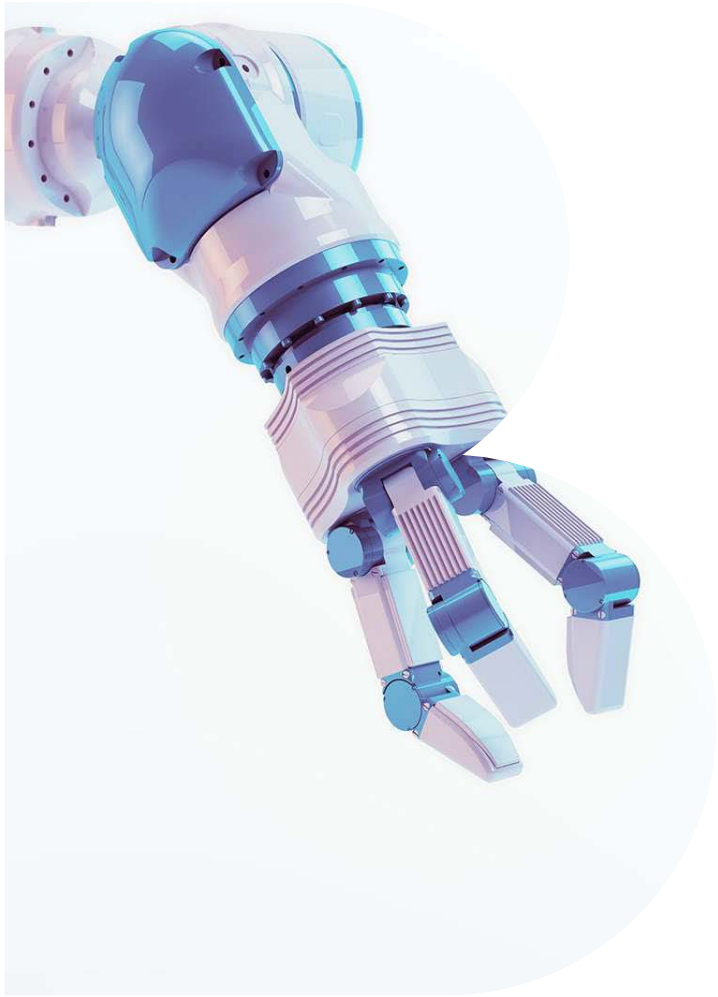
Hochschule Reutlingen
Reutlingen University

Roland Berger

The Engineering Excellence Study 2015



Short version

Stuttgart, December 2015

Hochschule Reutlingen
Reutlingen University

Roland Berger

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A. Management summary

Management summary (1/3)

Study background and objectives

- The **impact of efficient engineering** on a company's success is ever increasing owing to progressive globalization, larger volatility and ongoing high pressure on cost
- This is calling more than ever for a **strong but also efficient** engineering setup in all industries
- In the light of this environment, this study aims at deriving the **status quo** of the **engineering value chain** along selected key dimensions and enablers
- By doing so, a transparency on the successful **application of engineering best-practice** across and per industry is created
- This study therefore aims at providing CEOs, CTOs and key decision makers with **insights** into the **status quo in R&D, key challenges and best-practices** in order to help in **making** the **right decisions**

Source: Roland Berger Engineering Excellence Study 2015

Management summary (2/3)

Key results

- Western Europe companies predominantly show a **local R&D footprint**. Importance of **Europe** will remain high, while **China**, **USA** and **India** are catching up. Structural shift of R&D focus is driven by need for **proximity to sales** and **production** locations. **Quality of staff** as most important decision criteria
- Companies have **problems** to complete engineering projects on the planned **time** and on the planned **budget.** Timing of **project start** and timely **availability** of **resources** are the main limiting factors to project success
- **Customer requirements** are fulfilled best in **Europe** and the **US**. Respondents have problems with meeting customer expectations in **developing countries** even though products are often **adapted for local market requirements**
- Project leaders are **trained well** and **enabled** by organizational environment. Typically, **firefighting** is an exception for most companies
- Reporting systems are **very important** for successful R&D projects. Many companies still have problems to find **suitable KPI** for measuring **engineering efficiency**

Source: Roland Berger Engineering Excellence Study 2015

Management summary (3/3)

Key results

Engineering excellence differs by industry. For detailed **industry-specific** insights on any of the following industries, please refer to the latter sections of this study



Aerospace & Defense

> **Strong position of project management** in the overall organization
> **Timely start** of the project and **availability of resources** are issues to be improved



Automotive

> More **international R&D footprint** than other industries
> Industry with the lowest **share of revenues** spent on R&D



Consumer Goods

> Industry with the highest percentage of development projects to complete within the **planned time line and budget**
> Low **local product adaptions** and **customer requirements** fulfillment, especially in Asia



Engineered Products & High Tech

> Below average **local product adaptions** in China, India and Asia Pacific
> Below average use of **project management methods & tools** for requirements identified



Machinery/Plant Engineering

> On time **availability** of predefined **resources** is often perceived as a **limiting factor** to project success
> Special interests of stakeholders and **missing coordination** of target systems **limit planning** of projects

Source: Roland Berger Engineering Excellence Study 2015

B. Study objectives and design



The new "Engineering Excellence Study 2015" provides a valuable look at the engineering value chain and best-practice

Background

- Increasing globalization, larger volatility and ongoing high pressure on cost **require a strong but also efficient setup** of the engineering function
- Consequently, the **impact of efficient engineering** on a company's success is continuously increasing
- Thus, the current study is designed to **shed light on the engineering function**

Objectives

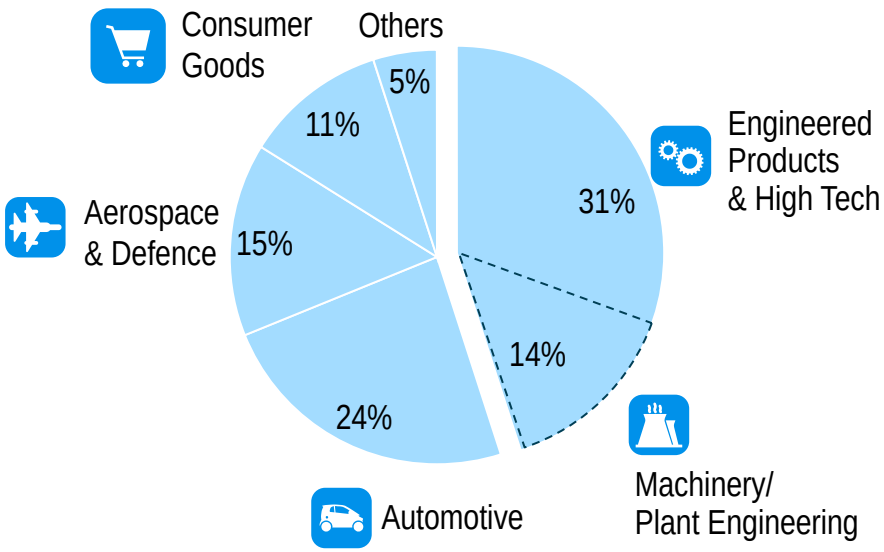
- Derive the **status quo** of the **engineering value chain** along selected key dimensions and enablers
- Create transparency on the successful **application of engineering best-practice** across and per industry

Source: Roland Berger Engineering Excellence Study 2015

Five core industries in focus – Participating companies with median revenues of EUR 1 bn and on average 1,000 headcount in R&D

Background of Engineering Excellence Study 2015

Participants' industries



Remarks

- Study participants mainly headquartered in Western Europe
- Contributors mainly from C-level, C-1 and C-2
- Median of revenue of participating companies around EUR 1 bn
- R&D headcount accounts on average for 8.6% of total employees

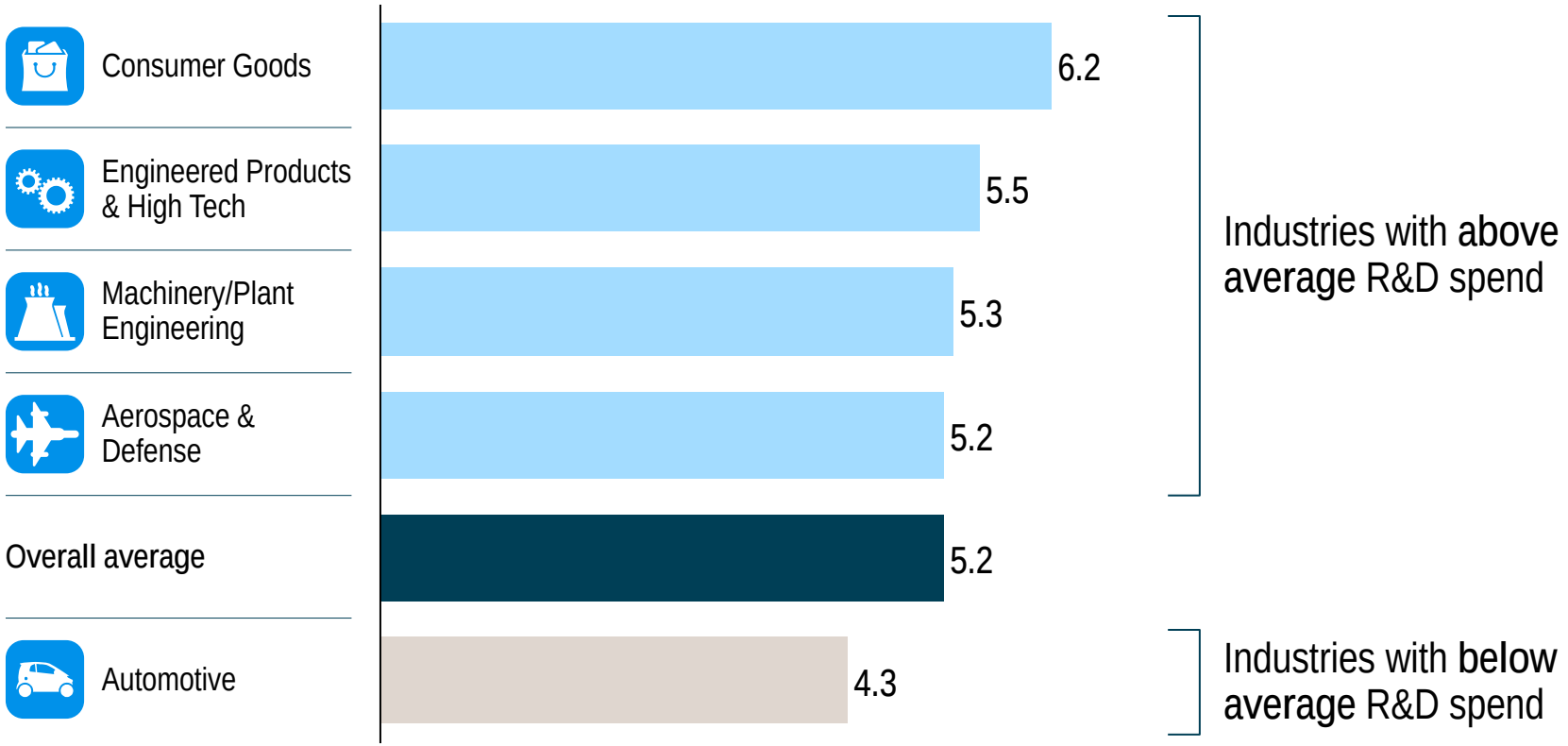
Source: Roland Berger Engineering Excellence Study 2015



