



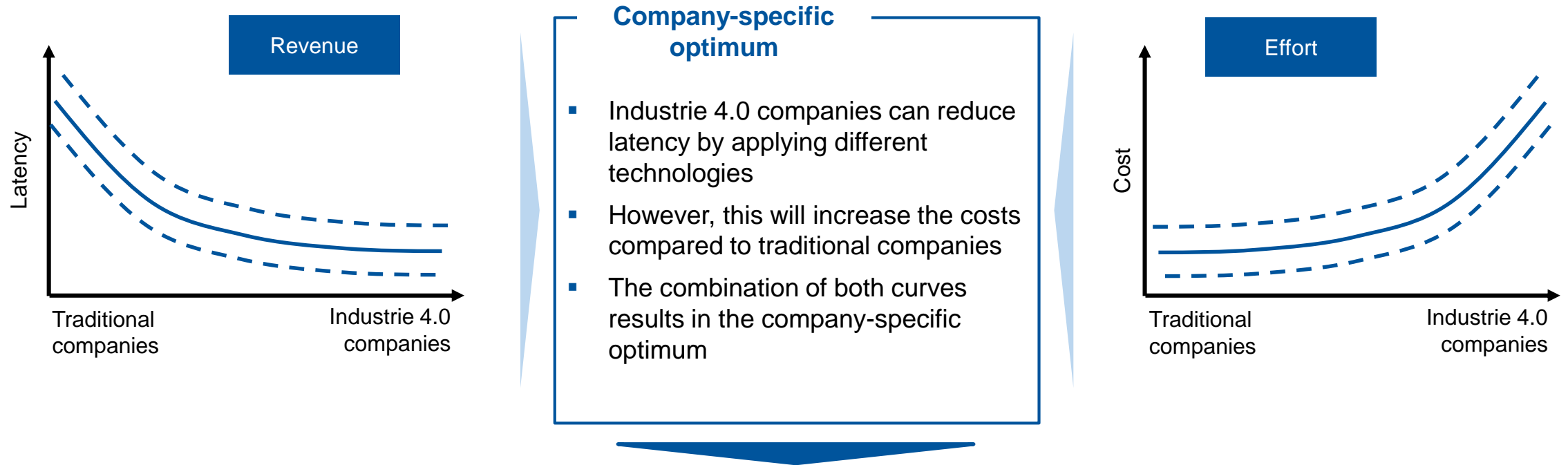
Methodology to Identify the Most Relevant Information Management Principles for Manufacturing Companies Based on their Business Model

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Due to increasing environmental dynamics, companies must be able to adapt to the situation more quickly than their environment does



Research questions

Which factors are necessary to derive a company typology and which are the most relevant corresponding information management principles

Agenda

- 1 Introduction and foundation
- 2 Derivation of the methodology
- 3 Determination of the companies' typology
- 4 Determination of the success factors
- 5 Determination of the required information management principles
- 6 Summary and outlook

