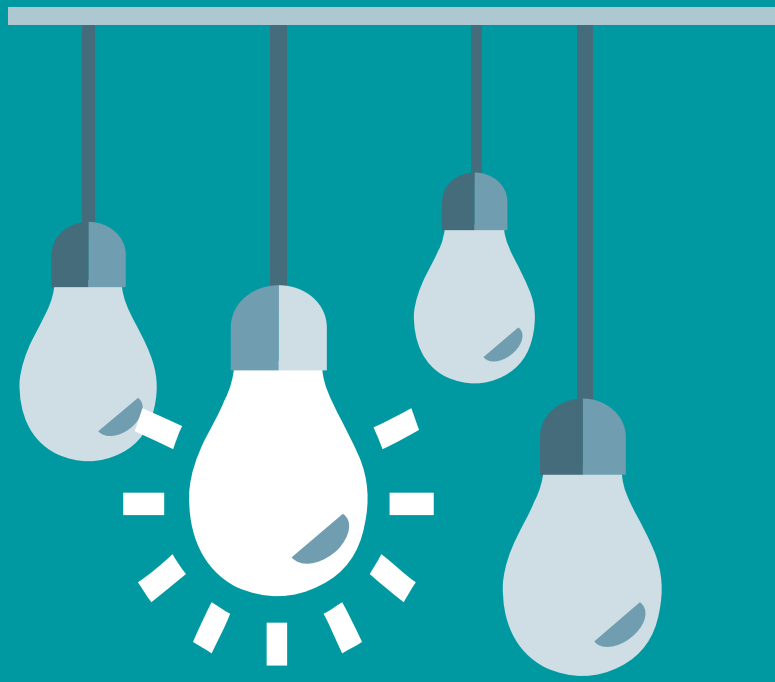
Innovation and Development Strategies

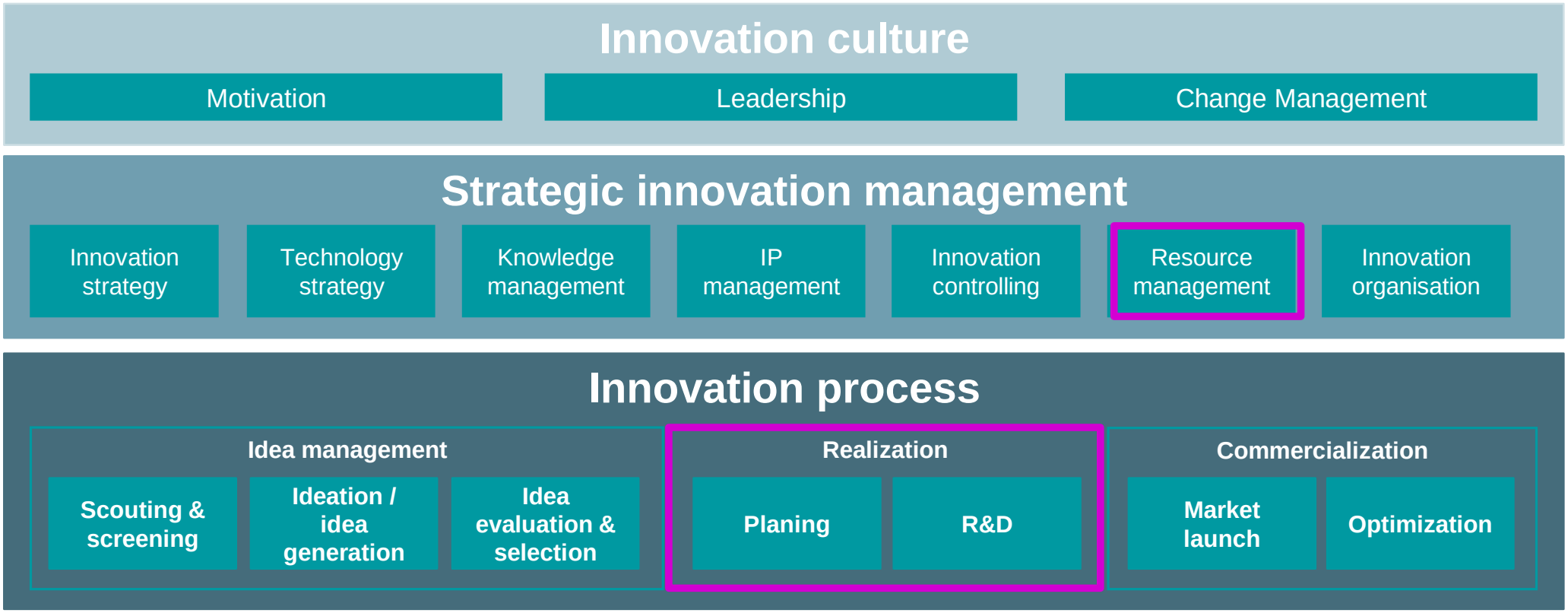
Business Case PHOENIX CONTACT
Part III

Christian Helmig



Business Case PHOENIX CONTACT

Part III



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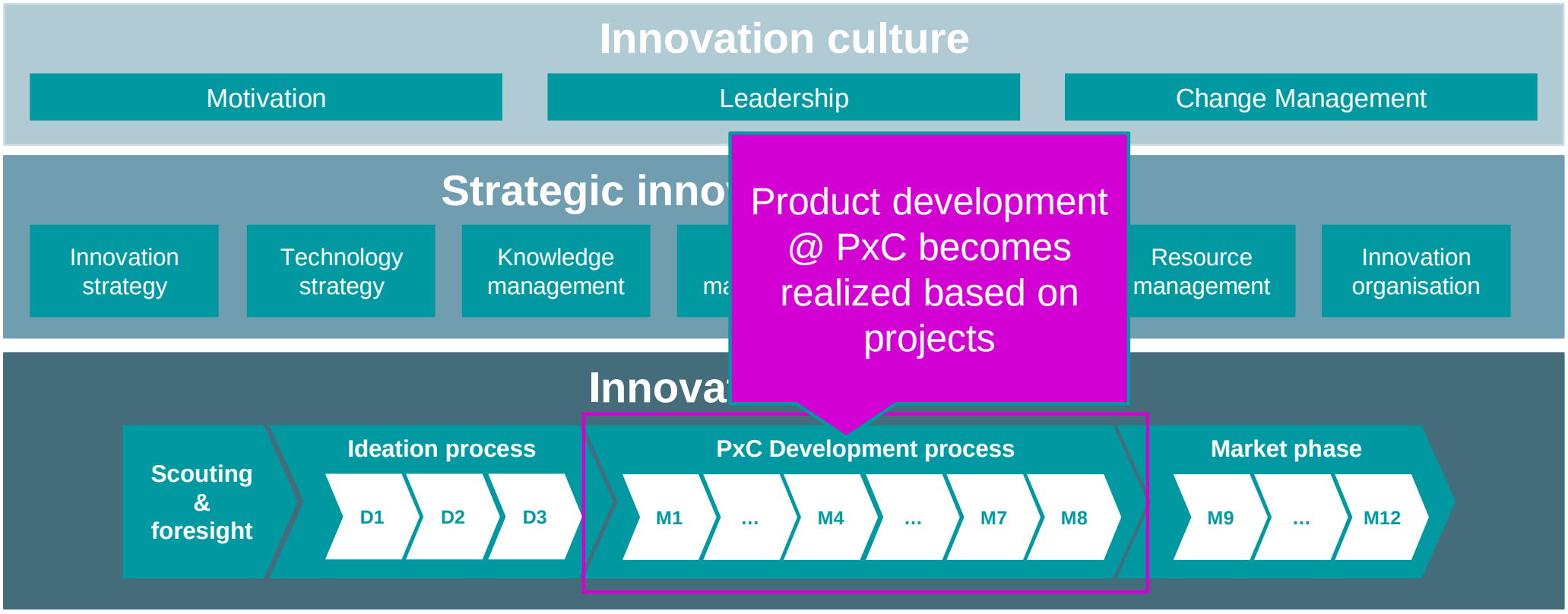
Innovation management



Adapted from Fraunhofer IPT

Business Case PHOENIX CONTACT Part III

Today´s agenda

- Project management
- Product development process

Why is project management required?
When is the implementation of project management useful (when not)?