C. Study results across industries

On average companies spend about 5% of revenues on R&D – Automotive industry with below average investments

Investment in R&D [% of revenues]



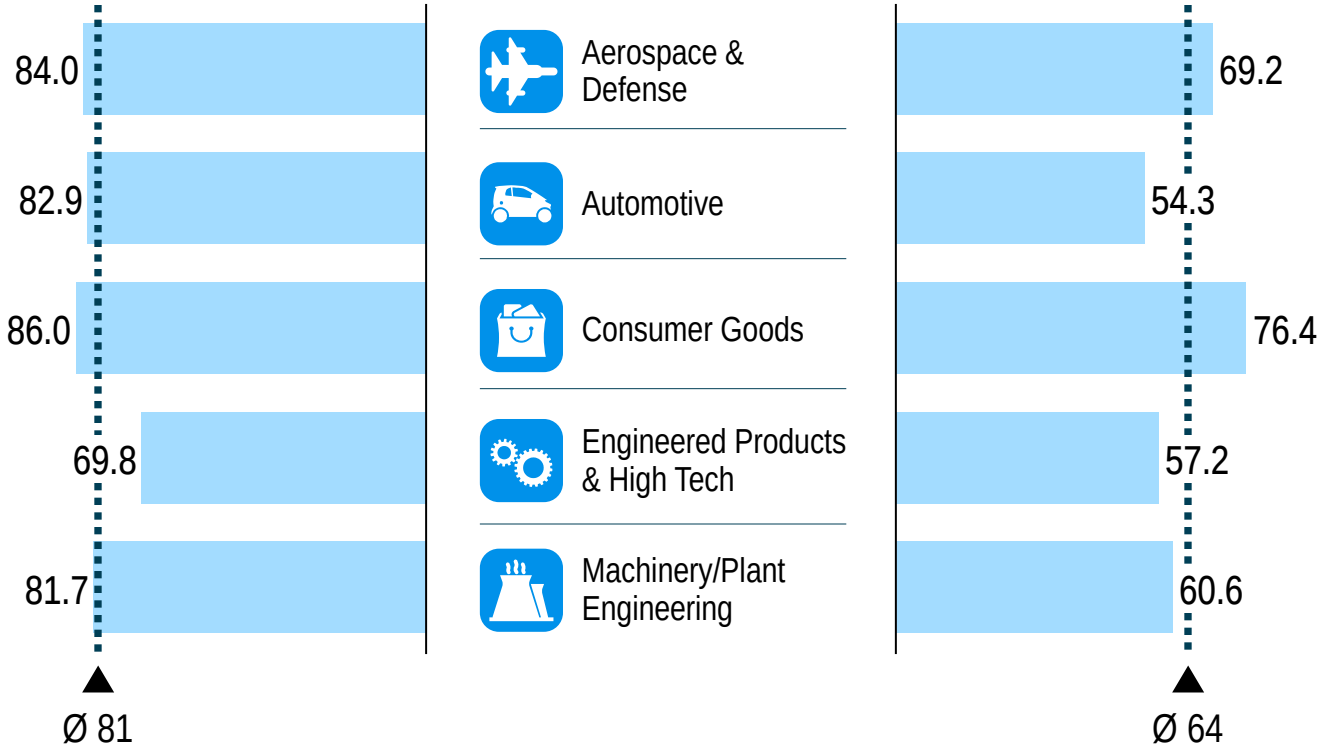
Source: Roland Berger Engineering Excellence Study 2015

Only 64% of all engineering projects are completed in the planned timeframe – Customer satisfaction of around 80% on average

Achievement of customer goals and project timeframe [%]

What percentage of development projects achieve the customer's goals as defined in the product requirements document?

What percentage of development projects are completed within the planned timeframe?

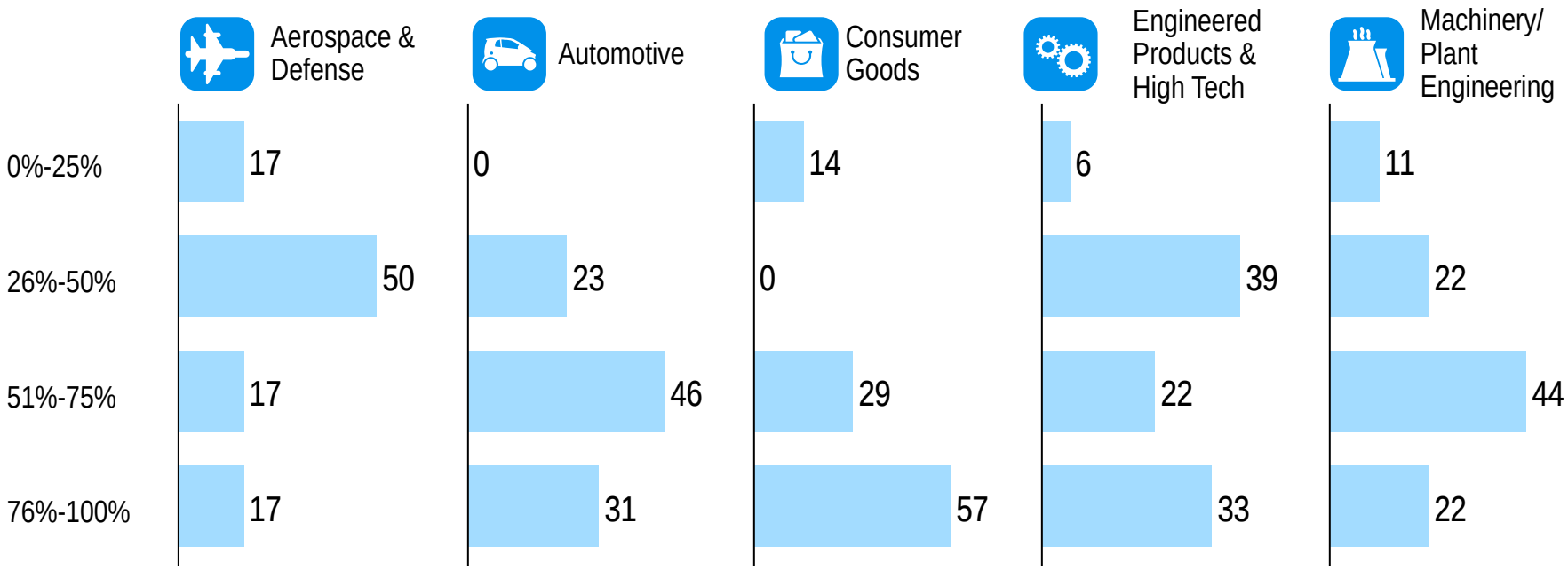


Source: Roland Berger Engineering Excellence Study 2015

In most industries, more than 25% of engineering projects are over budget – Consumer Goods industry as best-practice for budgeting

Achievement of project budgets [%]

What percentage of development projects stay on budget?



Source: Roland Berger Engineering Excellence Study 2015

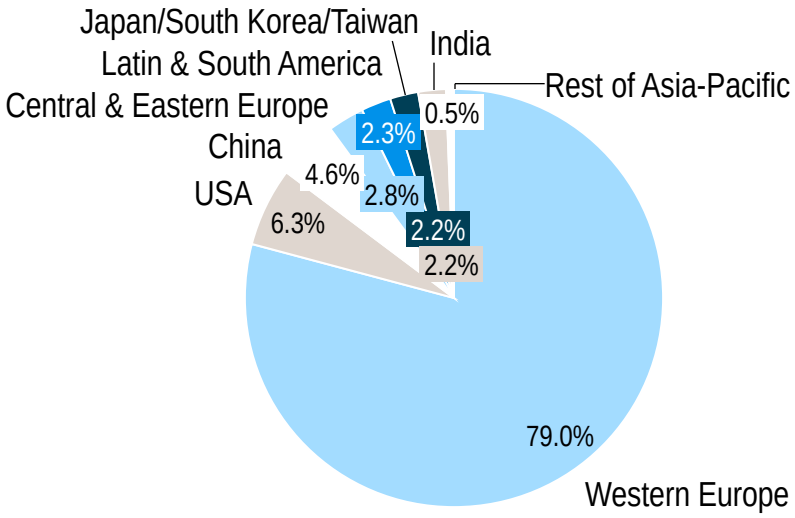


D. Footprint strategy

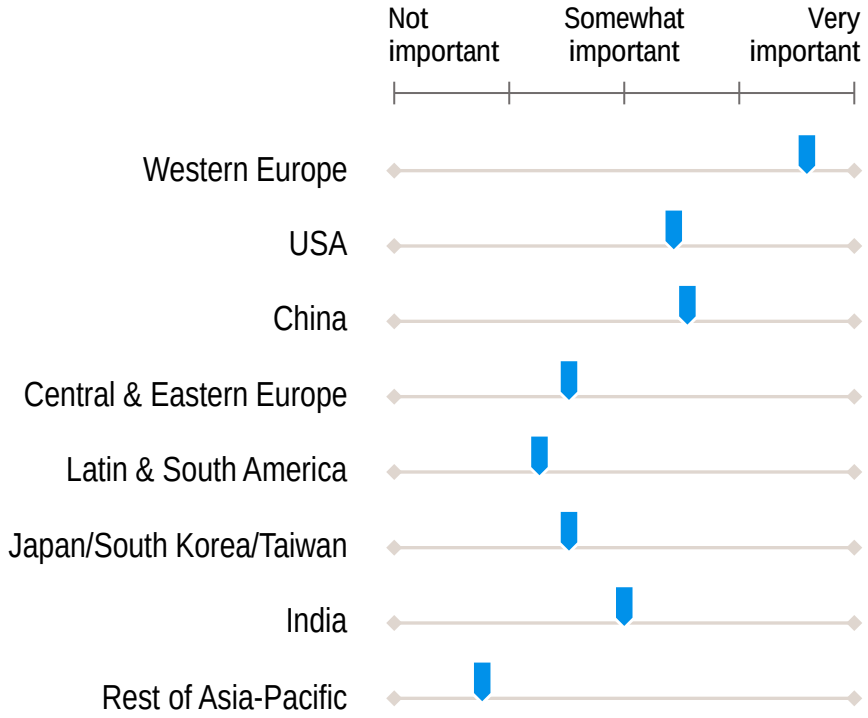
R&D footprint is dominated by Western Europe – Importance will remain high while China, USA and India are catching up