1 Introduction and foundation

2 Derivation of the methodology

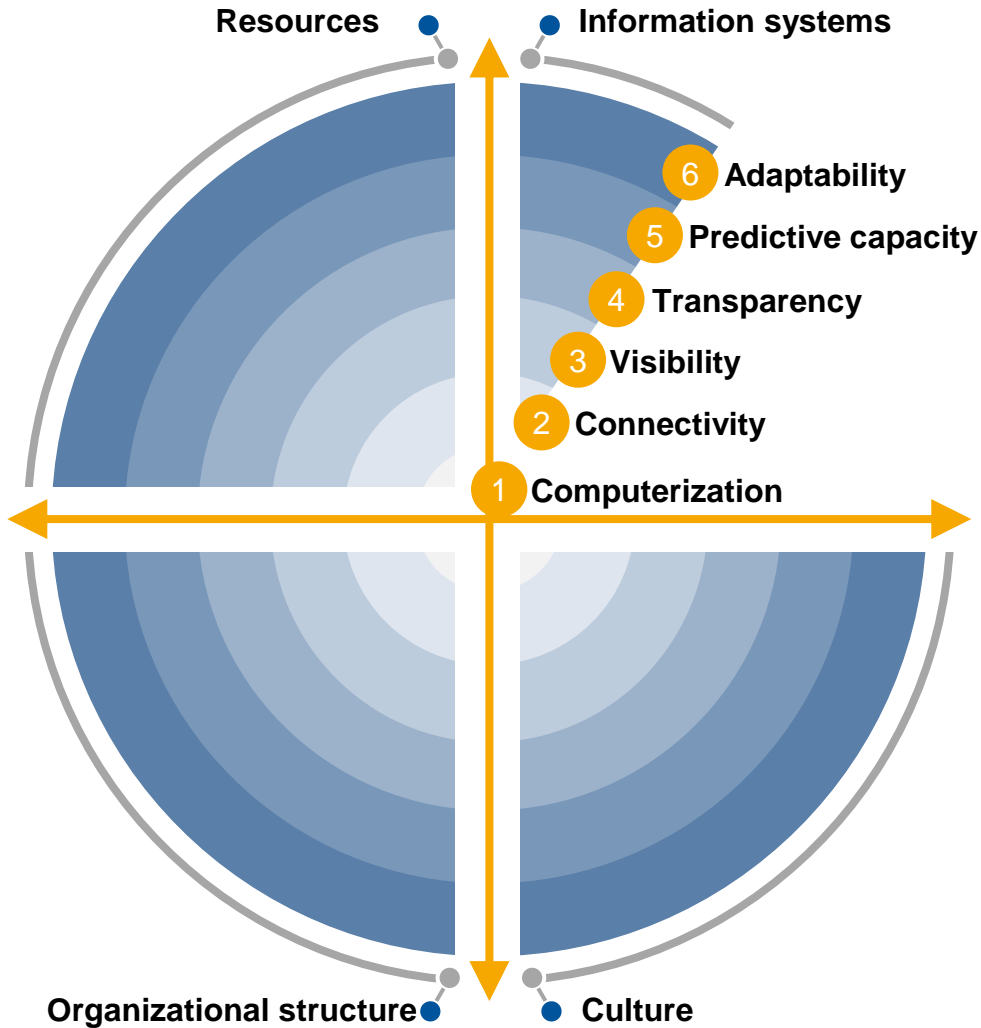
3 Determination of the companies' typology

4 Determination of the success factors


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6 Summary and outlook


The acatech Industrie 4.0 Maturity Index¹ is a methodical, maturity-based approach for the transformation to an Industrie 4.0 company