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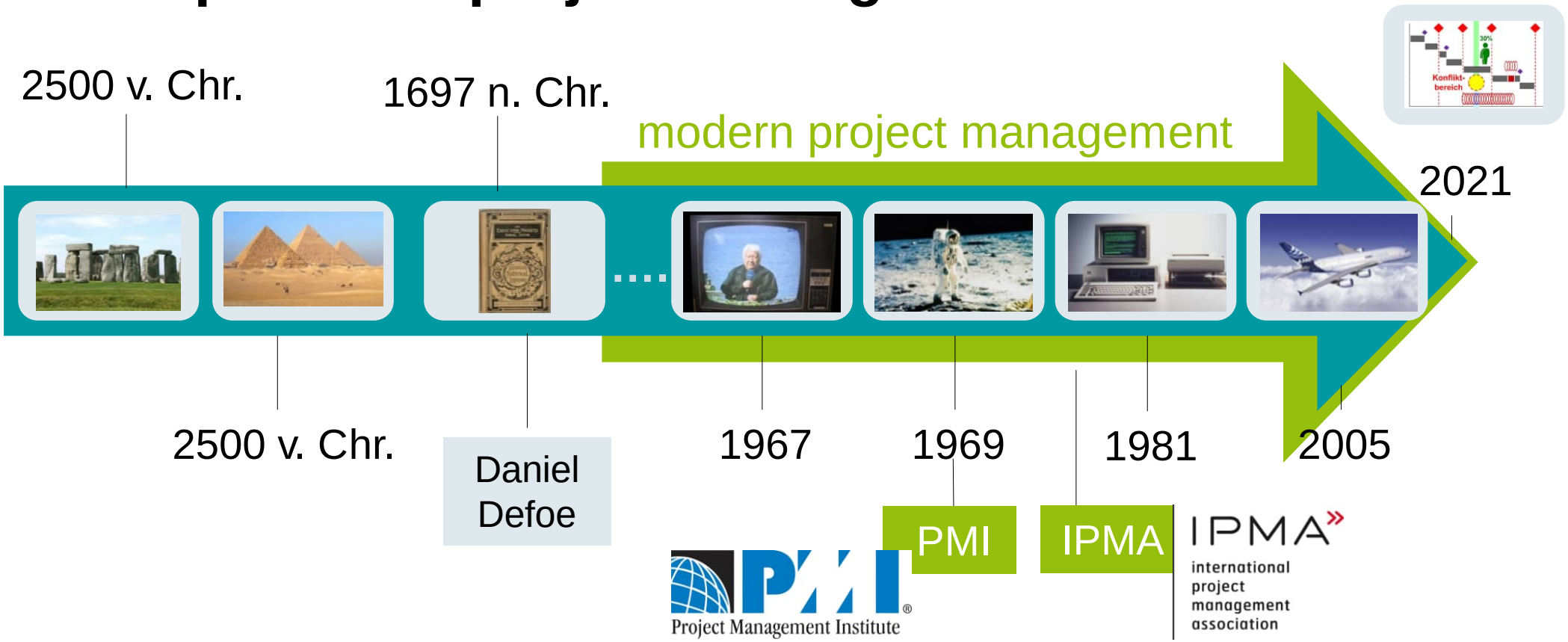
Development of project management



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Development of project management

However, an honorable project maker is one who adequately commits his idea to the clear principles of common sense, honesty and prudence.

analogous to Daniel Defoe (1697)

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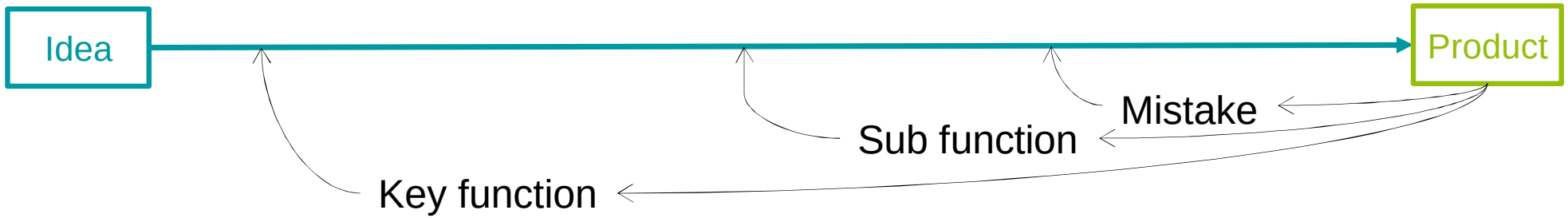
Why project management? - path from idea to product

→ The „fast way“



High level of **risks:**

- Problems are detected at the end of the development with all the bad consequences (time, money, …)
- There is no defined “setback"

→ not calculable

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Why project management? - path from idea to product

→ The „fast

Idea

Product

Some practical experiences

- **Duration of projects** is completely incalculable
  - Planned: 12 month; actual: 30 month
- Significant **development errors** occur only at the customer
  - Troubleshooting and device replacement in manufacturing plants
- Unsustainable commitments to customers lead to **prototype delivery**
  - "Banana products" mature at the customer site
- Announcing **ghost products** at trade shows and in brochures
  - Product discontinuation before the first delivery

High level of r

- Problems a
- There is no

ne, money, …)

→ not calcu

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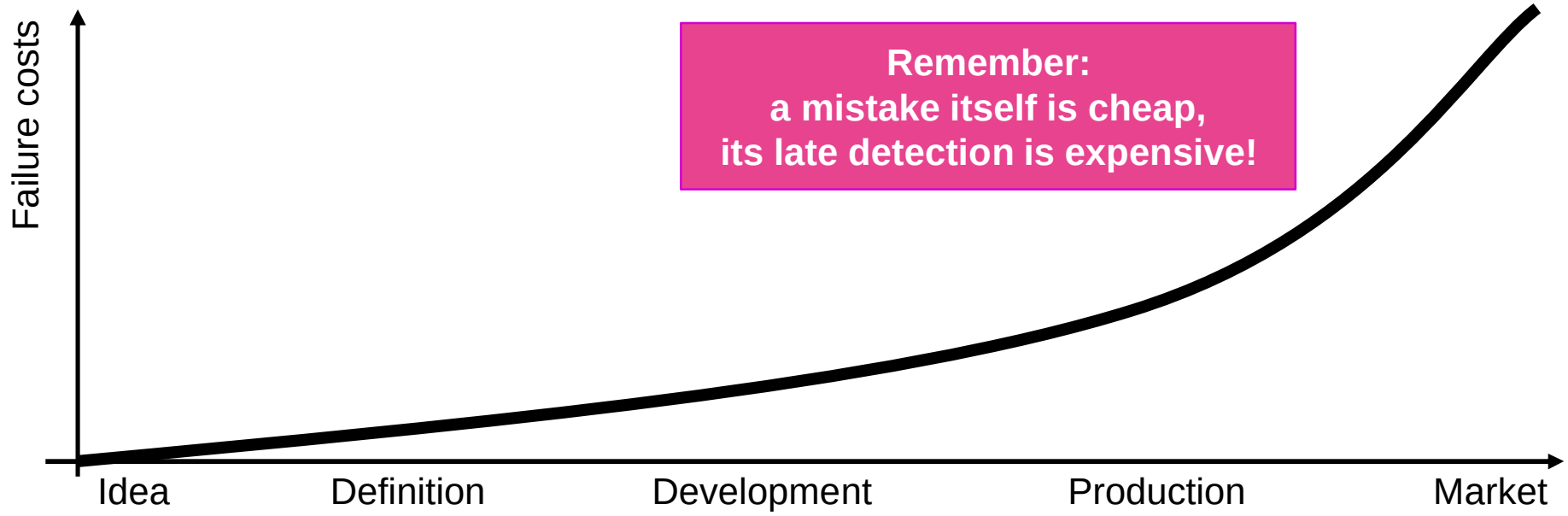
Why project management? - path from idea to product

→ The „fast way“



→ What goes wrong at the beginning will be costly in the end when detected lately

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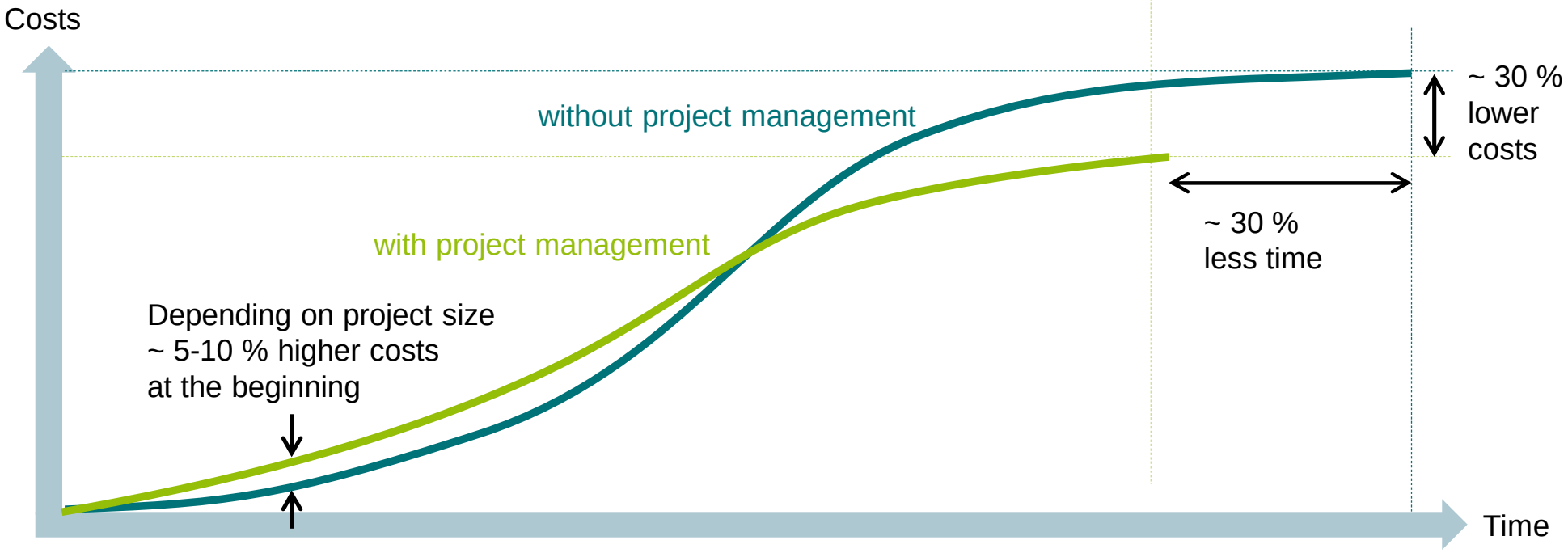
Why is project management required?



