatest challenge of them all; to get communication to work so a message is interpreted the same way for both the sender and the receiver.

Lene Sinkbæk Bjerregaard, project manager, NNE Pharmaplan

Best practices in addressing challenges

This section present best practices on how to address key challenges within global product development.

Cross-cultural collaboration

Culture can influence how we communicate, interpret verbal and non-verbal communication, how we view and approach work, work practices and how knowledge is shared and to whom.

A lack of consideration for cultural elements when implementing a global product development process can therefore result in misunderstandings and miscommunication, causing delays, quality issues and unnecessary rework.

Best practice examples include:

Education and training

- Educate Danish team-members and foreign team-members in each other's culture
- Sponsor Master level education in Denmark for engineers (potential employees) in the target country (for example as Danfoss does for Chinese engineers)
- Sponsor education in the target country (like FLSmidth does in Egypt to improve the availability of engineers with cement knowledge in that area)
- Invite foreign team members to work for some time in Denmark
- Use Danish expatriates abroad

Develop trust

- Face-to-face interaction is a good way to develop trust and address cultural differences and thereby lessen miscommunication and misunderstandings. Regular site visits, expatriation or inviting foreign employees for extended stays can provide this type of interaction.
- Develop a personal relationship through social activities face-to-face and informal talk in the beginning of virtual meetings can help develop trust
- Develop a virtual relationship through use of social media

- Deliverables can be used as a 'check of understanding' to ease communication and knowledge sharing
- Create cultural synergies through cultural understanding (for example through training in each other's culture) and use cultural differences creatively as input to new ideas
- Arrange for trust and relationship building through face-to-face interaction in all new teams. The Tuckmann model (1965) shown in figure 6 for group creation can be used to create a good team with a good foundation for trust. The better the team is, the better it performs. Therefore it is also essential to set the goals for the team; however whether to set the goals before or after the team is developed depends on the specific situation.

Embrace and respect the cultural differences. If you drive everyone to work as one uniform culture, you will fail to unleash the diverse talent. Don't be the arrogant "know it all" but get help to understand and harvest the strengths in the differences.

Clarifying the expectations and exercising positive control is absolutely mandatory in order to mitigate the risks of sharing your company's IP.

Richard Winther Lassen, NPI director, Trane Trane

Performing

Norming

Storming

Forming

Figure 6: The stages in Tuckmann's group development model (1965)

Knowledge sharing
Many tasks, and in particular engineering tasks, rely heavily on knowledge from many different areas and sources. In a global project this knowledge has to be shared across cultural and physical distances in a way that it is understood the same way for all the global employees involved in the project.

Best practice examples include:
• Explicit knowledge sharing through documentation is important as it is the easiest and cheapest way to share knowledge virtuelly. Focus on transforming all knowledge to this format is therefore often done, e.g. documenting production processes.
• The organisational IT-platform should employ simple interfaces (XLS, DOC, PDF vs. one universal system) to make knowledge sharing and documentation sharing easier and faster to implement as it is costly and resource-intense to create and implement a whole new system. This system can then be created later when resources allow and the project can be planned in detail with involvement from all stakeholders
• Milestone plan and small 'sprints' can be used to ensure an iterative learning process throughout the global project
• Expect failure and learn from them. This will foster learning and knowledge sharing. To be able to do this the organisation needs to develop a knowledge sharing culture. Many books on how to create such a culture exist. An example is Debowski (2006).
• Develop a network-actor diagram to represent who shares knowledge with whom. This can help understanding the impact on knowledge if changes are made to the current structure. In this manner, actions to improve knowledge sharing can be implemented. Several consultancy companies offer this service but the task can also be carried out in-house. Figure 7 shows an example of an actor-network diagram for communication in teams carrying out brainstorming (Badke-Schaub *et al*, 2009).
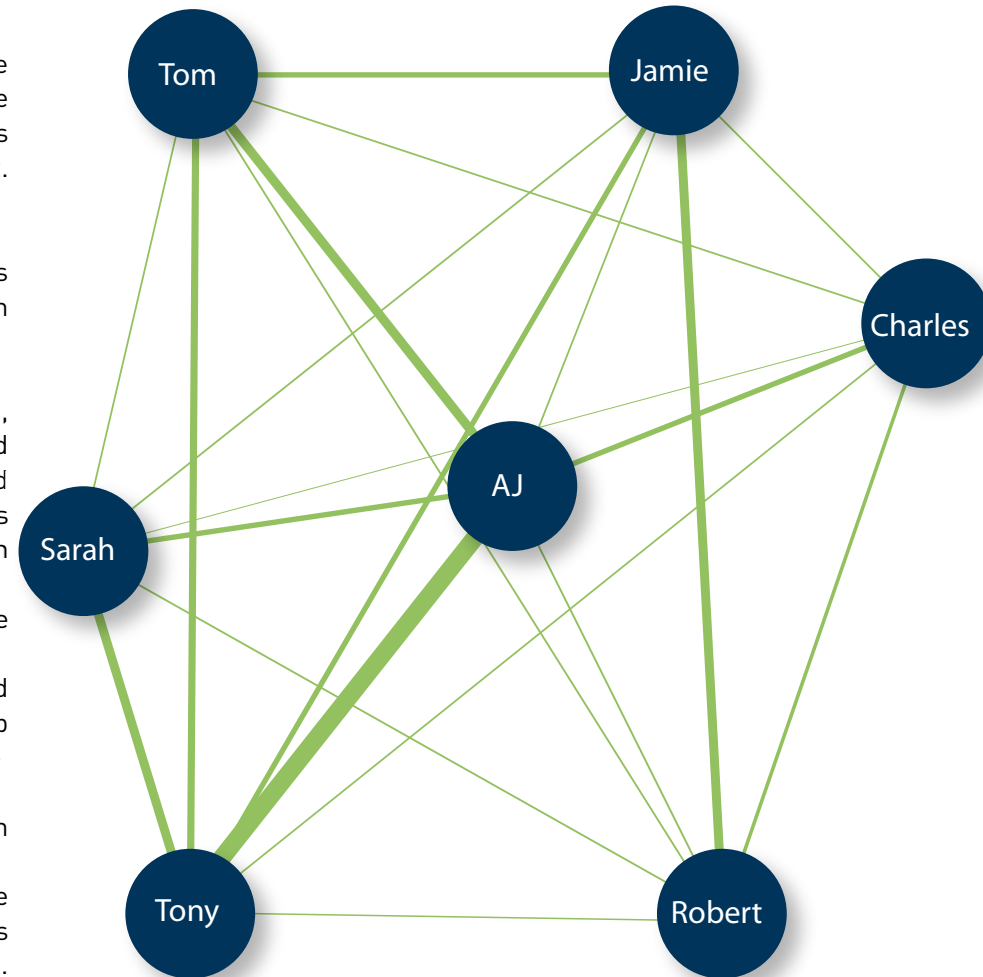