Global split R&D headcount

What percentage of people employed in R&D at your company/ business unit work in the following regions?



How important is it to you to have a development location in the following countries in five years?

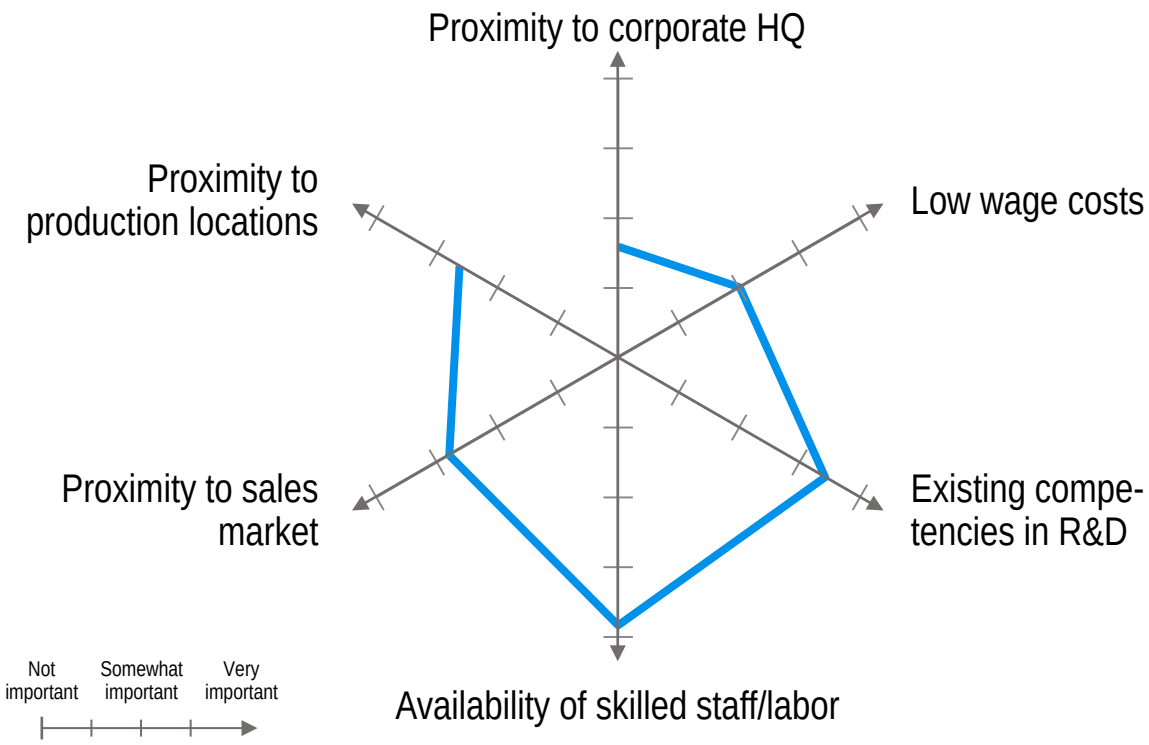


Source: Roland Berger Engineering Excellence Study 2015

Structural shift of R&D footprint driven by need for proximity to sales and production locations – Quality of staff is most important

Importance development resources

How important are the following factors for your company/business unit in decisions on building up development resources?



Remarks

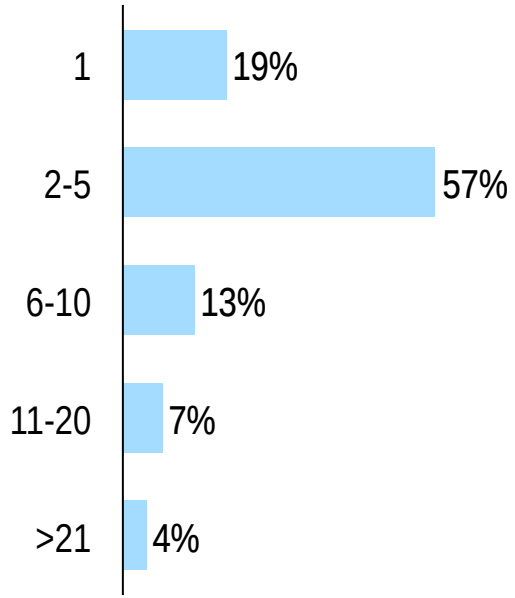
- Availability of skilled R&D staff is viewed as the overall limiting factor for globalization of R&D footprint
- The high importance assigned to existing competencies in R&D is in favor of regional continuity over a shift of the R&D footprint
- Proximity to sales and production locations are recognized as somewhat important driving forces for shift of R&D footprint
- Low wage costs and proximity to HQ are considered minor factors

Source: Roland Berger Engineering Excellence Study 2015

More than 50% of study participants with 2-5 development locations – About 2 locations work together in an average project

Number of development locations

How many development locations does your company/business unit have?



On average, how many development locations are involved in one development project?

1.9

Remarks

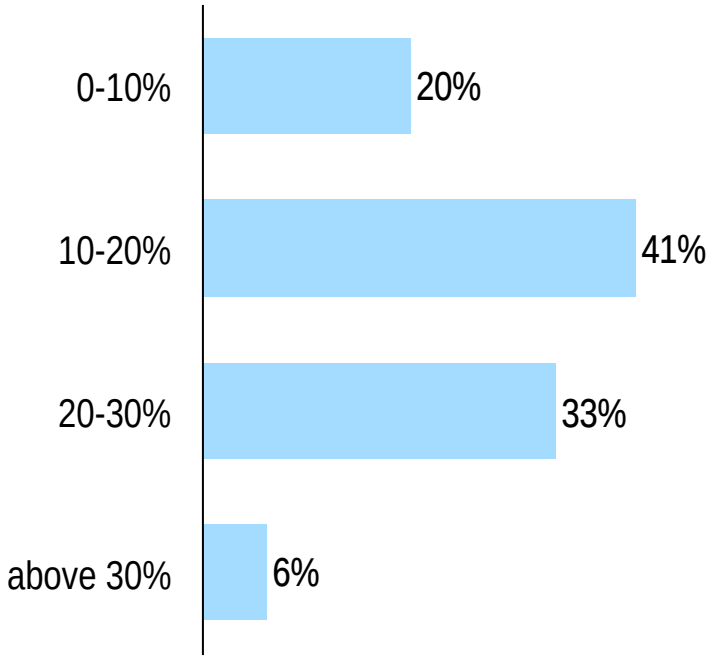
- More than 75% of study participants concentrate their development activities in 1-5 locations, revealing a strong preference for regional integrity of development processes
- Relatively low number of development locations involved per project of 1.9 shows that regional distribution of development activities is largely matched with functional distribution, with little cross-regional exchange of R&D information

Source: Roland Berger Engineering Excellence Study 2015

The majority of study participants invests 10-30% of capacity on coordination of distributed R&D footprint

Time spent on admin tasks for coordination of R&D locations

How high is the share of administrative hours/coordination tasks (e.g. travel, planning talks, etc.) for coordinating with international locations on development work?



Remarks

- Time spent on administrative tasks differs significantly between respective industries
- Whereas Consumer Goods companies invest maximum 20% of their capacity, Automotive companies do invest a much higher share

Source: Roland Berger Engineering Excellence Study 2015

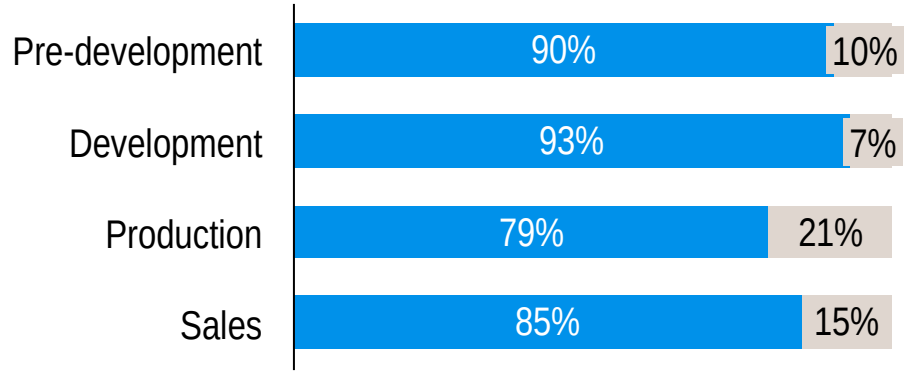


E. Technology roadmap

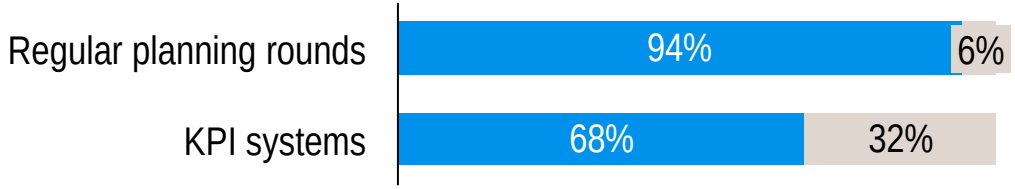
Technology roadmaps are extensively used for pre-development and development – Linkage of roadmaps in regular planning rounds

Technology roadmaps

Does your company/business unit have roadmaps (medium- and long-term planning for the coming 3-10 years) in the following areas?