→ Project management helps to reduce time and costs

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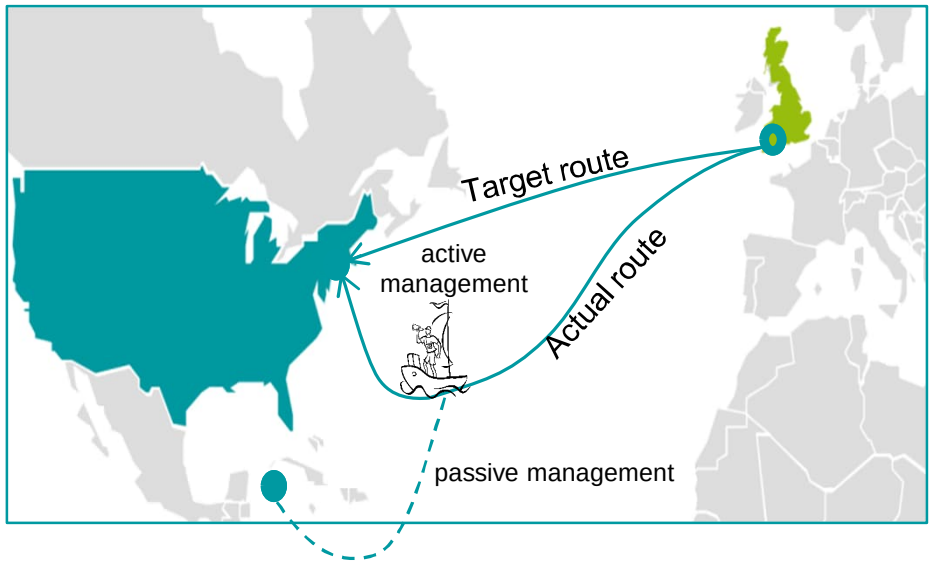
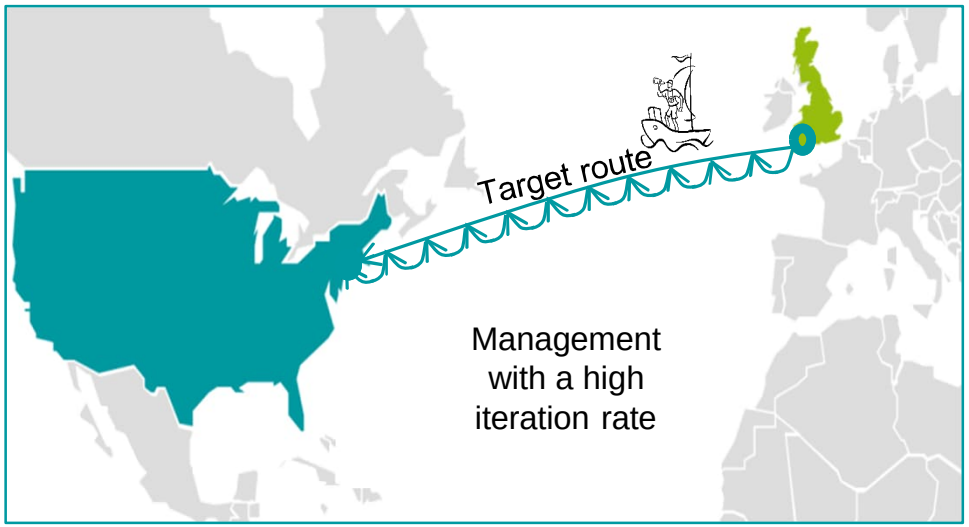
Project management: reducing risk & required time



→ Without project management



→ With project management

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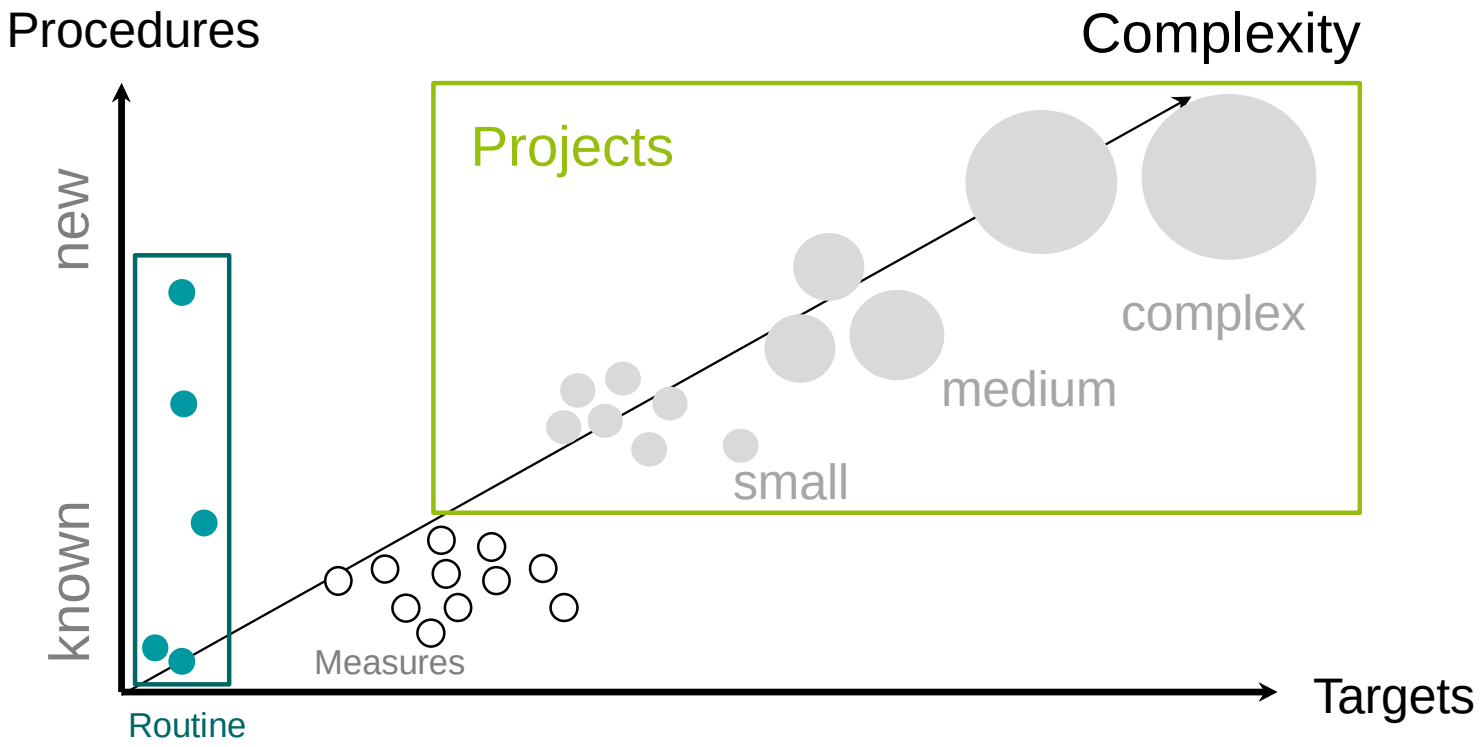
When is project management applied?