Figure 7: An example of an actor-network diagram showing team communication

Documentation

Documentation is a way of sharing knowledge through record keeping. It is often the cheapest and easiest way to share knowledge virtually. However, only explicit knowledge that can be easily written down can be shared this way (Wallace *et al*, 2005)

Best practice examples:
• Create and follow explicit work processes
• Share production and R&D documentation to ensure documentation is shared throughout the entire development process
• Conduct regular quality reviews of databases and documentation to ensure it is up to standard and continuously updated
• Make appropriate IT tools to share needed knowledge
• Run parallel processes to ensure quality and lower risk
• Use expatriates as "knowledge brokers" to ease communication and knowledge sharing between the headquarters and the foreign subsidiary
• Acceptance of specification changes can be made as a common frame of reference. This can ensure an iterative process so the product can include new knowledge of markets as well as technical areas

IP rights and IP security

Ensuring IP rights is often vital for a company to ensure competitive advantage. However, to obtain an innovative product collaboration with outsourcing partners, suppliers and subsidiaries around the world can be necessary. Different cultures and countries have different laws and approaches to IP issues. This can put a company in a dilemma between IP security and innovation.

Best practices include
• Strict control with suppliers and subsidiaries and the employees involved
• Different accesses to databases and knowledge between the members of the team

• Development of a trusting mutually beneficial relationship. Fundamentally There are two different approaches. One is to protect all information but this can reduce innovation and knowledge sharing. The other approach is to build a mutually beneficial and trusting relationship. This, however, takes more time and resources and involves a risk. No matter which approach is chosen it is important it is a conscious choice with full awareness of the risks and likely gains of the choice.

"

If you own documentation, then you own the product and the process-documentation is the key

Erling Hviid, owner, Ehviid-Consulting

"

Parallel cooperation between R&D and production in the early project phases is an advancement in speed and innovation and gives a good road map for R&D regarding choice of material and technical structure

Emil Piper, senior R&D engineer, Novo Nordisk

Organisational changes

The current approach to global product development means that once the task has been moved it is often discovered that current organisational practices, processes, approaches and structures can be in contradiction with the goal for global product development. These difficulties can be hard to resolve on the operational level due to the often large organisational changes involved.

Best practice examples of such large scale changes include:
• Consolidation of business activities
• Focusing on core competencies

Case study: Contradicting goals

One of the largest Danish companies has, over almost 100 years of it's existence, developed into almost as many sub-companies and focus areas. This had created multiple unclear – and at times contradicting – goals for each business area. The overall common goal setting was vague and not well understood throughout the organisation.

Explanation: The multiple contradictory goals can be a result of the company's current structures, processes and culture.

Lesson: A dedicated refocusing on what was found to be core competencies and a consolidation of business activities reduced these sub-companies to a handful with a common goal. This process was a large scale organisational restructuring process.

In the section "A successful global product development process", we suggest a way to address organisational changes early in the globalisation process so the costs of implementing changes can be lessened.

Interfaces

Interfaces of any kind – technical, organisation and managerial – means communication, interaction and knowledge sharing. In other words, a greater risk for misunderstandings and miscommunication.

Best practices include:
• Redefine the product to reduce interfaces (product architecture, and the creation of modules with minimal or clear interfaces)
• Make interfaces as explicit as possible (see documentation and knowledge sharing sections for more on this)

However, these practices may result in unforeseen negative impacts or be difficult to implement as not all interfaces are easy to define. In the section "A successful global product development process", we suggest a way to address interfaces early in the globalisation process so the costs of implementing changes can be lessened.

Quality

Quality is viewed differently in different cultures. Furthermore, misunderstandings caused by physical and cultural distance can add to issues with quality.

Best practice examples include:
• Some inspection onsite can be set up to ensure quality
• Introduce extra quality checks, or run parallel checks
• Regular meetings can be set up to ensure quality and understanding of project progress, work approach and goals

Lack of a common vision

When a global company creates a vision, it is often done in the headquarters, without input or consideration for the subsidiaries or other stakeholders. This can mean that the vision is not aligned with the market conditions, culture or products of the subsidiaries.

The key to move towards a common vision is to have all organisational units and relevant outsourcing partners comment on the vision developed in the Danish headquarters so it can be modified and aligned to the different markets and cultures. It is important to involve all stakeholders in the strategic debates so they have influence and thereby feel committed to the decision. Furthermore, it ensures the vision is understood and is easy to communicate across cultures. This turns a 'them and us' attitude into an 'us' culture. In this manner, cultural differences are used positively. It also allows for a dynamic approach to vision creation where it can be changed and adapted as circumstances change in the different markets (see figure 8).

Case study: Common strategy for global units

An engineering company had subsidiaries in Sweden, USA and India. The strategy for the company was developed in the Danish headquarters and communicated from here to the subsidiaries. The headquarters found that the subsidiaries did not follow the strategy as intended.

Explanation: The subsidiaries had their own culture and markets. The strategy developed in Denmark may not (1) have been communicated in a way so it was understood as intended and/or (2) the strategy may not be suited for the market and culture the given subsidiary was embedded in.