From inside to outside: Six stages describe the Industrie 4.0 Maturity Index


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1 Usage of information technologies for all of the company's ongoing processes. Data and information are stored in a central database and become available for analysis.
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2 State in which the different **resources and processes are connected** to each other by interfaces.
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3 Achievement of information and decision transparency within the business process. The company's **activities are all comprehensively documented** and can be observed in **real-time**.
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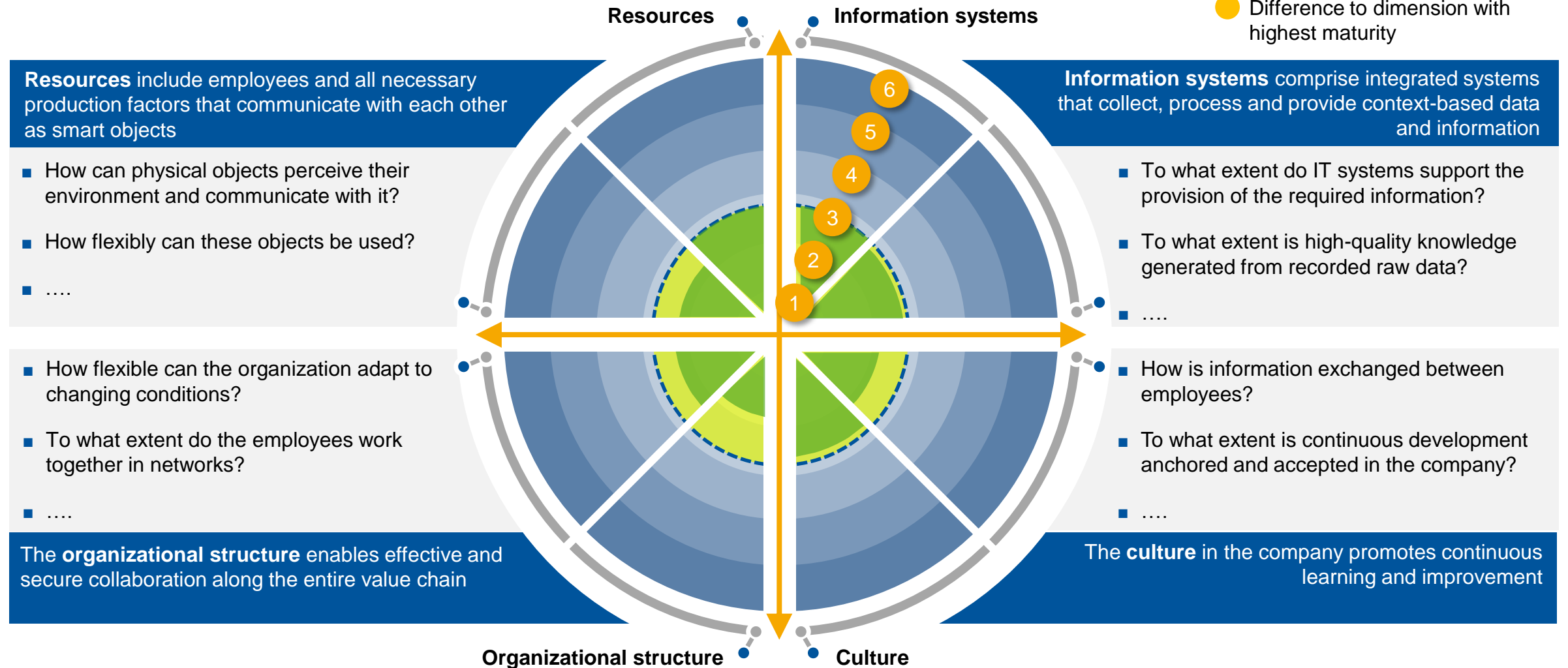
4 Question about how and why something happens. This enhanced understanding can be used to **construct an extensive expert system**.
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5 Predictive capacity translates this expert knowledge into **predictions**. Relevant models are used to predict future system conditions and to provide mechanisms to support decision-making.
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6 Up to a certain degree, possible options are not only generated but also **automatically evaluated**, and after an evaluation, the most appropriate option is implemented.

The four dimensions with its 46 capabilities contain the basic Industrie 4.0 developments and are covered by core questions from a questionnaire

- Degree of maturity reached
- Difference to dimension with highest maturity



Digital Business Models and Information Management Principles represent basic foundations of the developed methodology

Digital Business Models

- There isn't a clear definition of the term business model in literature
- This is not a problem because business models can be described in particular by their characteristics and conception
- Business models are often subject to dynamic change, which is why the concrete elements are depending on time and perspective
- **“A business model describes how the company communicates, creates, delivers and captures value out of a value proposition”²**



When determining the business model, the focus is on determining the core elements. It is less about naming a concrete business model out of a huge number of existing one, e.g. cost leadership, mass customization or pay-per-use.