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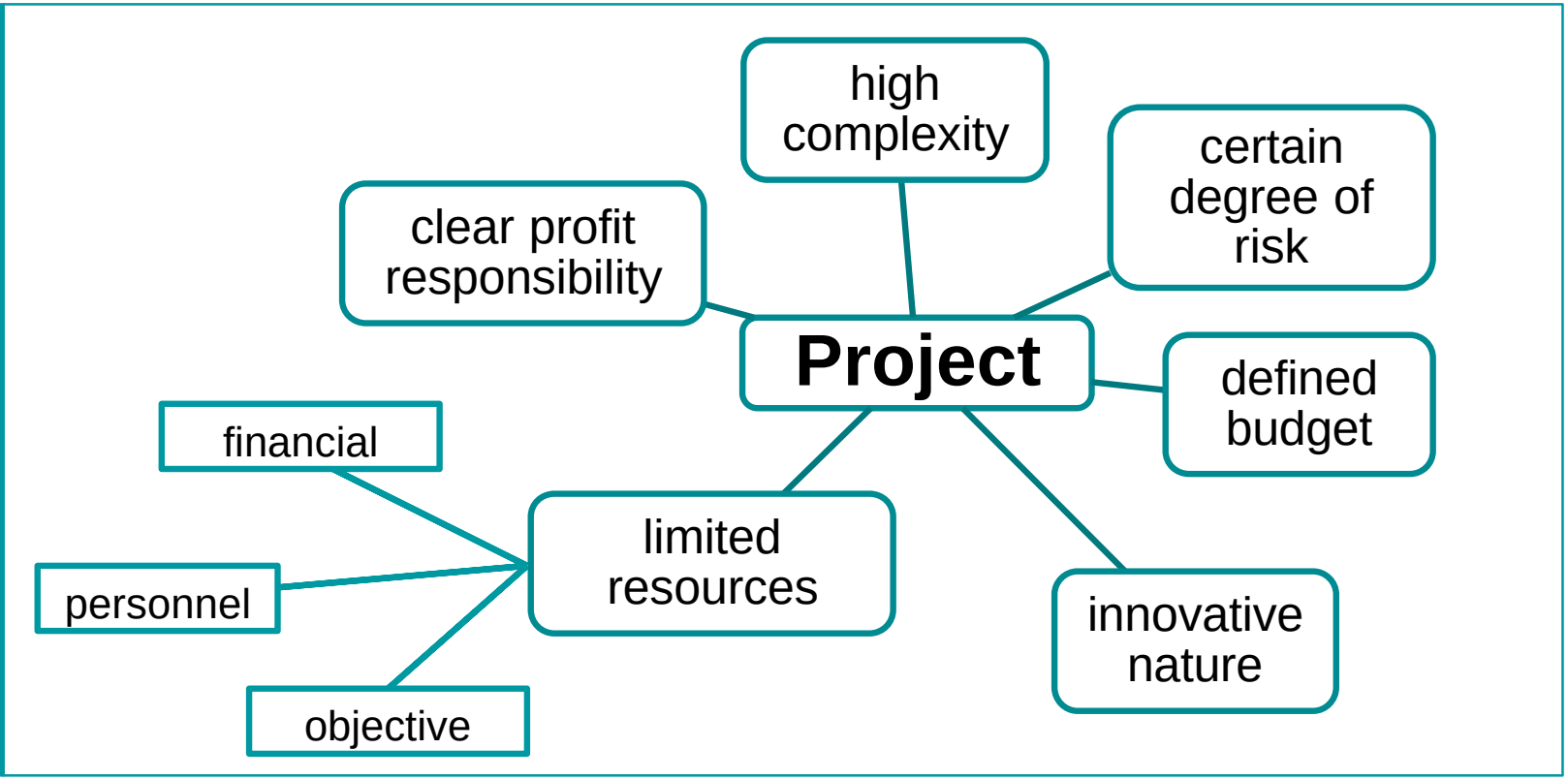
Characteristics of a projects

What characterizes a project?



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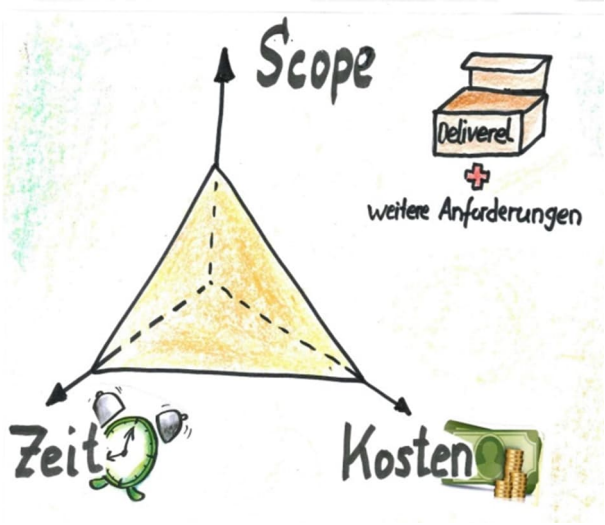
The „magical triangle“ of projects



Scope

- What does the project need in order to achieve the quality in terms of technology, budget and personnel?

Time

- Which final date and which intermediate dates (milestones) do you want to reach?

Budget

- What budget do you need if you want to meet the required deadline and the quality should meet your expectations?

Resources

- How many human resources do you need for this project?

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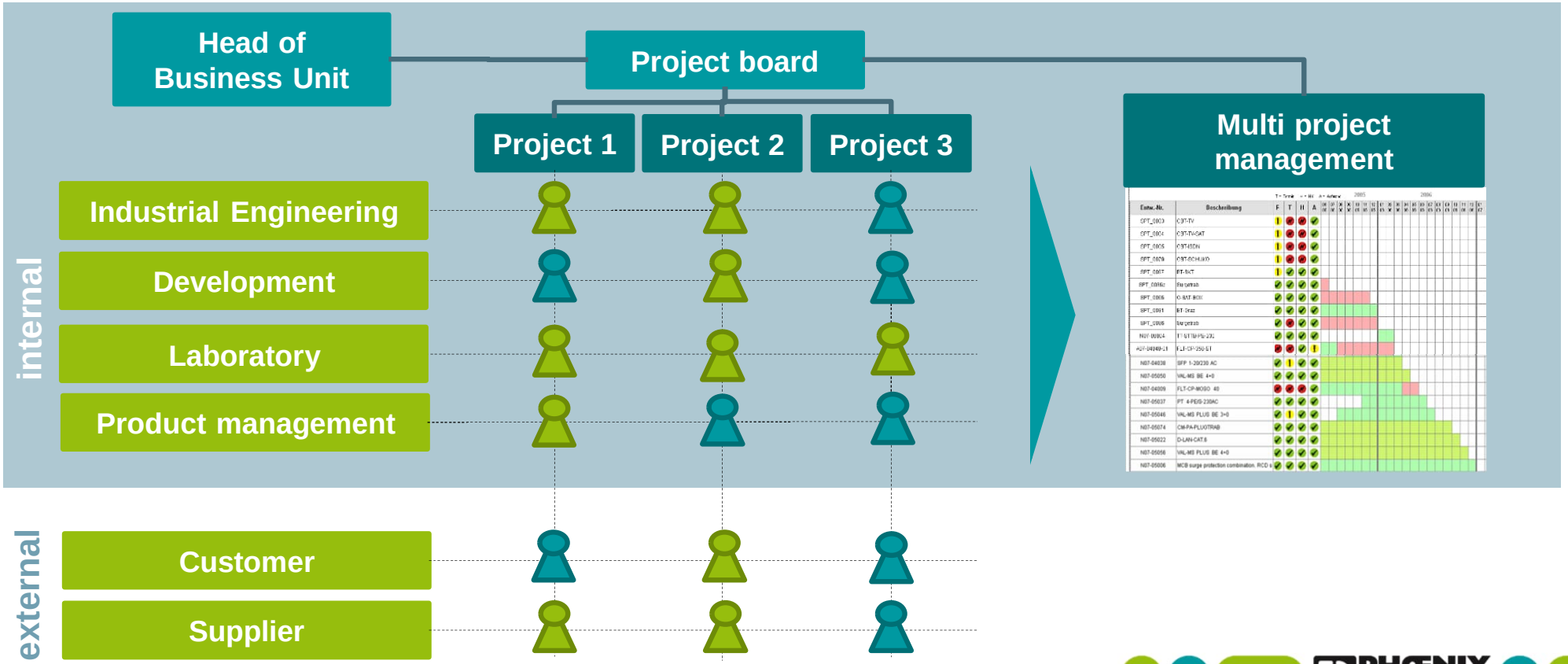
Project organization: matrix team



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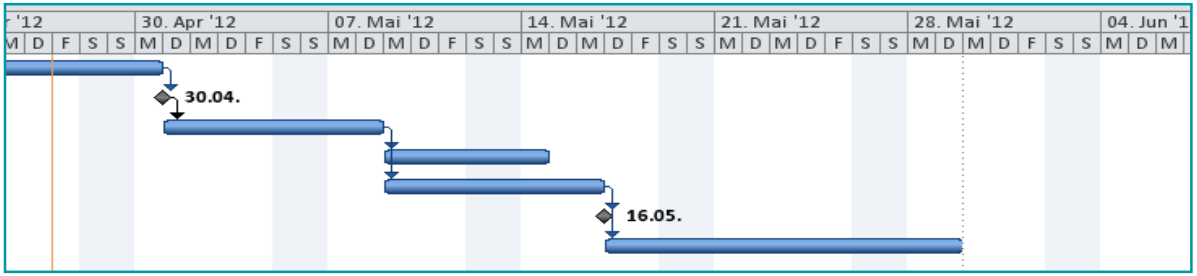
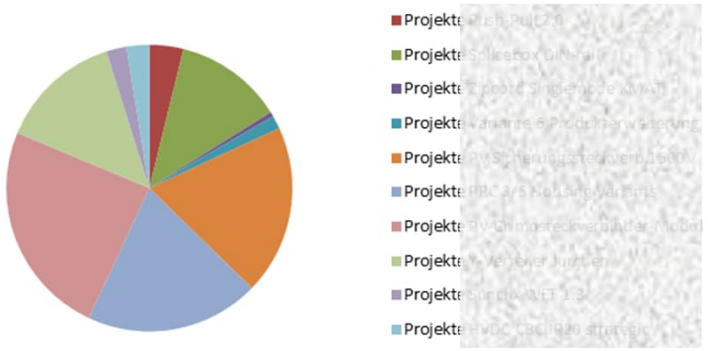
Project resource management