Lesson: It is vital that the subsidiaries are heard in the strategic process. This ensures commitment and fit of the strategy to the entire company. Furthermore, it ensures the strategies are modified to fit the different cultures and markets while still moving towards the same goals.
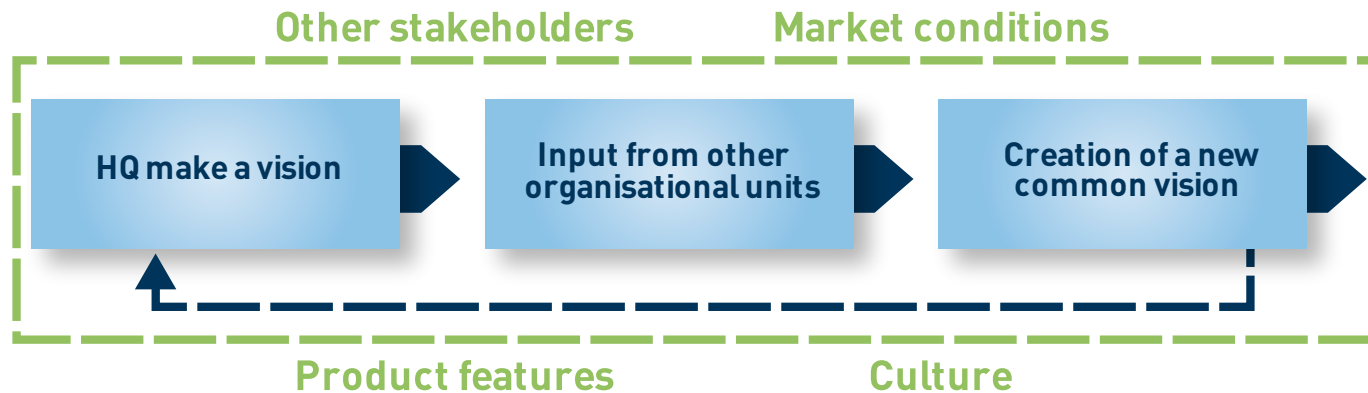
Other stakeholders   Market conditions

| HQ make a vision | → | Input from other organisational units | → | Creation of a new common vision | → |

Product features   Culture

Figure 8: Moving from a HQ dominated vision to a common global vision

"

The openess of the headquarters to revise the original vision in accordance to input made by other units is paramount to the success of creating a common vision

Christian Ernst, Project Manager, Dissing + Wettling Architecture

A successful global product development process

The challenges observed within global product development are based on two fundamental reasons; (1) a lack of preparation and (2) a lack of connection between the globalisation process and the rest of the organisation.

The Global Decision Making (GDM) framework (Hansen, 2011) is presented and expanded upon as a way to avoid the challenges within global product development through detailed preparation and a holistic approach to globalisation.

## The Global Decision Making framework

The Global Decision Making framework present a way to conduct a successful globalisation process through five iterative stages where stage four – implementation – can have many iterations as new knowledge is gained during implementation and changes are made based on this new knowledge (see figure 9).

"

It is an uphill battle to obtain a common vision in large companies, being unable to so is our definition of failure

Roy Nielsen, CEO and owner, Demeco

The GDM framework could thereby help an organisation avoid or minimise the challenges described previously. By using key performance indicators, a continuous feedback loop and learning, the change can be made to comply with the long-term goals and short-term planning for the organisation by discovering deviations early on and resolving causes for problems when they arise.
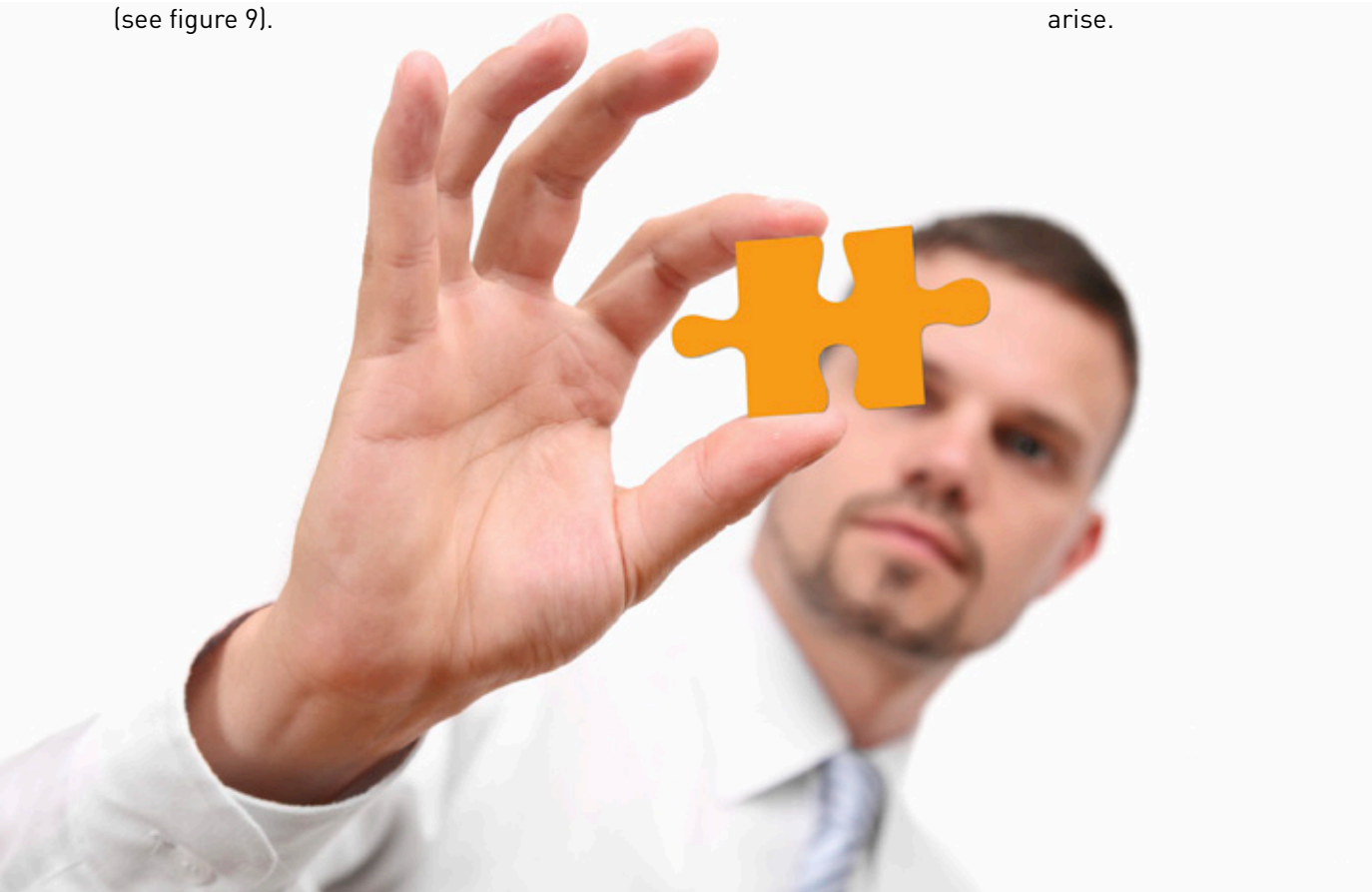
The five stages in the GDM framework each have multiple steps:

Stage 1: Strategic goal setting
1. Clarify the desired/ideal position for the organisation in the marketplace
2. Clarify key performance indicators (KPIs) for reaching this position

Stage 2: Strategic planning
1. Clarify the current position for the organisation in the marketplace
2. Clarify the gap between the current and ideal position i.e. the business problem the company seeks to solve through globalisation
3. Evaluate the best approach to move from the current to the desired position, including which factors encourage using globalisation as a tool to do so and which factors discourages this

Stage 3: Operational planning
1. Select the task to be moved abroad
2. Clarify the possible external changes and impacts due to moving this task
3. Clarify the possible internal changes and impacts due to moving this task
4. Select key performance indicators
5. Implement needed changes to the internal environment

Stage 4: Implementation phase
1. Move the task
2. Monitor key performance indicators
3. Implement changes if needed based upon the key performance indicators

Stage 5: Evaluation
1. Evaluate the key performance indicators
2. Implement changes to the organisation, global task or the key performance indicators in order to achieve the strategic goals set for the organisation
3. Re-evaluate the strategic goals regularly (around every second year) or whenever the key performance indicators indicate this is necessary

Depending on the strategic goals and the strategic plan one or several implementation phases may be needed (1-N on figure 9). Each implementation phase will be a change management project and will thus need operational planning in order to be carried out.

"

All politics are local. All customers are local. Consequently, the globalization of the product developmental process must create goods that meet local customer requirements. The companies that fail to do so may find themselves bringing a knife to a gun fight.

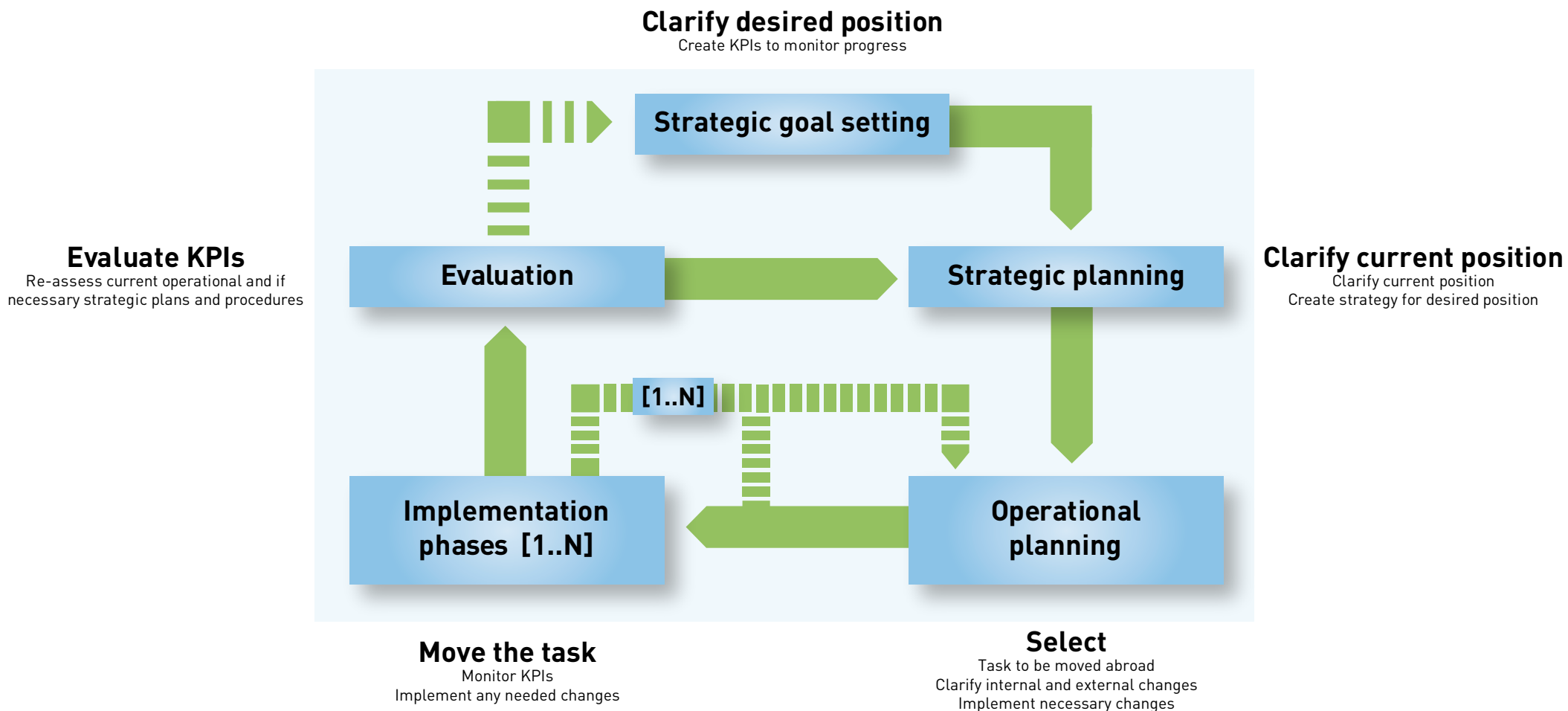Frank J Gallucci, Managing Director, Whitestone Associates LLC

Clarify desired position
Create KPIs to monitor progress

Strategic goal setting

Evaluate KPIs
Re-assess current operational and if
necessary strategic plans and procedures

Evaluation

Strategic planning

Clarify current position
Clarify current position
Create strategy for desired position

[1..N]

**Implementation
phases [1..N]**

**Operational
planning**

Move the task
Monitor KPIs
Implement any needed changes

Select
Task to be moved abroad
Clarify internal and external changes
Implement necessary changes

Figure 9: The GDM framework (Hansen, 2011) with detailed explanations added.

Stage 1: Strategic goal setting

In this step it needs to become clear where the company wishes to be in the future and how to measure the progress towards this at a strategic level.

Case study: Know yourself
In a large engineering company the executive leaders, department heads and project managers were asked what the core competencies of the company was. Everyone answered. Just not the same answer.

Explanation: The strategic goals for the organisation were unclear which made the employees think the company had different core competencies.

Lesson: It is vital that the strategic goals are clearly communicated and updated regularly to fit the market changes.

**The main challenges in creating this step successfully are**
• Unclear strategic goals
• Static goals

Many companies are busy with fire-fighting so taking time out to have a strategic goal setting meeting can be difficult. It can therefore also be difficult to find the time to regularly evaluate the strategic goals and keep them current and implemented throughout the organisation.