Are the following methods used to link the roadmaps?



Remarks

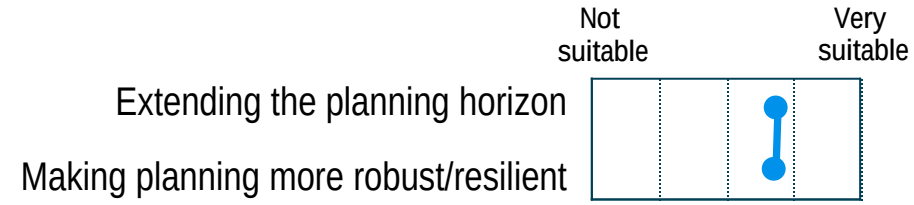
- All industries with a high share of roadmaps usage for pre-development and development (between 82% and 100%)
- Strong differences in production and sales with 100% in Aerospace & Defense and only 70% in Machinery/Plant Engineering
- In all industries planning rounds are widespread, whereas the usage of KPI systems differs significantly between 44% (Machinery/Plant Engineering) and 100% (Aerospace & Defense)

Source: Roland Berger Engineering Excellence Study 2015

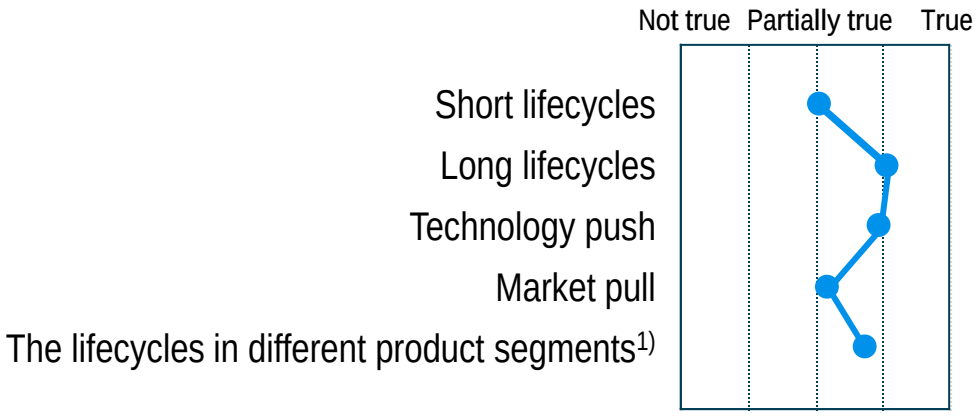
However, roadmaps with limited support for robust planning – Better support for short lifecycle products and market pull markets required

Technology roadmaps

If roadmaps are used, how suitable do you think they are for supporting the following goals?



With the help of roadmaps, products/ product families with the following characteristics can be planned well:



1) e.g. B2B, B2C are very different from each other

Remarks

- > Roadmaps are suitable for extending the planning horizon and are especially used for product families with long lifecycles and to push technologies
- > Consumer Goods companies see usage of roadmaps least suitable
- > Roadmaps are also seen as only partially helpful for planning of short lifecycle products and market pull products

Source: Roland Berger Engineering Excellence Study 2015

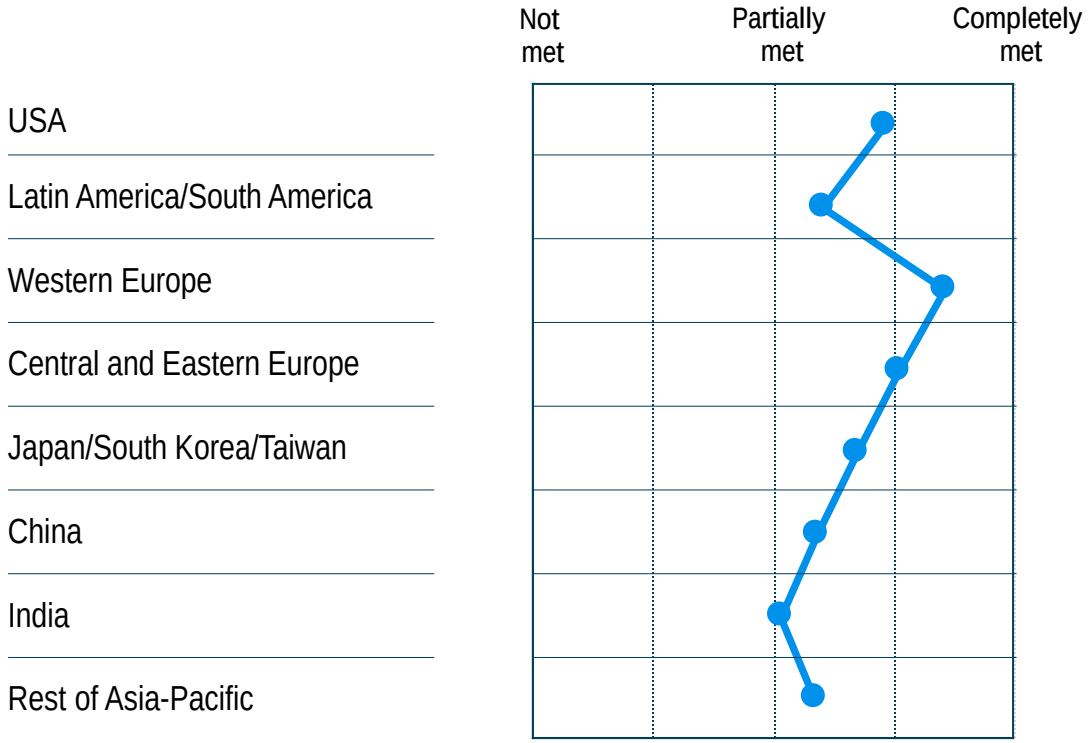


F. Customer orientation

Customer requirements are met best in Western Europe – In line with today's center of gravity of R&D footprint

Matching of regional customer requirements

In your view, how well do your products meet customer requirements in the following regions?



Remarks

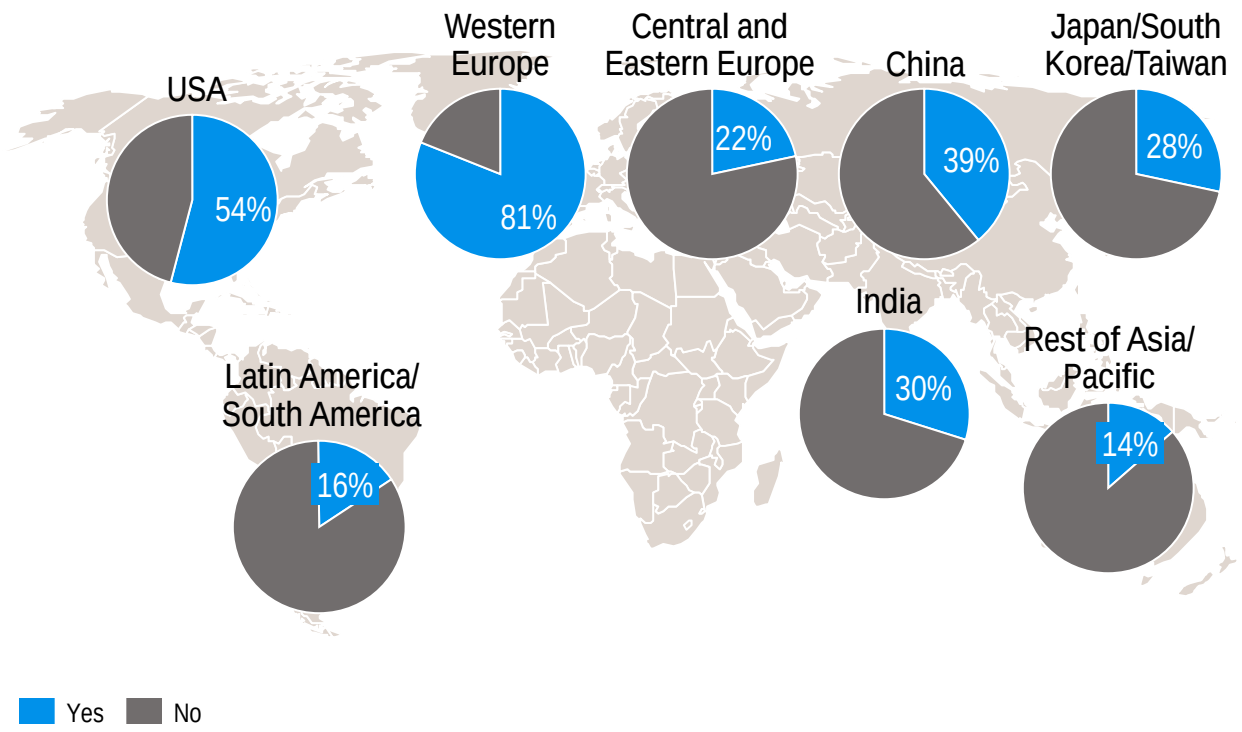
- Participating companies mainly develop their products for Western Europe
- Aerospace & Defense industry is very good in meeting customer requirements (especially in Western and Central/Eastern Europe)
- Consumer Goods industry with biggest problems to fulfill customer requirements (especially in Asia)

Source: Roland Berger Engineering Excellence Study 2015

Adaption of the participating companies' products is mainly done in Western Europe and US – Further focus on Asia

Customer requirements

In which regions are products adapted locally?