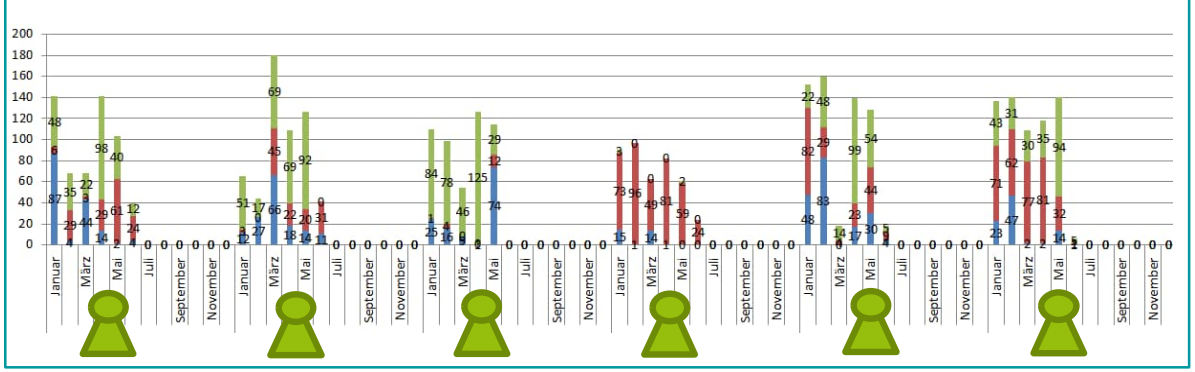
Human resource staffing at project start



Hours booked on projects



Staff: capacity utilization per employee



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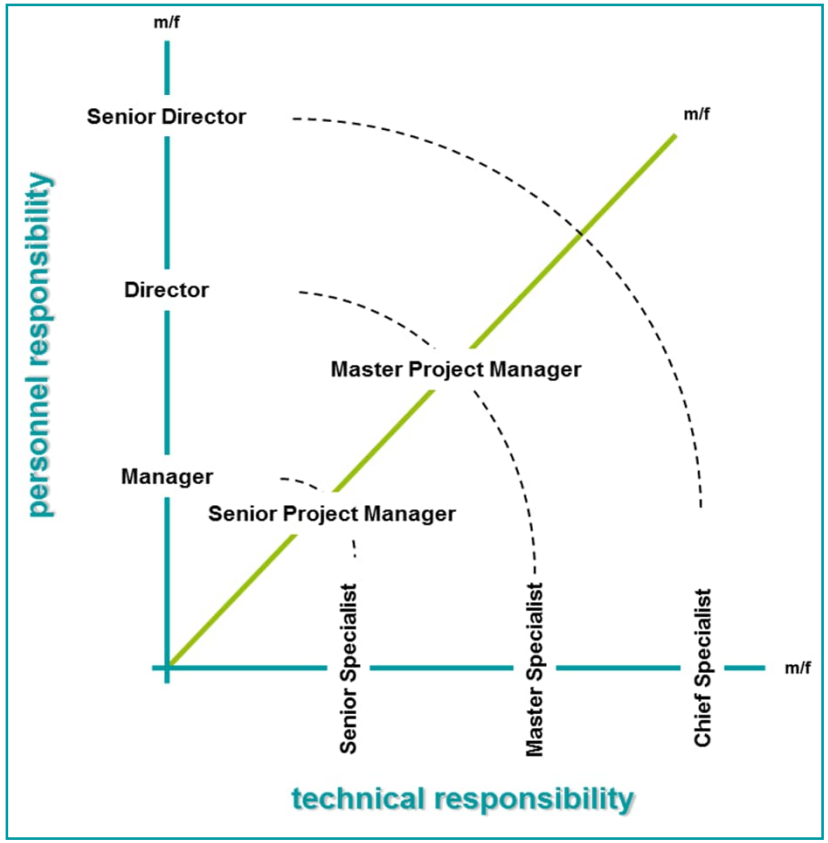
Phoenix Contact: career model



- A project-oriented company needs the job title "project manager" for the personnel development concept in addition to the classic specialist or management career path.
- Project managers are systematically qualified and supported. The project manager will be ranked according to his experience in the company's career model.
- Depending on interest and inclination, the project manager can later change to one or the other classic path.

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Phoenix Contact: Internal training concept

Project Management Institute

IPMA international project management association

Phoenix Contact Project Management Expert

External training

Internal training

Based on the same international standards!

ISO 21500:2012
Guidance on Project Management

IPMA international project management association

Project Management Institute

IPMA Level-A
Project Director

IPMA Level-B
Senior Project Manager

IPMA Level-C
Project Manager

IPMA Level-D
Project Management Expert

Basic Certificate

PMP
Project Management Professional for Project Manager

CAPM
Certified Associate in Project Management

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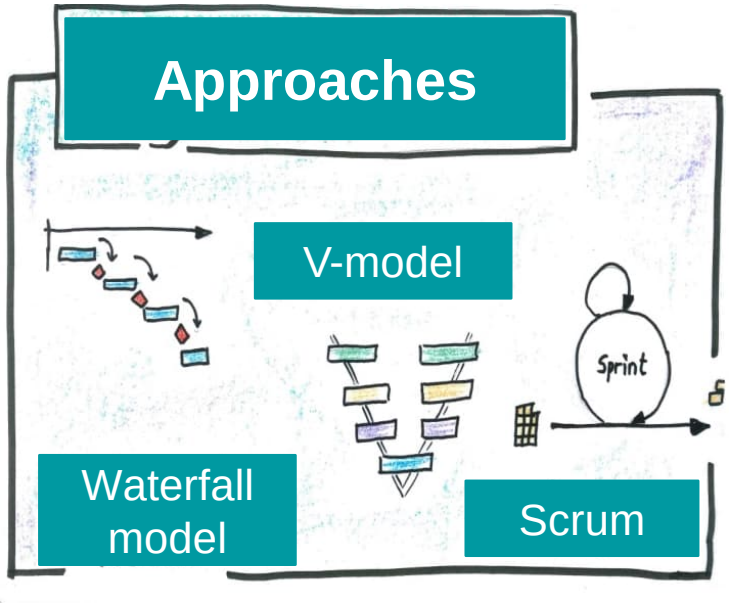
Different approaches to run projects



Different types of projects requires different types of project procedure models

- **Waterfall model:** commonly known as Stage Gate process (by Cooper)
  - Dominant approach by Phoenix Contact in product development
- **Scrum:** agile project management approach initial for software development
- **V-Model:** mainly used in software system development

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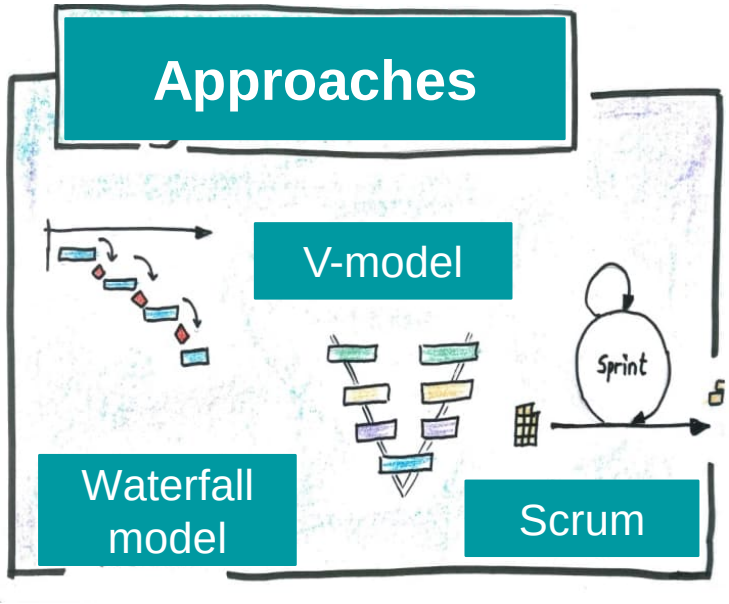
Different approaches to run projects



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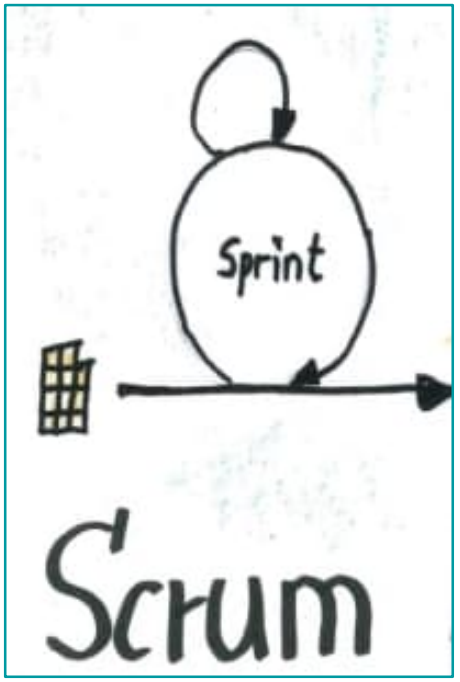
Definition of agile project mangement

Agile project management is a generic term for various process models in software development such as ”Scrum“ or ”Extreme Programming”.