It is easier and faster to make strategic goal setting between few people and using few resources on it. These often become very value goals and thereby they rarely need to be changed but also say very little about the organisation.

However, this can create challenges in term of a mixmatch between strategic goals and operations, a lack of knowledge of the strategic goals throughout the organisation and the risk of different organisational units moving towards different goals.
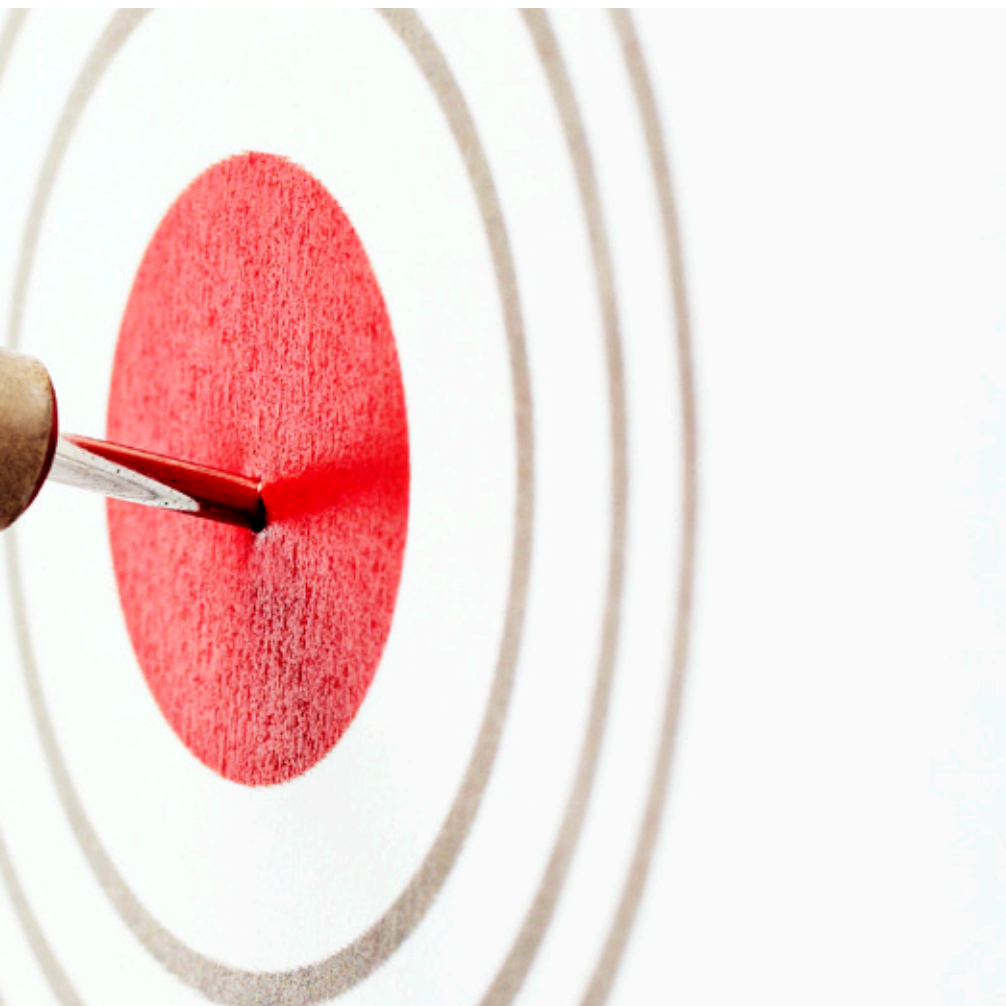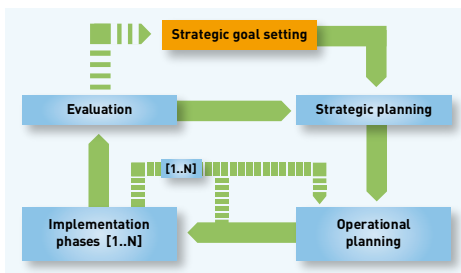
To be successful with this step the company needs to evaluate several factors. To find a desired future position the organisation needs to evaluate internal and external factors, past experiences as well as allow for brain storming sessions without practical or resource barriers. Hereafter, practical concerns can be added to the desired future scenarios created. The result after these intense workshop days will be the strategic goals and some KPIs at a strategic level to reach them over a defined period of time (for example if the goal is to be the market leader by 2020 then by 2010 the KPI may be to have 70% of the market, 85% in 2015, etc.).

To create a good strategic plan a company needs to:
• Involve stakeholders in goal setting
• Seek international, national, internal and external knowledge
• Think outside the box

Involving all stakeholders and seeking knowledge from internal and external sources can help an organisation discover their potential futures and thereby what goals the organisation could have and select the most advantageous. When doing so, thinking innovatively and creatively is vital in creating ambitious but realistic goals. This process can help create clear strategic goals for the business.

Important to remember:

• Consider many different potential futures for the organisation before selecting one and formulating clear goals to create that future

• Take the time to consider and debate strategic goals with all stakeholders

• Communicate the goals continuously to all levels and implement them in the strategic and operational plans for the organisation

• Evaluate the understanding, compliance and market fitness of the strategic goals regularly

STAGE 1
Goals

STAGE 2
Strategic planning

STAGE 3
Operational planning

STAGE 4
Implementation

STAGE 5
Evaluation

25

Stage 2: Strategic planning

In this step the strategic plan for how to move the organisation from where it is to where it wishes to be in the future is created. Key performance indications need to be created to evaluate the progress within a set time intervals towards the desired future position. The progress from the current position for the organisation to the desired position is incremental as it is continuously adjusted to new information.

Case study: Stay connected
In a large engineering consultancy company, the top management made a strategic goal which was to use more offshoring. They had an office in China and in order to offer cheaper services they wanted to use this office more. They had made a goal of offshoring at least 10% of the engineering work of all projects. However, this rarely happened.

Explanation: The engineers and managers in Denmark were evaluated and awarded based on how many hours they worked and billed to a client. Therefore, they did not feel motivated to follow the strategy.

Lesson: It is vital that the strategic plan stays connected to the operational level. If the strategy is not reflected in the operational tools, it will not be followed.