Remarks

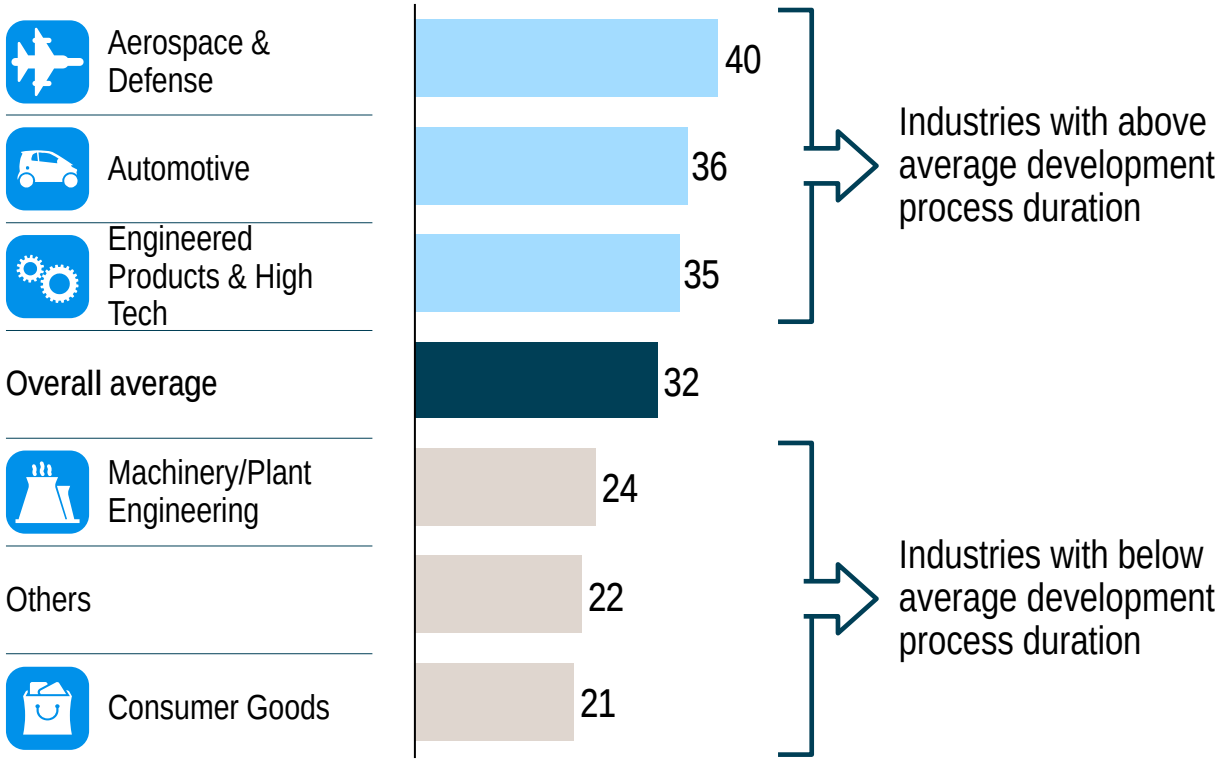
- Aerospace & Defense companies adapt products locally (especially in Western Europe and USA)
- Consumer Goods companies often make no local adaptions, Asia out of scope for most companies
- Automotive companies still develop for the Western Europe market but make local adaptions focusing on USA and China

Source: Roland Berger Engineering Excellence Study 2015

On average, the product development process takes 32 months – Longest in Aerospace and shortest in Consumer Goods industry

Average product development process [months]

How long does your average product development process last?



Remarks

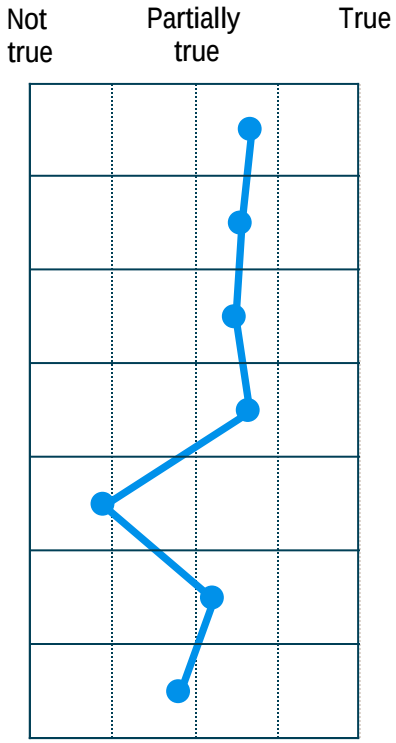
- Aerospace & Defense and Automotive OEMs often with > 60 months development processes
- Development processes of suppliers with shorter duration
- Machinery/Plant Engineering companies also need to develop faster than OEM

Source: Roland Berger Engineering Excellence Study 2015

Hardly any company develops products specifically for emerging markets

Market requirements

Please indicate how true the following statements are for your company/ business unit:



Remarks

> Aerospace & Defense industry with a limited number of clients incorporates target customers in the development process (incl. pilot customers)

> New developed products are often changed after market launch in A&D industry while Consumer Goods companies do not change the product anymore after launch

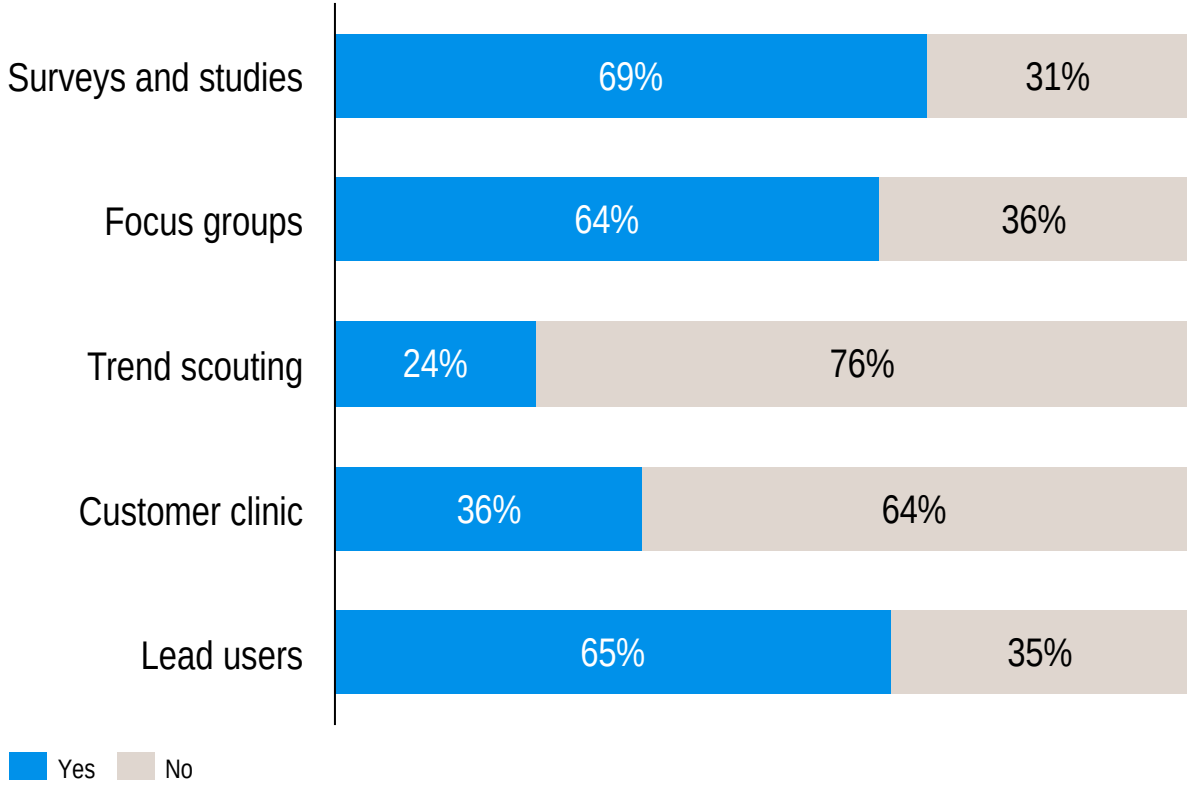
> The EPHT industry tries to adapt the development process for emerging market products

Source: Roland Berger Engineering Excellence Study 2015

Main ways to determine customer requirements include surveys, lead users and focus groups – Little focus on trend scouting

Customer requirements determination

When determining customer requirements, do you use the following tools?



Remarks

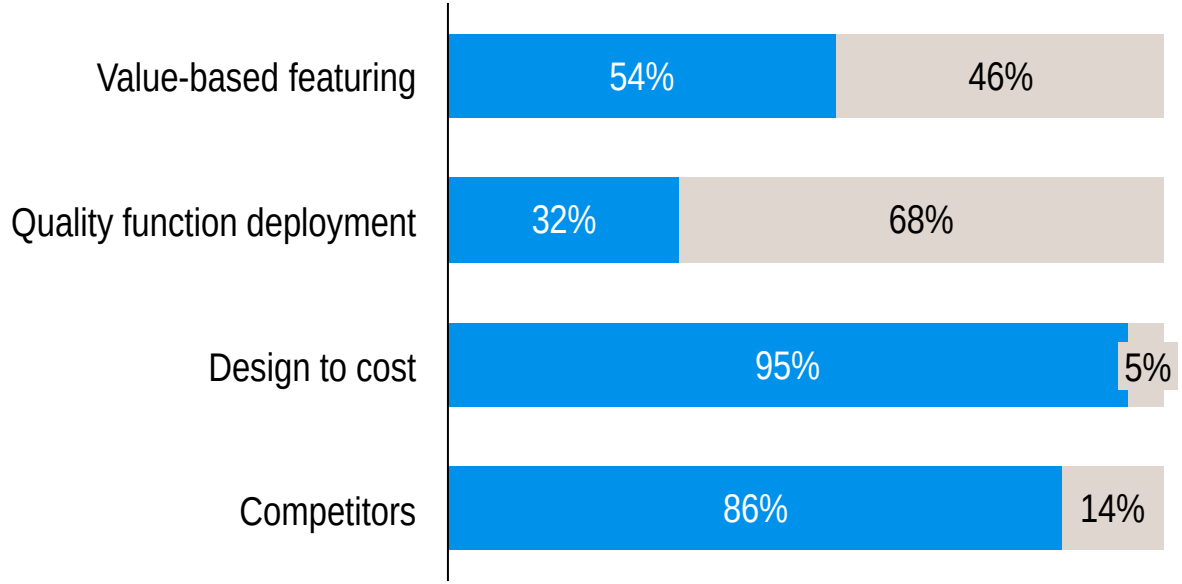
- Surveys and studies are important in all industries with the exception of Machinery/ Plant Engineering – here direct customer contact through focus groups and lead users is most relevant
- Many companies stress the importance of direct contact to the customer (direct sales, user experience etc.)
- One company uses a reference customer model to determine requirements

Source: Roland Berger Engineering Excellence Study 2015

Design to cost and competitive pricing as main ways to determine selling price

Customer-oriented development

What methods do you use for cost-benefit analysis and to determine the selling price?