Information Management Principles

- This paper makes use of the capabilities from the Industrie 4.0 Maturity Index
- Because of the deep and profound analysis within the mentioned acatech study as well as high amount the participating manufacturing companies and research institutes, we see the capabilities corresponding to the dimension information systems as constituting for the information management principles in this work

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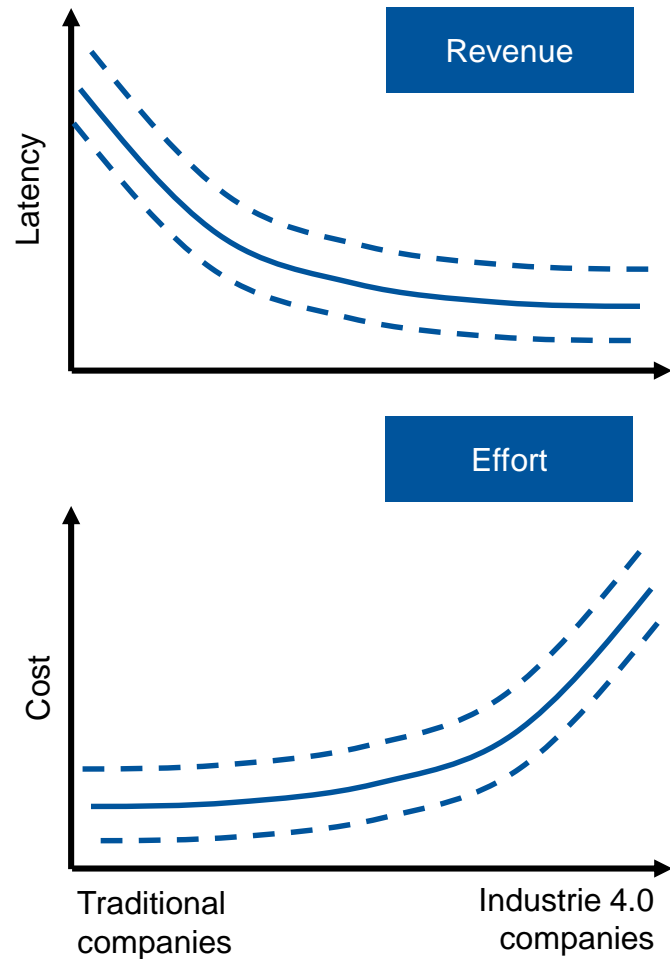
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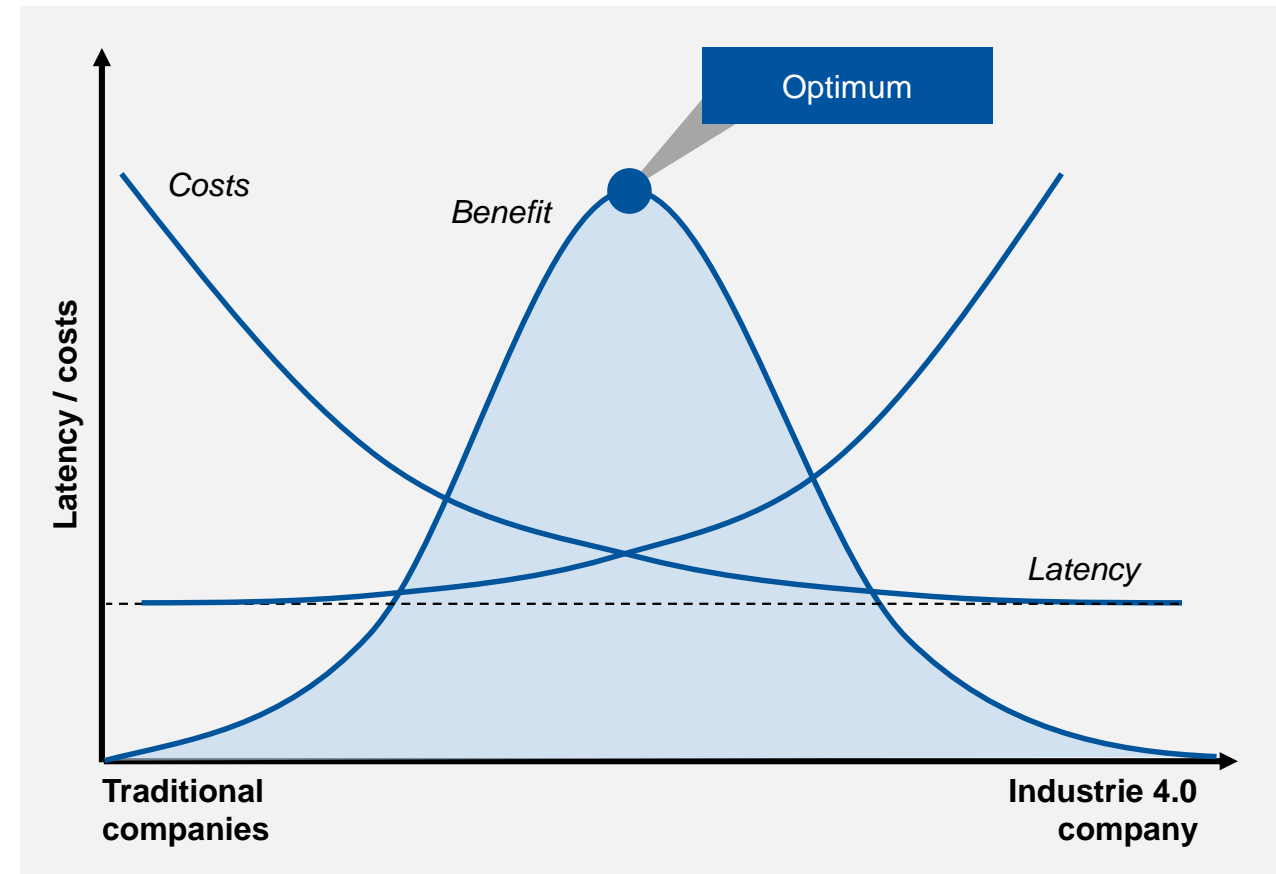
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The company-specific balance of costs and revenues leads to an optimum that paves the way for the highest benefit