It is also increasingly used as a term for a new way of thinking in project management as opposed to traditional, planning-oriented project management.

With the adjective "agile" the representatives of the "agile" processes and the "agile project management" want to express that they want to make the management and control of projects and processes very dynamic and flexible. "Agile" is the successor term of "light" or "lightweight" and should highlight the positive aspects of low planning and leadership intensity more clearly.



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The agile manifest

“We are looking for better ways to develop products by practicing it ourselves and helping others to do so.“

- **Individuals and interactions** take precedent over processes and tools.
- **Functional products** have priority over extensive documentation.
- **Cooperation with the customer** takes precedent over contract negotiations.
- Addressing **changes has priority** over strict schedule tracking

→ Agile project management is becoming more and more relevant & established by Phoenix Contact.

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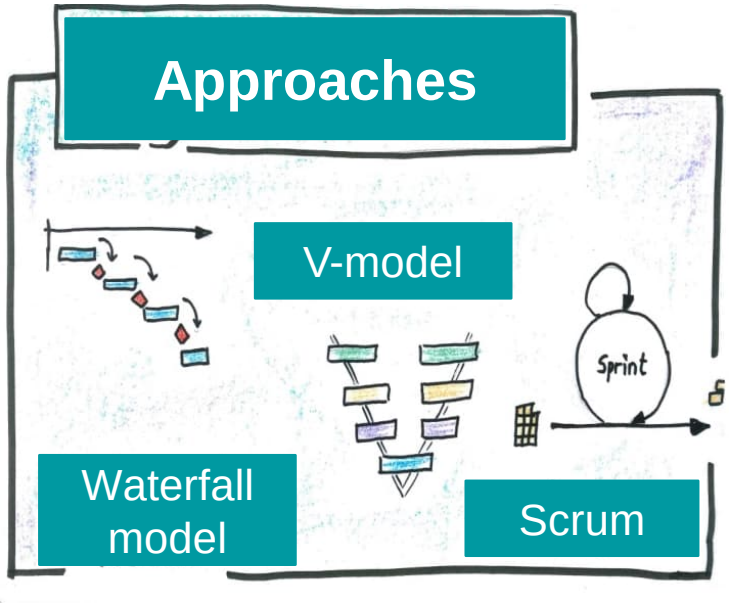
Different approaches to run projects



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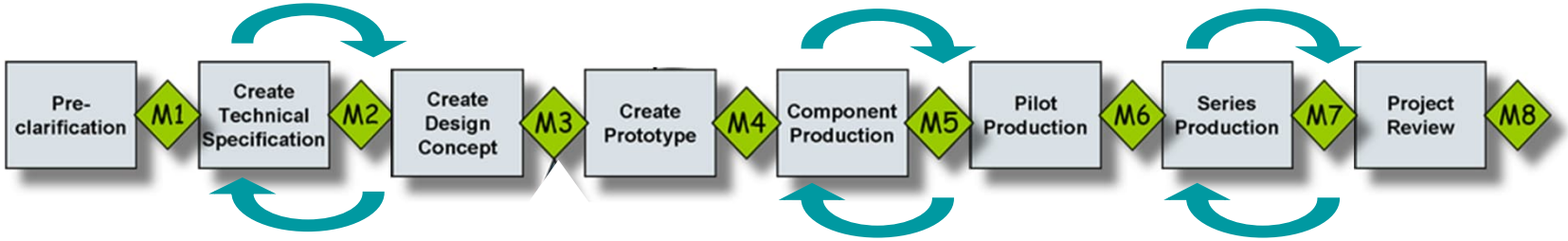
Waterfall: Stage-Gate® Milestone Process



…allows to shorten the “time to market” thanks to the early detection of problems and the avoidance of setbacks in the development process and…

... makes the project more calculable & safe

Stage-Gate® is a registered trademark of the Dr. Robert. G. Cooper, Product Development Institute

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Today´s agenda

- Project management
- Product development process

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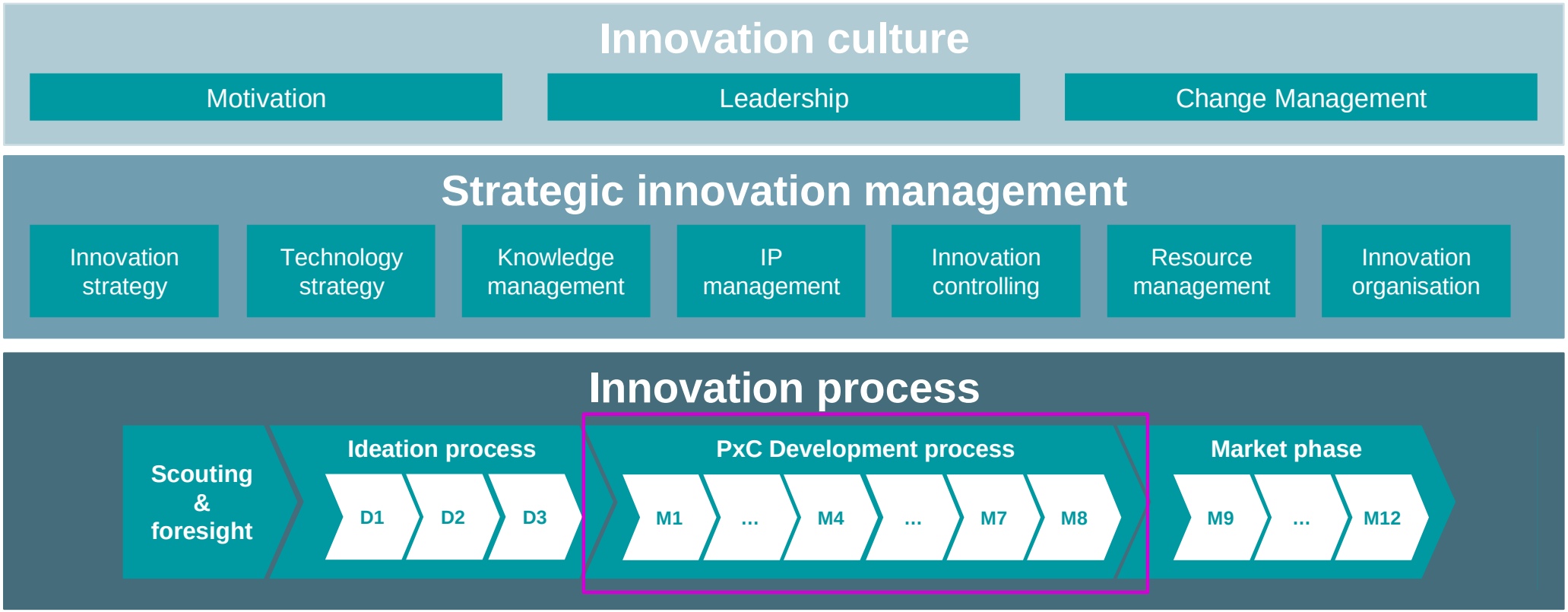
Reminder: Innovation process