Remarks

- Quality function deployment is heavily used in the Consumer Goods industry - Competitor's pricing is less relevant than in other industries
- Design to cost is used in all EPHT and Automotive companies
- Some companies also use cost to design / target pricing methods

Source: Roland Berger Engineering Excellence Study 2015

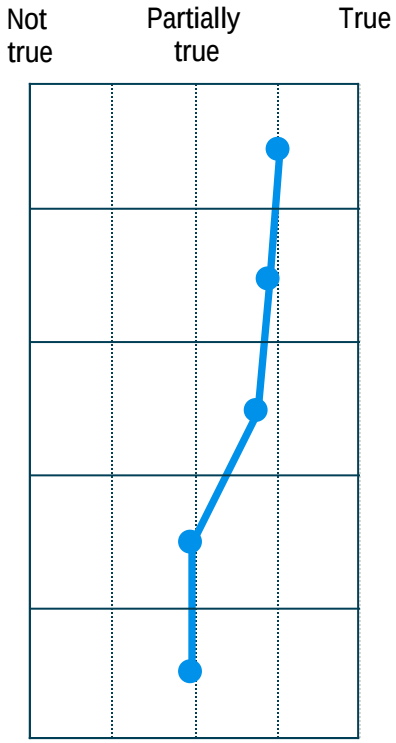


G. Project management

P&L responsibility for projects is not consequently allocated to project managers – PM not established as career path

Development project management

Please indicate how true the following statements are for your company/ business unit:



Remarks

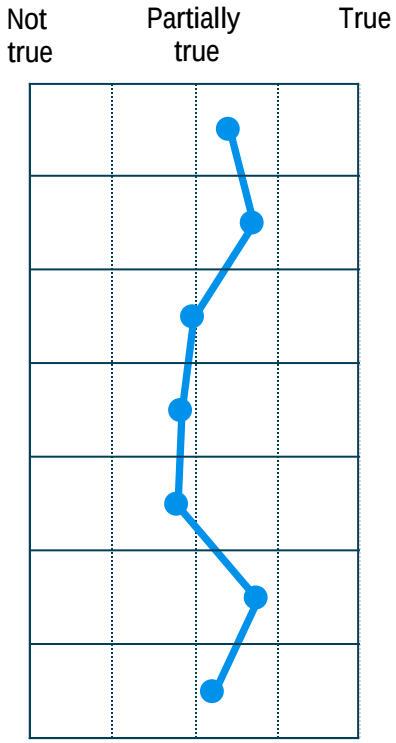
- Study shows that there is no clear common practice of responsibility and accountability allocation to project managers
- Most participants have not centralized PM career path and development prospects in one PM organization unit
- Dedicated training of PMs and clear definition of limiting project conditions before start are common practice among players

Source: Roland Berger Engineering Excellence Study 2015

Timing of project start and timely availability of predefined resources are often perceived as a limiting factor to project success

Characteristics development projects

To what extent is the project work on development projects at your company/business unit defined by the following characteristics?



- The **project sponsor** helps drive the implementation of the project goals due to his or her position in the hierarchy
- The project leader responsibly **manages** the approved **project budget independently** and assumes sole responsibility in a development project
- The project leader has a **say/veto right** in **staffing project employees**. Leader also has access to agreed-upon resources in the line organization and the right to participate in performance evaluations of employees
- There is ONE **project management organizational unit** that manages the project leader career path and development opportunities
- *If a dedicated PM organization exists:* The **PM organization** is allocated (with solid-line reporting and responsibility for project targets) to a position with **P&L responsibility**
- The organization ensures **appropriate communication structures** be-tween project and line as well as effective escalation structures
- If the specifications for a development project are unknown/unclear the project is not kicked-off. First, requirements are clearly defined

Remarks

> Clear definition of development requirements is only somewhat accepted as a prerequisite for project kick-off

> In general, timing of project milestones and deadlines are viewed as realistic, making firefighting an exception

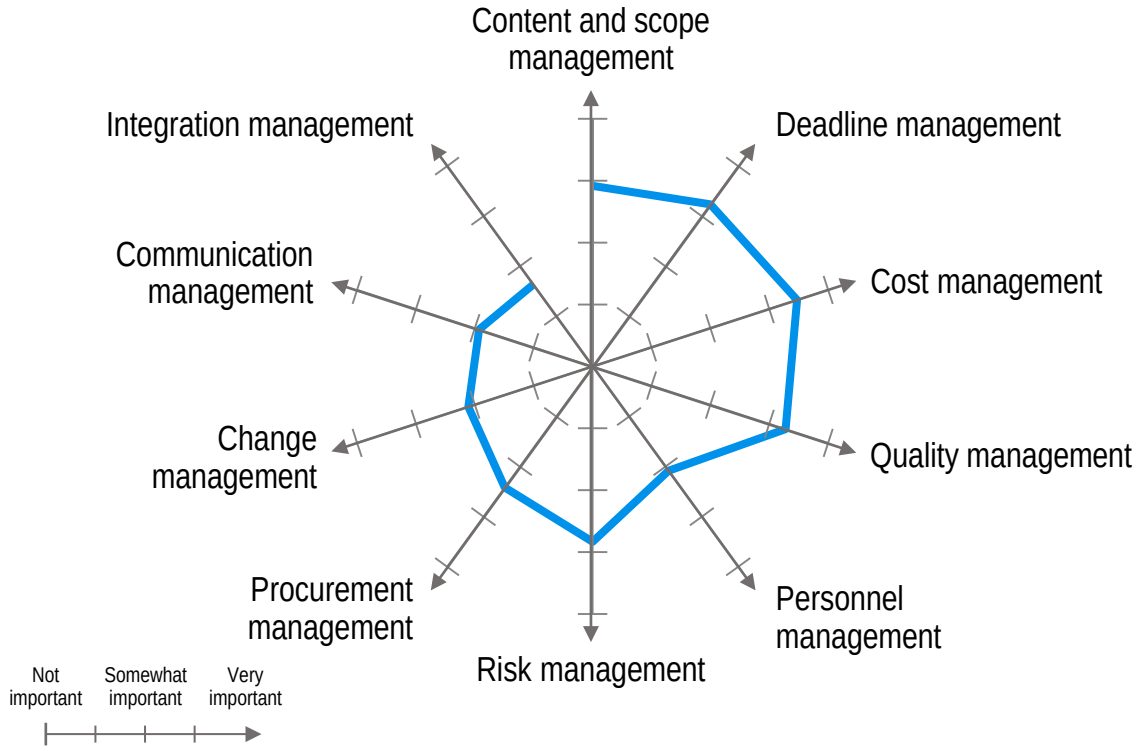
> However, timing of project start and availability/approval of predefined resources are often perceived as a limiting factor to project success

Source: Roland Berger Engineering Excellence Study 2015

Project management focus is primarily on cost, quality, contents and timing – Other aspects are in risk of being left "out of sight"

Importance of project management methods

How much importance does your company/ business unit put on the following methods/ tools in project management?



Remarks

- Costs, quality, deadlines and contents are commonly regarded as the most important project management objectives
- Integration management as a means of prioritizing competing sub-project goals is considered only a minor factor to overall project success
- The "softer" methods, i.e. personnel-, communication- and change management might also need more attention

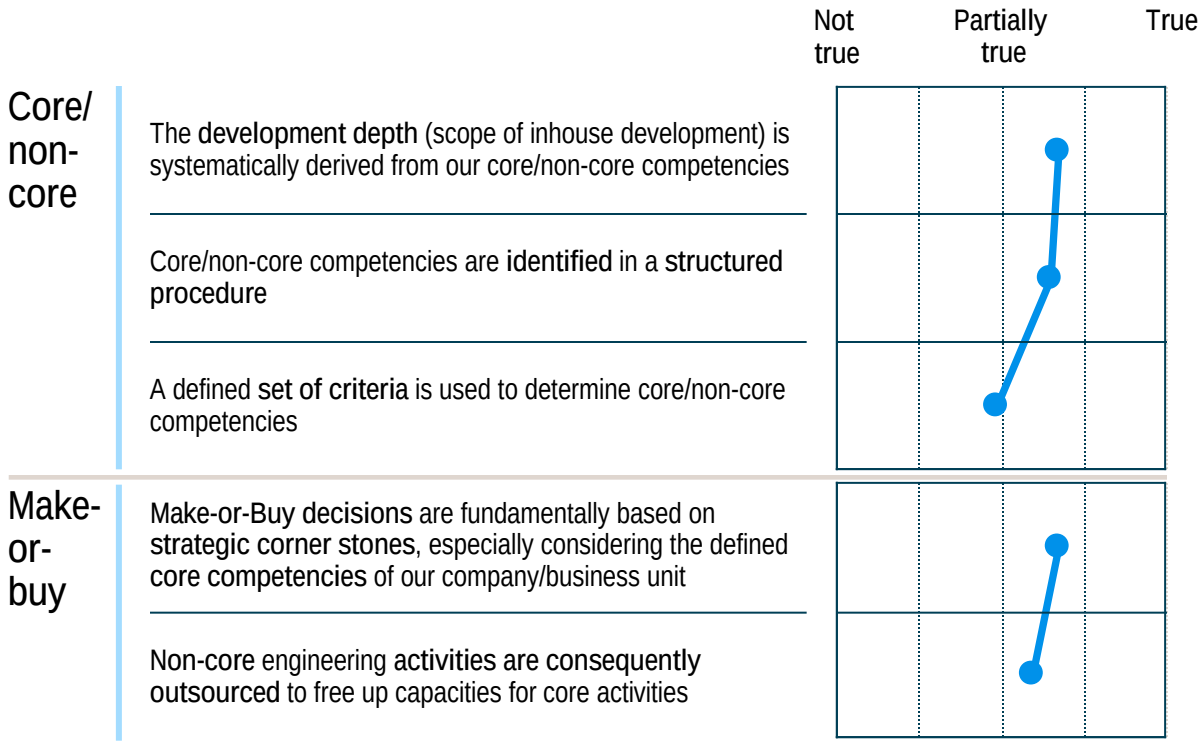
Source: Roland Berger Engineering Excellence Study 2015