The main challenges for creating this step successfully is:
- Lack of connectivity between the strategic, tactical and operational areas of the organisation
- Lack of incorporation of the strategic plan in the organisational structure
- Lack of a strategic plan which considers the global product development process
- Goals interpreted differently by different organisational units

Daily fire-fighting often means strategic goal setting or strategic planning is not carried out. It is therefore unclear to the organisation's members what the current strategic position is, where to go and why. There is often not a dedicated debate about how to reach the strategic goals. How globalisation fits into this is therefore not openly evaluated. Furthermore, a global organisation is often created through many years of different strategic focus areas (e.g. mergers & acquisitions and/or core markets). A global product development process is therefore often emergent, a result of operational changes and clear short-term goal (e.g. 10% outsourced to China within 2 years) but without a detailed and dedicated debate about the impact and benefit of doing this.

As a result there is often no or little connectivity between the strategic, tactical and operational areas of the organisation. This means there is limited incorporation of the strategic plan in the organisational structure. Therefore, the strategic goals are often interpreted differently by the different layers of the organisation (if these goals are known across the organisation at all). In this way the company's strategic goals often become so vague they never need to change but also say very little about the organisation. A strategic plan is often not carried out; besides time pressure this is also because many companies currently engaged in global activities have a very complex current organisational structure (e.g. organisational units, outsourcing vendors, customers, partners and suppliers across the globe) which will take dedicated resources to map.

Therefore, this stage should include reflection on the global network the organisation is a part of (e.g. own organisational units, suppliers, customers), where they are currently located, how they interact and, how this could be optimised.

To create a good strategic plan a company needs to:
• Involve all stakeholders in mapping the current organisational position in the market as well as physical locations for organisational units, suppliers, customers, etc.
• Make a communication and a responsibility plan, including evaluation phases to ensure a common vision is created
• Make a conscious strategic plan which considers the role and goal with global product development
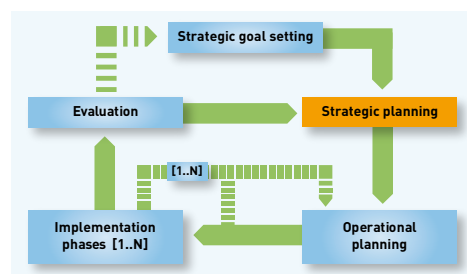
Going from the current position to a new position, is a change for the organisation. Considering this strategic move as a change management process can therefore be helpful in ensuring that best practices are followed. This also includes best practise within project management as a change project is a type of project – in this case a very large organisational project – the company is carrying out.

Inspired by best practices within change management it is important to involve all stakeholders from all organisational units in this process as it provides ownership, improves knowledge areas and improves communication of the strategic plan. This also means ensuring communication, creating clear roles and responsibilities for the further implementation of the strategic plan are key elements. Ensuring a clear strategic plan which considers a global product development process ensures that globalisation is embedded at the strategic level.

Important to remember:

• Know where your organisation is today

• Involve all stakeholders

• Consider many different potential ways to reach the strategic goals

• Make it an iterative process so the way to fulfilling the strategic goals can be corrected as new knowledge is gained

STAGE 2
Strategic planning

STAGE 3
Operational planning

STAGE 4
Implemen- tation

STAGE 5
Evaluation

27

Stage 3: Operational planning

In this stage a clear operational plan for moving out and maintaining daily operations are devised. This includes location decision, changes to the current organisational structures and processes, defining interfaces and processes for knowledge sharing in order to allow for a global approach in the product development process.

Case study: How did we get it to work before?
A large engineering company moved almost all production offshore to Eastern Europe. The financial analysis which indicated the amount of resources needed for the move was far exceeded.

Explanation: The documentation for the machinery was only in Danish and outdated. Updating and translating it took time and resources. Furthermore, a large amount of the operational skills were tacit, meaning they could not be written down.

Lesson: It is vital that scenarios for how knowledge is shared now and how it can be shared when the task is moved offshore are developed before the task is moved so the necessary processes can be put in place for sharing knowledge globally.

The main challenges to creating this step successfully are
• Organisational challenges
• Defining interfaces
• Knowledge sharing across distances
• Cultural differences
• Contractual matters

Organisational challenges are often a result of poor operational planning where the current organisational structures, processes and procedures are kept in place while a given task is moved abroad without reflection on whether the organisational aspects support the new global element. Knowledge sharing difficulties are often due to a lack of understanding of how knowledge is shared today and with whom. In particular, the tacit knowledge, the knowledge which cannot be written down into documents, can be hard to transfer and share across distances without conscious reflection upon its role and nature.

Culture – organisational, professional, national – influences the way we communicate, understand and perceive things. Difficulties are often due to a lack of understanding of how culture influences these factors so a common understanding across organisational units can be created.

Location decisions are often based on where the current growing market is as well as where the organisation already has a network (e.g. own organisational units and suppliers). However, a reflection on where the task would be placed if the historical legacy was not included and how the global network can be optimised to the current situation can be beneficial. This builds on the strategic plan created in step 2, where the desired global network for the organisation has been created.

If the organisation is outsourcing – e.g. moving the task to a foreign company – a contract needs to be developed. Outsourcing is often complicated by vague, unclear or ill-defined contracts which makes it difficult for the buyer and outsourcing company to reach a common understanding.

The main goal with this step is to understand the impact moving a given task will have on the internal and external environment so changes can be made before implementation which ensures an efficient move and continuous operation after the task has been moved out. In this step it may be discovered a given task is too resource-heavy to move or for other reasons should not be moved. In this case the previous step needs to be redone. This is the key of this iterative approach to globalise the product development process; to learn and adapt to new knowledge.

To ensure a good operational plan a company can:
• Involve all stakeholders in creating the operational plan
• Develop scenarios of what would happen if a given task is moved; what is affected and how would these elements (human, organisational and technical) need to be changed to support and encourage globalisation
• Write down how a task is solved today, who is involved and what knowledge each actor (human or technical) brings in order to define and clarify all interfaces.
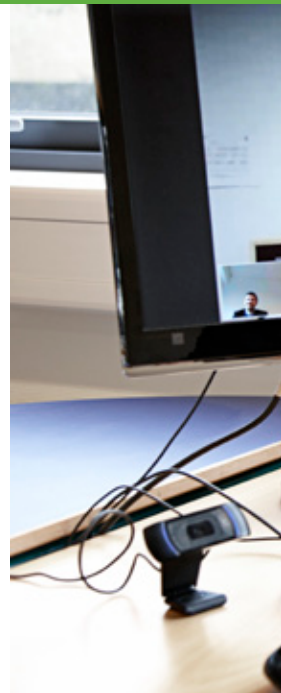
If a decision is made to engage in an outsourcing contact a company can:
• Involve all stakeholders in supplying information for formulating the contract
• Clarify the goal with the relationship
• Involve the outsourcing partner
• Consider cultural differences in contract formulation
• If it is not clear how the task is carried out today (e.g. lack of knowledge of interfaces and knowledge sharing) then it will be very difficult to move and even more difficult to move it abroad to a foreign provider. Many books on outsourcing contracts exist for further reading, e.g. Kimball (2010).