Industrie 4.0 transformation utility



The methodology consists of three elementary steps, which allows the determination of the company-specific target value

1 Determination of the business model

- The business model is determined to explain the company typology
- The Business Model Canvas will be conducted in the form of a workshop
- Relevant aspects are uncovered, so that a better awareness can be achieved

2 Determination of the relevant success factors

| | |
|-------------|---|
| Data | <p>Detailed analysis of the customer's requirements</p> <p>Dynamic and agile adaptability of business models</p> <p>Control over the interface between product and customer</p> <p>Ability to create value from available data</p> <p>Ensuring data security and data protection</p> <p>Providing solutions for applications based on and supported by data</p> |
|-------------|---|

- In a second workshop, the company determines the relevant success factors for a successful functionality of the business model
- How many success factors are regarded as relevant can be decided individually

3 Derivation of the required information management principles

| Digital Capability | Resources | | | Information Systems | | | OS |
|--|---------------|-------------|-------------------------|---------------------|--|--|----|
| | Struct. Comm. | Integration | Informations processing | Collab. VN | | | |
| Factory structure | | | | | | | |
| Identification of (intermediate) products and assemblies | | | | | | | |
| Identification of the material | | | | | | | |
| Identification of tool | | | | | | | |
| Information processing of machines | | | | | | | |
| Information processing of products | | | | | | | |
| Interdisciplinarity of employees | | | | | | | |
| IT competence of the employees | | | | | | | |
| Cooperation human / machine | | | | | | | |
| Perception / Sensors of the machine | | | | | | | |
| Perception / Sensors of the product | | | | | | | |
| Machine communication interface | | | | | | | |
| Human communication interface | | | | | | | |
| Communication interface human / machine | | | | | | | |
| Data governance | | | | | | | |
| Data model | | | | | | | |
| Data quality | | | | | | | |
| Data interface | | | | | | | |
| System transparency | | | | | | | |
| Horizontal integration | | | | | | | |
| Vertical integration | | | | | | | |
| User interface | | | | | | | |
| Data analysis for decision support | | | | | | | |
| Data retention | | | | | | | |
| Data volume | | | | | | | |
| Range in information | | | | | | | |
| Information provision | | | | | | | |
| Resilience | | | | | | | |
| Capacity management | | | | | | | |
| Core competencies | | | | | | | |
| Competence management | | | | | | | |