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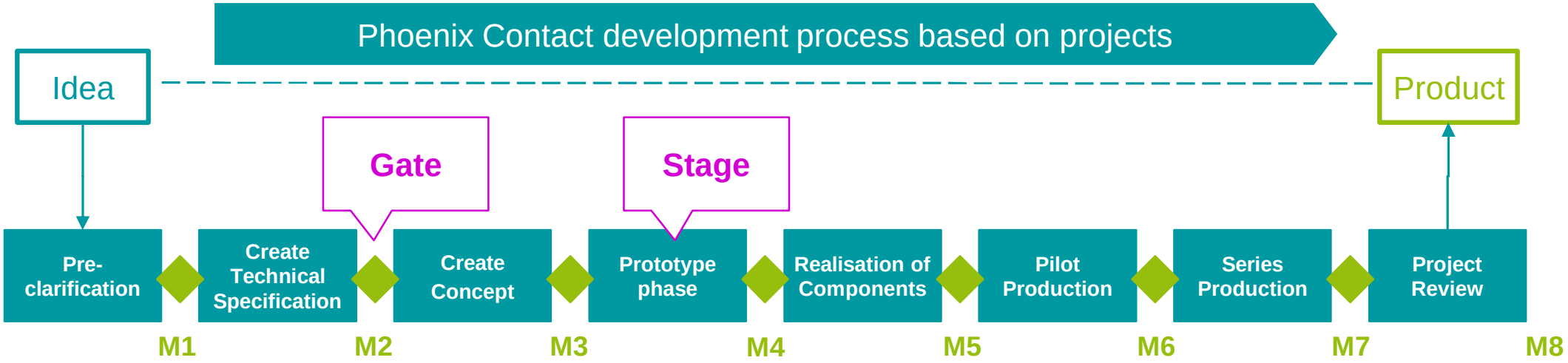
Product development @ PxC: Milestone Process



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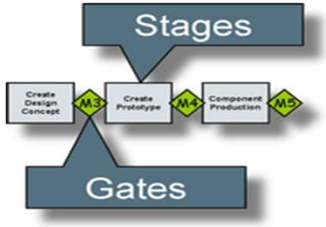
Product development @ PxC: Milestone Process

The stages

- In each stage, the team deals with a set of specified activities that are based on the “Best Practices” of Product Development.
- Each stage has to be completed successfully before approval (from management) is granted and the next stage of the product development can be tackled.
- All stages are interdisciplinary – several departments of a company are involved.
- Prior to each stage, there is a decision or “gate”.



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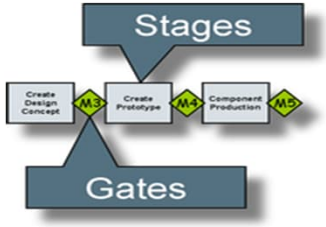
Product development @ PxC: Milestone Process

The gates

There is a gate prior to every stage...

- In the Gate Review Meeting, the results of the activities of the previous stages (“deliverables”) are measured by means of specific criteria.
- Quality assurance of the project: Has the previous stage been carried out in sufficient quality?
- The criteria are stated in the form of checklists
- The results of the Review Meeting provide decisions in the form of “Go”, “Hold”, “Recycle” or “Kill”

...which determines whether and how the next stage is started.



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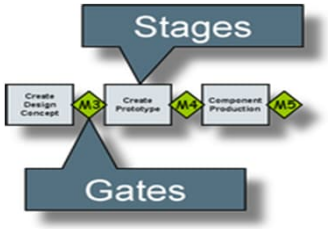
Product development @ PxC: Milestone Process

Gate Meeting



Are all requirements of the project with the plan at this time?

Review gate meeting (project team & management team)

No, requirements are not met → **Rejection/ on hold** (or new planning & re-evaluation) → **Project ends or gets "on hold"**

Yes with constraints: requirements are not entirely met → **Limited release** (project continues, constraints have to be met) → **Catalog of measures has to be completed**

Yes, requirements are met → **Release** (project continues) → **Project can be continued**

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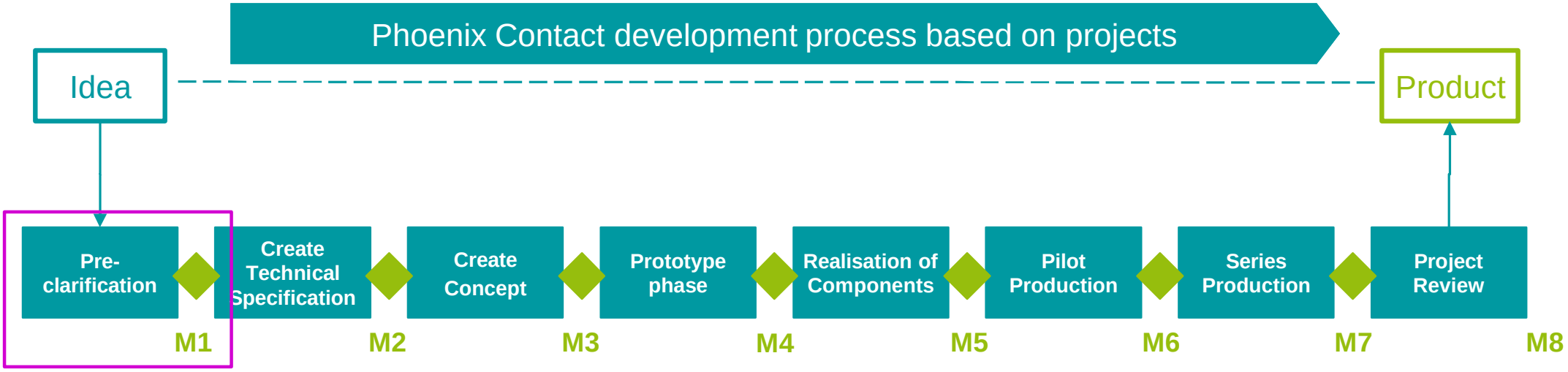
Product development @ PxC: Milestone Process



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

What is required?

Pre-clarification / M1

→ M1 gate meeting: release of requirement specifications

- Target: Marketing/Sales have described a product that contributes to the success of the company
- Criteria:
  - Functions have been accepted by the customer or comply with the market requirements
  - Compliance with the Strategic Development Plan (SDP)
  - Importance and priority of the product have been coordinated
  - A project leader and a team have been named for the functional specifications stage
  - The resources are available

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Example SUNCLIX: analysis of competitive products

Analysis of competitive products in order to identify strenght & weaknesses and potentials for USPs

Analysis in terms of…	
Competitor products: → Amphenol Helios H4 → Kostal KSK4 → Lapp EPIC® SOLAR 4 → Multi-Contact MC4 → QC Solar QC4.10 → Yamaichi Y-Sol4 F.A.T. → Weidmüller WM4 → Weidmüller PV-Stick	▪ Extended temperature shocks ▪ Thermal tests ▪ Climatic tests ▪ Mechanical tests ▪ Life tests ▪ Mounting comparison ▪ Life cycle costs

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Example: SUNCLIX benchmarking against competition

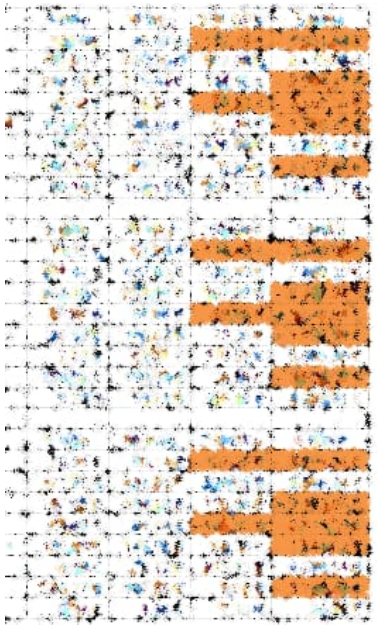
Endurance test

Assembly test

Installation time benchmarking

Handling & instruction evaluation

Economic evaluation

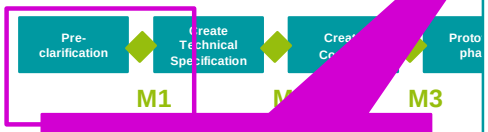


Business Case PHOENIX CONTA

Product development

What is required?

Pre-clarification / M1



→ re

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- e St
- Importance and priority
- A project leader and a t
- The resources are avai

Part of the SUNCLIX requirement specifications document

FS A-3-0103 / -00

3.4. Form, Farbe, Größe, Gewicht, Material (Shape, colour, size, weight, material)

Nr. (No.)	Last (Requirement)	Prio (Prio)	Bemerkung (Remark)
319-0	Materialien und Komponenten UL-gelistet (s. Datenbank UL IQ (my.secure.home1.ul.com/portal/page/portal/usa/iQ/iQWelcome)	1	
320-0	Kunststoff: Material verträglich mit [redacted] und allen bei SUNCLIX 1.1 verwendeten Materialien PV-CF-S 2,5-6 (+) - 1774674 PV-CM-S 2,5-6 (-) – 1774687 PV-C1F-S 2,5-6 (+) – 1789821 PV-C1M-S 2,5-6 (-) – 1789834 PV-CF-S 6-16 (+) - 1790784 PV-CM-S 6-16 (-) - 1790797 PV-FT-C2F-HSG - 1704926 PV-FT-C2M-HSG – 1704925 PV-C3F-S-2,5-6 - 1628221 PV-C3M-S-2,5-6 - 1628220 PV-C-M/F-PRO/F-1000/15-EU - 1622156 PV-C PLUG - 1775631 PV-C PROTECTION CAP - 1785430	1	
330-0	Farbe des Kunststoffs: schwarz (ähnlich RAL 9005)	2	Optische Vergleichsprüfung