To create an understanding of how a task should function abroad it needs to be clear how it functions today. This includes knowledge aspects and interfaces. When these have been documented, a plan for how to move the task while ensuring these elements are considered can be created. Furthermore, by doing this it can also become clear which other activities and areas depend on input and knowledge from this task so that these interfaces and exchanges can be considered when moving the task.

• Consider all stakeholders in the process of discovering how knowledge is shared today, how it could be shared globally and what would be needed to make this happen
• Consider all stakeholders in decision making and implementation of tools to ensure cultural considerations in communication, to ensure ownership and to get a multifaceted perspective

Knowledge sharing is different based on culture. It is therefore important to expect failure and learn from them. It is also important to emphasize the need for trust. Trust needs to be created through social networking and proximity and also a sustained relationship building model needs to be created. The more interaction and interfaces; the greater is the need for a sustained relationship. This is a "learning by doing" process where the organisation must learn from its mistakes. These aspects need to be included in the operational plan.

Important to remember:

• Involve all stakeholders in the development of the plan to ensure knowledge, commitment and understanding of it.

• Define your interfaces (technical, organisational and managerial).

• Create scenarios for: potential impacts on internal and external factors if a given task is moved and how these impacts could be addressed
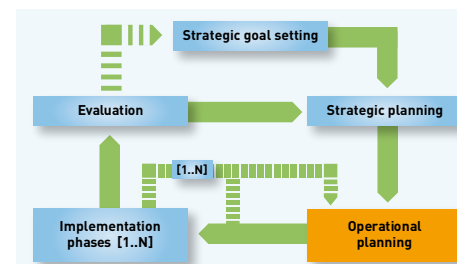
STAGE 3 **Operational planning**

STAGE 4 **Implementation**

STAGE 5 **Evaluation**

29

Stage 4: Implementation

In this stage the operational plan is implemented. Tasks are moved abroad and daily operations begin. As feedback is given on the progress of the move and more knowledge of the new global operation is gained, changes and adjustments to the operational plan can be made.

Case study: Operational challenges
A large engineering company had offshored product development to China. They sent Danish managers and project leaders to ease the transaction. The goal was cheaper products which utilised the strong engineering skills of the Chinese engineers. However, the projects lacked the innovativeness desired.

Explanation: To protect IP rights there were limits to which information the Chinese engineers were allowed to access. Furthermore, there were no clear processes and structures in place for transferring knowledge from the subsidiary to the Danish headquarters. Lastly, the Danish engineers held the belief that the Chinese engineers were not as well educated or knowledgeable as themselves. These factors hindered knowledge sharing.

Lesson: It is vital that structures and processes are in place to encourage the goals with globalisation. Furthermore, the staff in the headquarters needs to have been involved in the globalisation process as described in previous sections through change management practices so they feel involved and can understand and support the process.

The main challenges to creating this step successfully are:
• Organisational challenges
• Cross-cultural collaboration
• Knowledge sharing across distances
• Low quality

Challenges with implementation are mainly due to: (1) inadequate operational planning and; (2) lack of knowledge. Lack of planning can mean that the organisation has not been prepared at all levels – strategically, tactically and operationally – for the global perspective. It can also mean that there is not a concrete plan for what to move, when, roles and responsibilities and timelines coupled with poor KPIs.

This can therefore be seen reflected in complications with moving and sharing knowledge, collaboration and organisational challenges (e.g. a mix-match between strategic and operational goals compared to organisational structures, processes, technological implementations, HR practices). As a consequence quality can fall, resulting in rework and use of additional resources.
To address these challenges the company may need to go back to previous steps – in particular the implementation plan - and redo them.

**To ensure a good implementation process and daily management of the global task a company can:**

• Ensure continuous learning and reflection through actively using KPIs and fostering a knowledge sharing culture
• Change organisational aspects (for example HR practices) as new information becomes available and indicates a better approach which better supports the operational plan
• Based on new knowledge gained, set up KPIs which are easier to measure or better reflect the new situation to determine how the implementation of the global operation is going as well as to measure daily management

As the move itself is carried out, new and additional knowledge can be gained about the impact on the country the task is moved from (e.g. political, customers, strategic or operational consequences), the country the task is moved to (e.g. country, customer preferences, additional possibilities and/ or new challenges) which can be used strategically. The iterative approach is therefore vital in ensuring that the organisation learns and adapts and thereby remains competitive as circumstances change.

Important to remember:

• Use your KPIs to evaluate the progress of implementation and daily operations

• Continue to learn by implementing changes to the organisation as new knowledge is gained

• Revisit previous steps in the globalisation process – for example the operational plan – if new knowledge indicates this is needed

STAGE 4
**Implemen-
tation**

STAGE 5
Evaluation

31
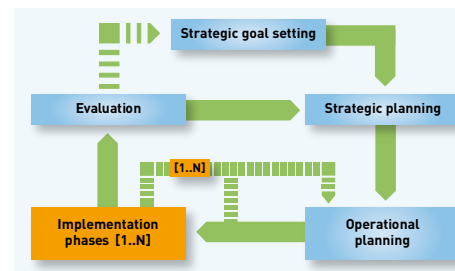
Stage 5: Evaluation

In this stage the global operation is re-evaluated as a part of continuous learning for the organisation.

The main challenges to creating this step successfully are
• Lack of time
• Lack of planning

Changes in leadership, fire-fighting, set routines and doctrines often means that current operations are rarely re-evaluated. The danger of this is that opportunities caused by market changes can be missed and the current global network can become outdated.

To implement an iterative globalisation process with evaluation a company can:

• Use change management practices in the globalisation process.
• Implement best practices for product development of global projects to ensure evaluation of the process, documentation and quality. These best practices maybe industry specific.
• Implement well established project management practices in global projects to ensure roles, responsibilities and documentation.
• Implement a learning culture in the organisation to foster evaluation of actions, acceptance of changes and a focus on continuous improvement.