- In the final step, the necessary information management principles of the Maturity Index are derived from the relevant success factors
- This results in the company-specific target characteristics

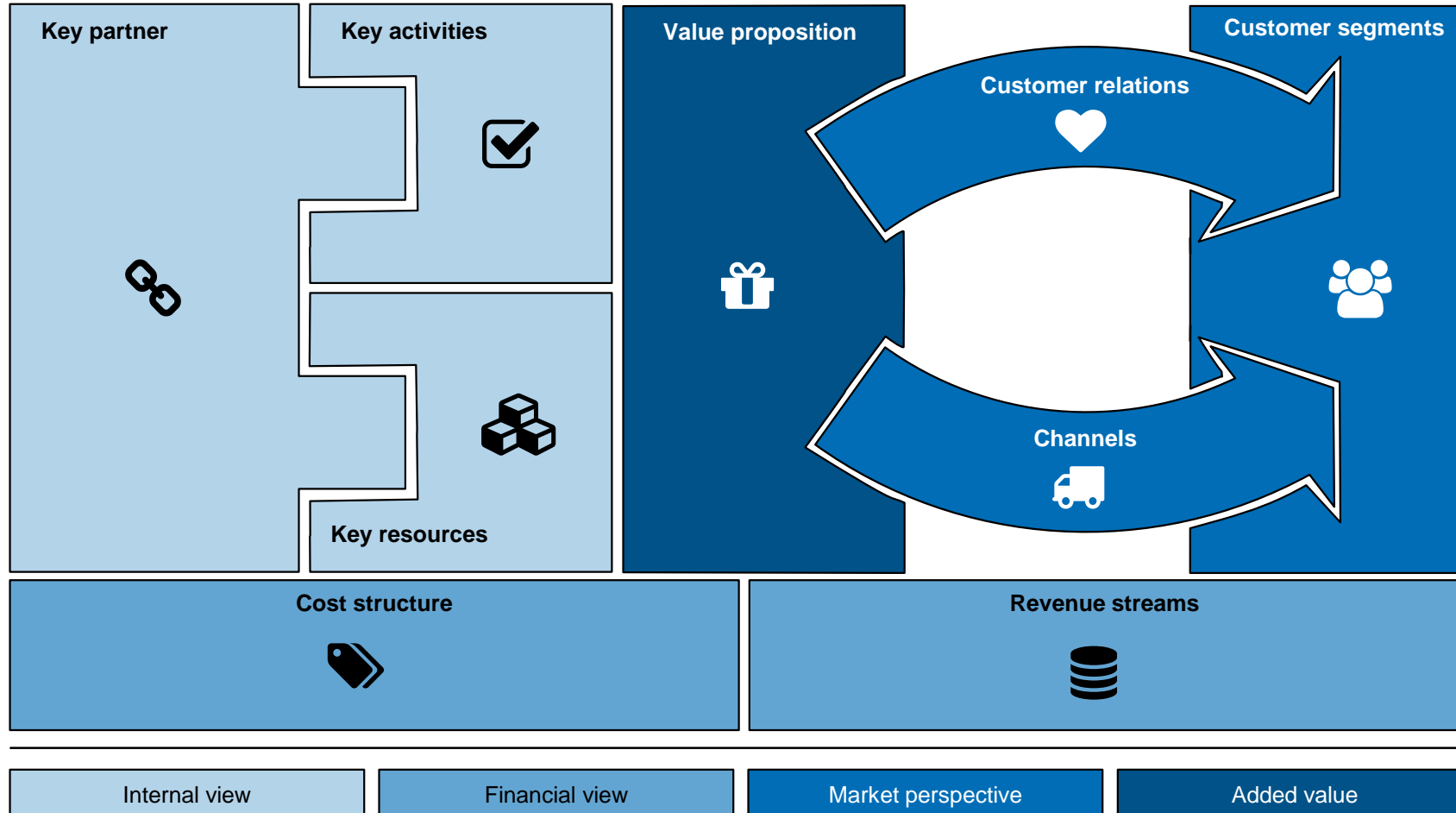
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The use of the Business Model Canvas³ in the form of a workshop determines the companies' typology using the business model