H. Further success factors

Make-or-buy decisions are not consequently based on core and non-core competencies – Clear set of criteria missing

Core competences and make-or-buy



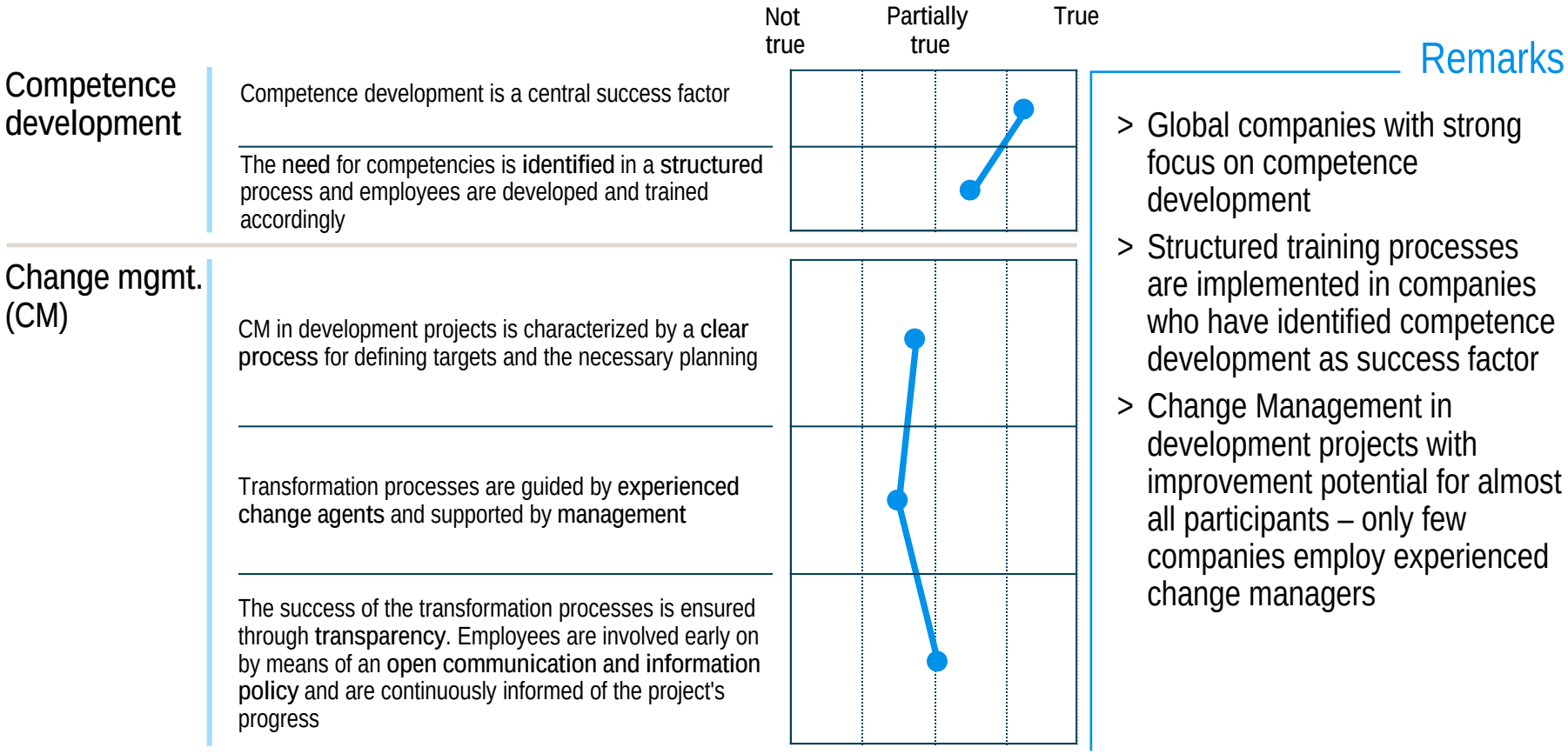
Remarks

- > Aerospace & Defense companies with strong focus on core competencies
- > Large OEM with strong focus on structured identification of core competencies
- > Especially Consumer Goods companies outsource non-core development activities to suppliers

Source: Roland Berger Engineering Excellence Study 2015

Change management projects show improvement potential in majority of the participants

Change management and competence development



Remarks

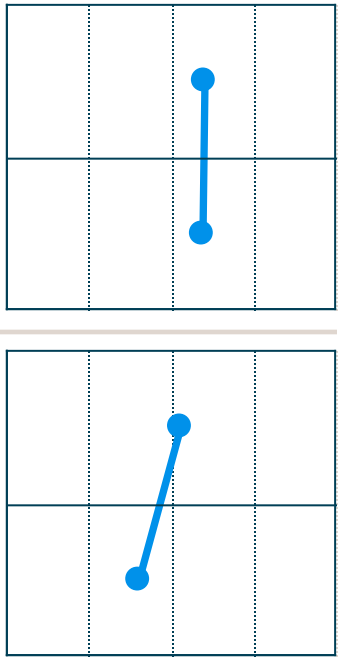
- Global companies with strong focus on competence development
- Structured training processes are implemented in companies who have identified competence development as success factor
- Change Management in development projects with improvement potential for almost all participants – only few companies employ experienced change managers

Source: Roland Berger Engineering Excellence Study 2015

Majority of the organizations adapt to the market accordingly, still, maturity models are only partially used

Processes & organization and continuous improvement process

		Not true	Partially true	True
Processes & organization	Processes & organization are **regularly** compared with **market requirements** and adjusted as necessary			
	Changing market requirements (customer wishes, time-to-market, technology leaps, etc.) are **responded to flexibly** and processes and organizational structures are **adapted** accordingly			
Continuous improvement process (CIP)	The concept of the **self-learning organization** is firmly established (e.g. according to CMM(i), etc.)			
	To evaluate the development organization, a **maturity level model** (e.g. CMM(i), PMMM, OPM3) is used and the **adjustment and development requirements** are derived from that			



Remarks

- Especially Consumer Goods companies compare processes & organization with market requirements
- Continuous improvement process is well established in Consumer Goods companies
- Automotive and Aerospace & Defense companies have problems with implementation of continuous improvement

Source: Roland Berger Engineering Excellence Study 2015

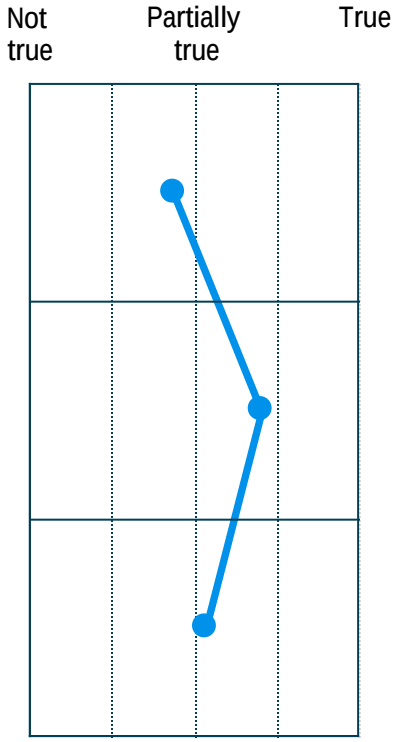
In general, projects are put into a company-wide framework – Still, special interests and non-coordinated target systems limit planning

Cost-, Resource- and Budget Management

Transparent planning and adhering to limits on resources and budgets often fail due to special interests

The project is put into a **company-wide/business unit-wide target system** for the purposes of **planning and managing** the project budget

This **target system** integrates the interests of all stakeholders and is **coordinated** in such a way that special interests do not get in the way of the company's/business unit's interests



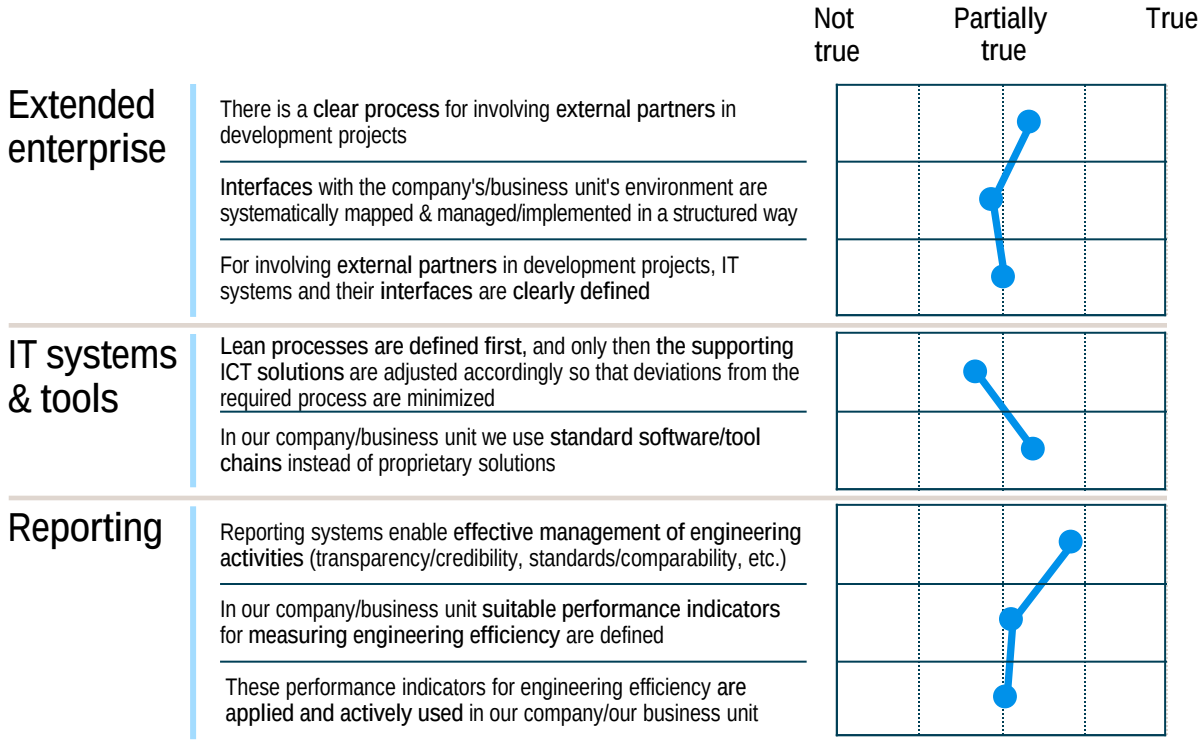
Remarks

- Top-down budget planning based on target systems is widely used among study participant
- Heterogeneous stakeholder landscape and their special interests are partially showstoppers for sticking to plans and targets
- Majority of companies integrates development projects in an overarching target system