Using product development practices and project management practices which are iterative and reflective encourage this iterative behaviour for the whole organisation. Furthermore, viewing globalisation projects as change management projects also encourages evaluation. This can help these practices to become embedded in the organisational culture and thereby create a reflective and learning organisation; also as it grows and become more global.

In order to evaluate the success of global product develoure, the company needs to measure both hard and soft KPIs. Examples of hard KPIs are employee retainment, time-to-market, market share, resources employed. Whereas the soft KPIs can include, for example enduser statements, supplier feedback, employee satisfaction surveys, surveys to understand culture across the organisation and feedback from organisational units, etc.
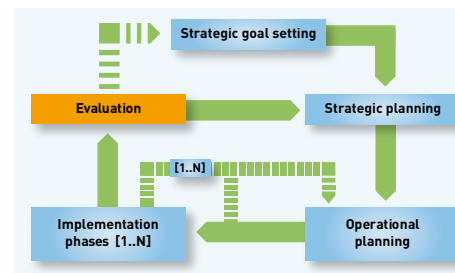
Important to remember:

• Use your KPIs to evaluate wheter the current organisational structures encourage the strategic goals

• Use the evaluation to implement new knowledge into a new strategic plan and if needed – reevaluate the strategic goals

STAGE 5
Evaluation

Useful literature:

Badke-Schaub, P., Lauche, K., Neumann, A., Ahmed, S (2009) Task-Team-Process: The Development of Shared Representations in a Engineeing Design

Team in About:Designing, Designing Analysing Design Meetings (ISBN: 978-0-415-44058-5) , pages: 153-170,Taylor & Francis, London

Christodoulou, P., Fleet, D. & Hanson, P. (2007). Making the Right Things in the Right Places. University of Cambridge. IfM Publication. Cambridge, UK.

Dansk Industri (2004). Globale muligheder og vækst – en analyse af danske virksomheders outsourcing. Dansk Industri. Copenhagen, DK.

Debowski, S. (2006). Knowledge Management, John Wiley & Sons Ltd, Sydney, Australia.

Demoskop (2006). Report on outsourcing in Scandinavia, www.demoskop.se

Hansen, Z. N. L. , Zhang, Y. & Ahmed-Kristensen, S. (2011). Viewing engineering offshoring in a network perspective: Challenges and key patterns,

Proceedings of the 18th International Annual EurOMA Conference, International Annual EurOMA Conference, Cambridge, UK

Hansen, Z. N. L., Ahmed-Kristensen, S. (2011), Global product development: The impact on the product development process and how companies deal with it, International Journal of Product Development, Vol. 15, No. 4, pp 205-226

Hansen, Z. N. L. (2011), On outsourcing and offshoring: Challenges facing management and engineering, PhD Thesis, Technical University of Denmark. Lyngby, DK.

Kimball, G. (2010). Outsourcing Agreements: A Practical Guide. OUP Oxford.

Kotter, J. (1996). Leading Change. Harvard Business Press. Harvard, USA.

Minshall, T. (1999). Manufacturing mobility: A strategic guide to transferring manufacturing capability. Cambridge University, Institute of Manufacturing, Cambridge UK.

Perunovic, Z. (2009). The Utilisation of Information and Communication Technology across the Outsourcing Process: The Vendor's Perspective. PhD Thesis, Technical University of Denmark. Lyngby, DK.

PTC (unknown). Gaining Competitive Advantage Through Global Product Development: A PTC White Paper. www.aia-aerospace.org/assets/smc_wp-competitiveadvantage.pdf

Tuckman, B. (1965). Developmental sequence in small groups. Psychological Bulletin, Vol.63, No 6, pp. 384–99.

Ulrich K., & Eppinger S. (2008). Product Design and development, 4th ed, McGraw-Hill International, New York, NY.

Wallace, K.M .,Ahmed, S., Bracewell, R.(2005) Engineering Knowledge Management in Design Process Improvement, A Review of Current Practice (ISBN: 185233701X), pages: 326-343, 2005, Springer-Verlag, London.

Yip, G. S., Loewe, P. M., & Yoshino, M. Y. (1988). How to take your company to the global market. Columbia Journal of World Business. Vol. 23, No 4. Winter. pp. 37–48.

Zhang, Y. (2007). Engineering in the changing world: an exploratory study on the context, capability and configuration of global engineering networks (GEN), PhD thesis, Cambridge University.

About the authors

Zaza Nadja Lee Hansen

Zaza Nadja Lee Hansen is a research assistant in the Product Development section at the Department of Management Engineering at the Technical University of Denmark.

Her PhD on global product development, carried out at the Engineering Knowledge Management group at DTU, is the foundation for this guide and she was also the main researcher working on this project.

Her research interests are global product development and organisational issues which are focused on industrial applicability.

Saeema Ahmed-Kristensen

Saeema Ahmed-Kristensen is an Associate Professor of Product Development at the Section of Engineering Design and Product Development the Technical University of Denmark and has since 2005 been leading the Engineering Knowledge Management group.

She was the main supervisor for the PhD research project on global product development carried out by Zaza and the project leader on the follow-up project to create this guide.

Her research interests focus upon supporting decision making through capturing, structuring and indexing knowledge in complex engineering products. This includes process and product modelling, assessment of aesthetics, global product development and design thinking.

She employs empirical research methods in close collaboration with industry, including aerospace, and oil industry.

CONTACT

Inquiries:
More information on: joining our best practice network, courses, joint further research, implemention of the framework at your company, contact us at:

Saeema Ahmed-Kristensen
sakr@man.dtu.dk
Phone: +45 4525 5563

For more information please visit our webpage at:
www.tiny.cc/xd283

A guide for successful global product development

This guide presents commonly encountered problems and best practices to address these, for global product development process. The guide is built on over 50 interviews with seven case companies and five workshops with participants from over 25 companies.

The Global Decision Making framework is presented as a way to illustrate a holistic and iterative approach to globalising the product development process. It provides a series of steps to follow from the strategic level to implementation when a company is globalising the product development process.

The guide supports the management of the global product development process and to view it in a holistic manner while keeping the overall business goals of the company in mind.

leadership
quality
moving target
outsourcing
distance
virtual teams
quality
explicit processes
global product development
offshoring
offshoring
coordination
knowledge sharing
culture
collaboration
modularity

For more information please visit our webpage
www.tiny.cc/xd283