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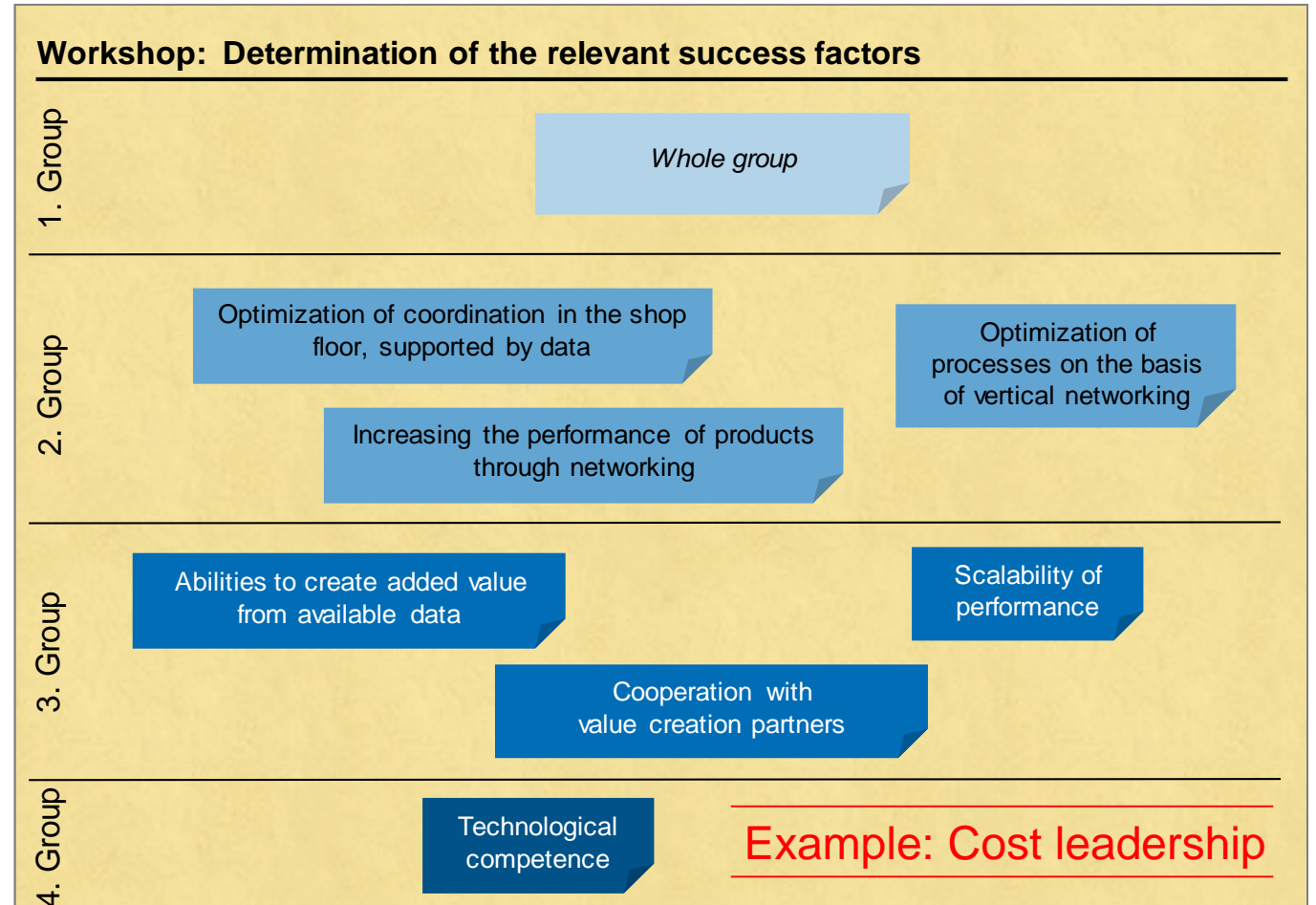
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- 4 **Determination of the success factors**