Source: Roland Berger Engineering Excellence Study 2015

Majority of participants recognizes high importance of reporting systems – However, they are only partially used

Extended enterprise, IT systems & tools and reporting



Remarks

- Machinery/Plant Engineering Companies are often reluctant to involve external partners in the product development process
- External interfaces are well structured only in the Consumer Goods and Aerospace & Defense industry
- Standardized software is used in EPHT and Machinery and Automotive industry – process development often within existing IT framework
- Consumer Goods companies with most efficient reporting systems among participants

Source: Roland Berger Engineering Excellence Study 2015

I. The Engineering Excellence Study 2015 per industry

Details per industry available in long version – Please do not hesitate to contact us

- Aerospace & Defense
- Automotive
- Consumer Goods
- Engineered Products & High Tech
- Machinery/Plant Engineering

Strong international R&D collaboration in Aerospace & Defense industry – Strong project organization secures successful engineering

Main results of the Engineering Excellence Study – Aerospace & Defense

- **R&D footprint** of European Aerospace & Defense companies is **dominated** by **Western Europe** due to easy access to high **qualified staff** and **proximity** to **production** and **existing** R&D capacities. USA followed by China and India will gain more importance in the next five years
- Around three **different development locations** involved in a R&D project. **Strong position of project** in the overall organization enables proper management of all involved resources
- **Target customers** are systematically identified to integrate their requirements in R&D process. Aerospace & Defense companies rely on **focus groups** and use results to adapt products to **local** requirements, especially for the US market
- Development projects are **well structured** before start. However a **timely start** of the project and the **availability of resources** is an issue that needs to be solved
- Non-core R&D activities are consequently **outsourced**. External partners are integrated via IT systems and standardized interfaces

Source: Roland Berger Engineering Excellence Study 2015

Globalization of Automotive R&D organizations will continue – Customer requirements in growing sales markets need to be met better

Main results of the Engineering Excellence Study – Automotive

- European Automotive companies with more **international R&D footprint** than other industries. **China** and **USA** with significant number of development resources and increasing importance. Driver is **proximity to sales markets** and **production locations**
- Multiple locations involved in a development project. Automotive companies struggle with **high administrative effort** for coordination of international locations
- Good **internal communication** between project and line as well between different departments. Planning is supported by **technology roadmaps** which are aligned in regular cross-functional planning rounds
- **Customer requirements** in developed markets are **met very well**. Automotive companies have **problems** in **China and India** even though they try to **locally adapt** products in these regions
- **Project leaders** are **well trained** and have a large number of methodology competencies. The project itself needs to be **strengthened** within the organization

Source: Roland Berger Engineering Excellence Study 2015

Involvement of customer in development process is crucial for Consumer goods companies and leads to a shift of R&D focus to markets

Main results of the Engineering Excellence Study – Consumer Goods

- Western European Consumer Goods companies with **local R&D focus**. Significant development capacity in **Eastern Europe** will **lose importance** while the US, Latin America, China and India require **increased presence** due to **proximity** to sales and production
- On overage **less than two locations** are involved in a development project. Thus not a lot of time is spend on **administrative coordination tasks**
- **Roadmaps** with **limited** support for **robust planning**. Consumer Goods companies require better support for **short lifecycle products** and **market pull** markets
- Consumer good companies are very **tool driven** regarding identification of **customer requirements**. Target customers are **involved in development process** and new products are tested customer clinics, focus groups and with pilot customers
- Development projects are **enabled by organizational** environment and generally managed very well. However **staffing** of **resources** is a frequent problem

Source: Roland Berger Engineering Excellence Study 2015

EPHT companies spend a lot of effort on internal cross-functional collaboration – Use of supporting tools and methods below average

Main results of the Engineering Excellence Study – Engineered Products & High Tech

- **R&D footprint** of **EPHT companies** is strongly focused on Western Europe, the US and China. Respondents underline the need for **proximity** to **production locations** and **availability** of **skilled** labor so that current locations remain important
- Even though only a **small number** of **locations** is involved in a R&D project, EPHT industry shows a high share of **administrative** work. This is due to high **internal communication** effort and **a weak position** of the project management organization
- EPHT companies meet **customer requirements** very **well**. **Difficulties** only in **China**, India and Asia Pacific due to below average of **local product adaptions** in these regions
- Companies in the EPHT industry with below average **use** of **project management methods** and **tools** for **requirements** identification
- In general, projects are put into a **company-wide framework**. Still, special interests and non-coordinated target systems limit planning

Source: Roland Berger Engineering Excellence Study 2015

Europe will remain main location for R&D due to high qualification of employees – Project success limited by timing and availability factors

Main results of the Engineering Excellence Study – Machinery/Plant Engineering

- **R&D footprint** of European companies is **dominated** by **Western Europe** due to easy access to high qualified staff. Structural shift of R&D footprint mainly driven by need for **proximity to sales** and **production locations**. In five years Western Europe still very important followed by China and India
- More than 50% of Machinery/Plant engineering companies have **2-5 development locations** – In general, projects are put into a company wide network with on average **two locations** working together
- Special interests of stakeholders and **missing coordination** of target systems **limit planning** of projects
- **P&L responsibility** for projects is **not consequently allocated** to project managers – PM not established as career path
- On time **availability** of predefined **resources** is often perceived as a **limiting factor** to project success. Soft factors of project management are in risk of being left "out of sight"

Source: Roland Berger Engineering Excellence Study 2015

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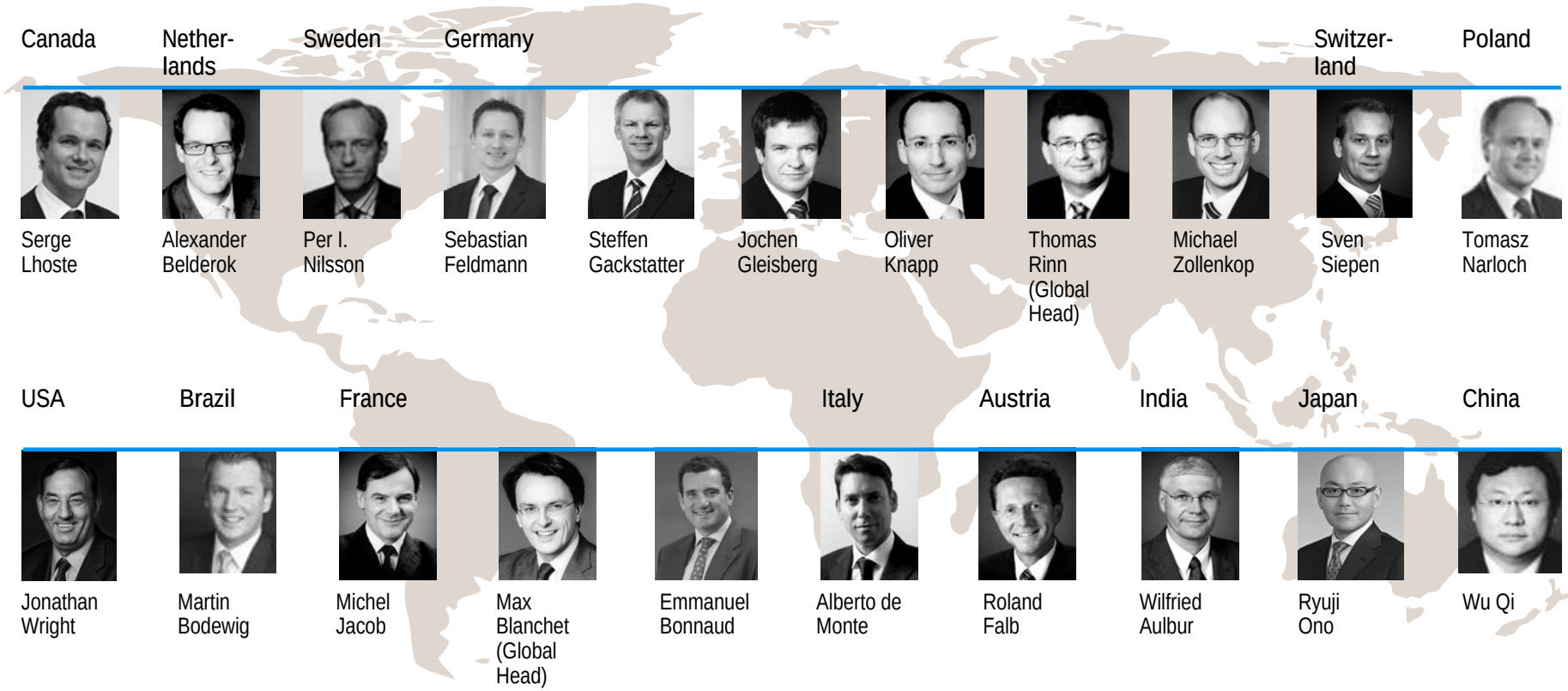
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