- 5 Determination of the required information management principles
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In the second step, those success factors are selected from 46 aggregated success factors, which are considered relevant by the company

| Success factors | |
|-------------------|---|
| Data | Detailed analysis of the customer's requirements |
| | Dynamic and agile adaptability of business models |
| | Control over the interface between product and customer |
| | Ability to create value from available data |
| | Ensuring data security and data protection |
| | Providing solutions for applications based on and supported by data |
| Production System | Increase of "First Time Quality" |
| | Reduction of the reject rate |
| | Increasing resource efficiency |
| | Reduction of the number of work in progress parts |
| | Reduction of (warehouse) stocks |
| | Reduction of lead time |
| | Reduction of set-up times |
| | Reduction of maintenance costs |
| | Reduction of downtime |
| | Implementation in production with a high number of |



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In the third step, the extensive matrix is reduced to the selected success factors in order to be able to read off the resulting target values

| Success factors | Resources | | | | Information Systems | | | | OS |
|--|--------------------|---------------|-------------|------------------------|---------------------|--|--|--|----|
| | Digital Capability | Struct. Comm. | Integration | Information processing | Collab. VN | | | | |
| Factory structure Identification of intermediate products and assemblies Identification of material Identification of tool Information processing of machines Interdisciplinary processing of products Interdisciplinary of employees IT competence of the employees Cooperation human / machine Perception / Sensors of the market Perception / Sensors of the machine Machine communication interface Human communication interface Communication interface human / machine | | | | | | | | | |
| Data Detailed analysis of the customer's requirements Dynamic and agile adaptability of business models Control over the interface between product and customer Ability to create value from available data Ensuring data security and data protection Providing solutions for applications based on and supported by data Increase of "First Time Quality" Reduction of the reject rate Increasing resource efficiency Reduction of the number of work in progress parts Reduction of (over-house) stocks Reduction of lead time Reduction of set-up times Reduction of maintenance costs Reduction of downtime Implementation in production with a high number of variants and small quantities - lot size 1 Reduction of fixed costs / investment requirements Exploiting the full potential of Industrie 4.0 through structural change in terms of flexibilisation Optimization of coordination in the shop floor, supported by data | | | | | | | | | |
| Production System Highly qualified specialists Optimization of processes on the basis of vertical networking Combining efficiency and flexibility Orientation on Best Practices of other industries Differentiation through uniqueness Identification of research and development Technological competence Traditional core competencies Decoupling of product development and production Customer benefits and customer requirements as the basis for products and services Cooperation with value creation partners Integration of customers into the value chain Strategy for participation in platforms Participation in platform as a basic prerequisite for sustainable corporate success Transparency and networking Protection against new market participants Increased transparency | | | | | | | | | |
| Internal company value creation Digitization of the product and service portfolio Hybrid product and service combination Intelligent products that appeal to new target groups Individuality and modularity of performance Scalability of performance Availability of services and products Openness of systems Agility by shortening product life cycles Increasing the performance of products through networking Economic design of the service offering | | | | | | | | | |

| | Resources | | | Information Systems | | | | OS |
|---|--------------------|---------------|-------------|-------------------------|------------|--|--|----|
| | Digital Capability | Struct. Comm. | Integration | Informations processing | Collab. VN | | | |
| Factory structure | | | | | | | | |
| Identification of (intermediate) products and assemblies | | | | | | | | |
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| IT competence of the employees | | | | | | | | |
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| Perception / Sensors of the machine | | | | | | | | |
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Company-specific information management principles

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Future or subsequent research needs

Inclusion of the two dimensions organizational structure and culture of Industrie 4.0 Maturity Index

Elaboration of the developed workshop concepts in field trials

Possible inclusion of further company characteristics to describe a company typology

Detailed analysis of the 46 success factors in terms of significance, scope and totality



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Thank you very much for your attention!

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