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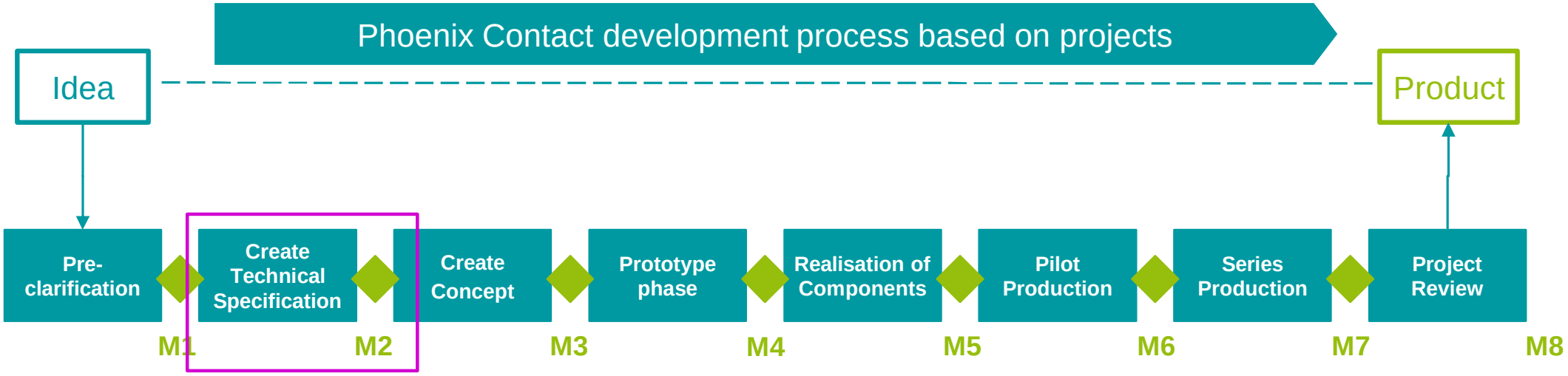


Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

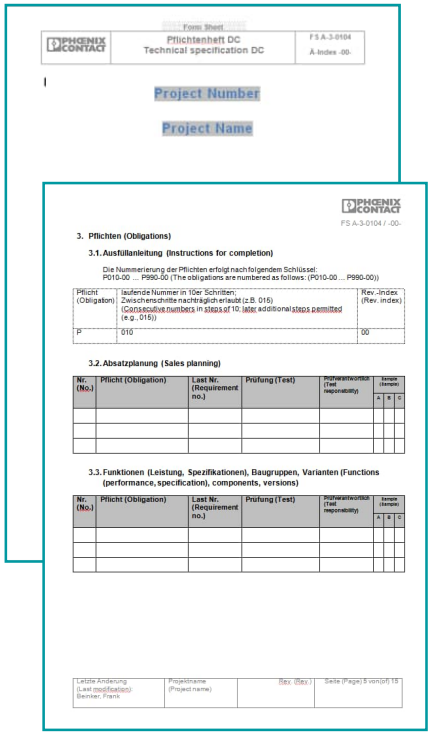
Translation of requirements into technical specifications

Create Technical Specification / M2

→ M2 gate meeting: technical specs are created

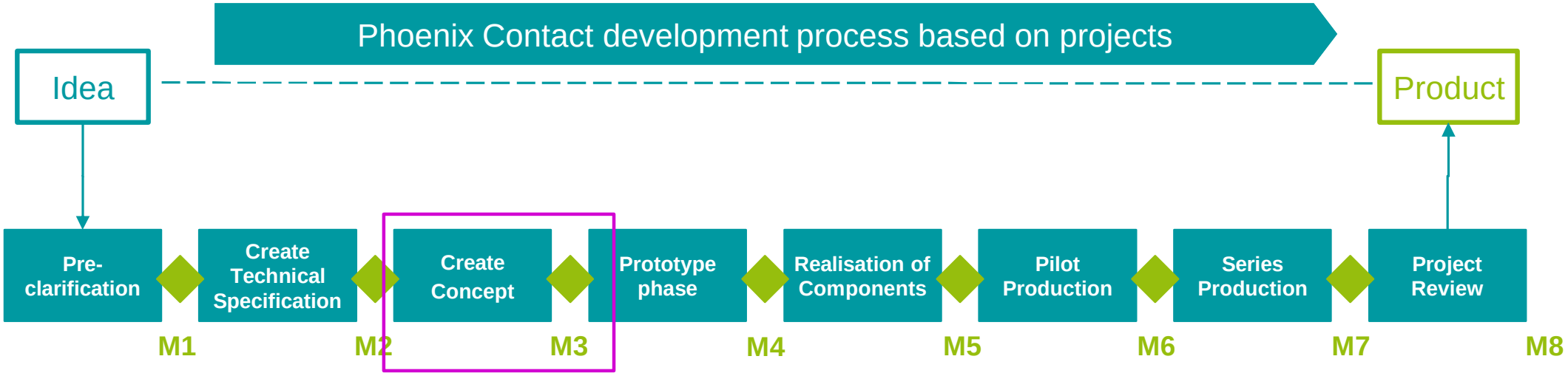
Criteria:

- The requirement specification is transferred to the technical specification. The specifications for development and implementation are agreed and documented in the technical specification. The realization concept is agreed by all departments involved.
- The project manager is appointed and has taken over the project order.



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Design concept phase

Definition of product concepts/ M3

→ M3 gate meeting: The concept and the steps to realization of the product are known to all involved in the project. They serve as basis for further ascertainment of the product.

Criteria:

- If mechanical components are created during the project, a CAD 3-D model must exist. If necessary, the order for production of a rapid prototype is issued or procurement of samples (components, standard parts etc.) is initiated.
- Development has reach a level of maturity that supplies meaningful results during tests on 3D models/ rapid prototypes The project manager is appointed and has taken over the project order.
- In the case of electronics: the function blocks for realization of the product are determined and the division between hardware, firmware and software took place.
- Depending on the risk assessment, a product FMEA must be available.

Business Case PHOENIX CONTACT Part III

EXAMPLE: developing product concepts with customers

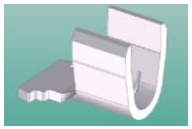
Innovation workshops with a large inverter supplier

(here: morphological box)

Contact system

Field connection

Device connection



Wall feed through

Locking

Business Case PHOENIX CONTACT Part III

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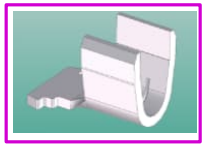

Wall feed through

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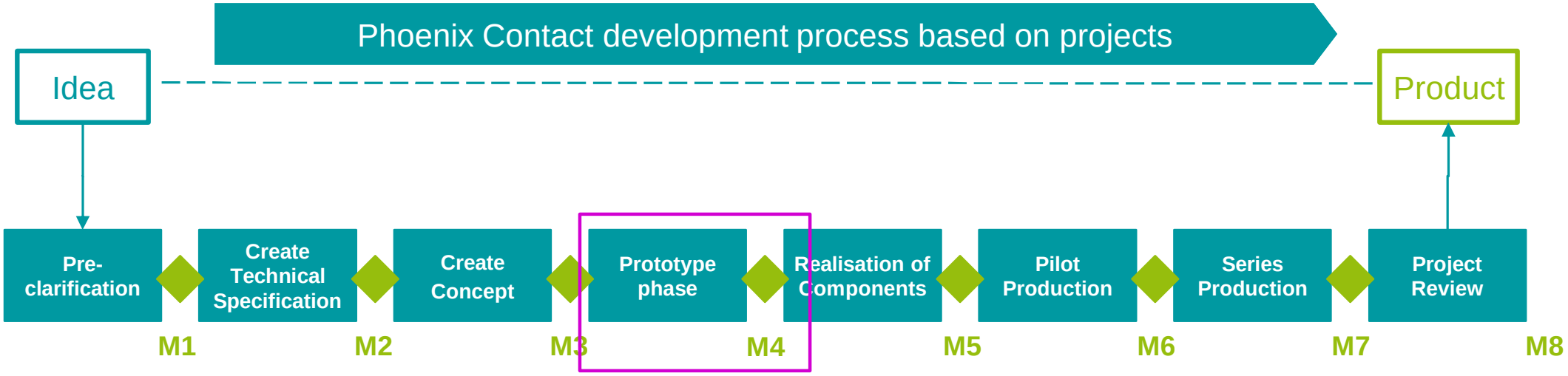
Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

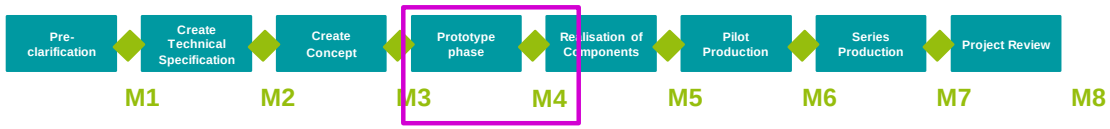


Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Prototype phase

Prototype approval/ M4



→ M4 gate meeting: The development concept has been verified. All construction elements are available. The production of tools and equipment can be initiated

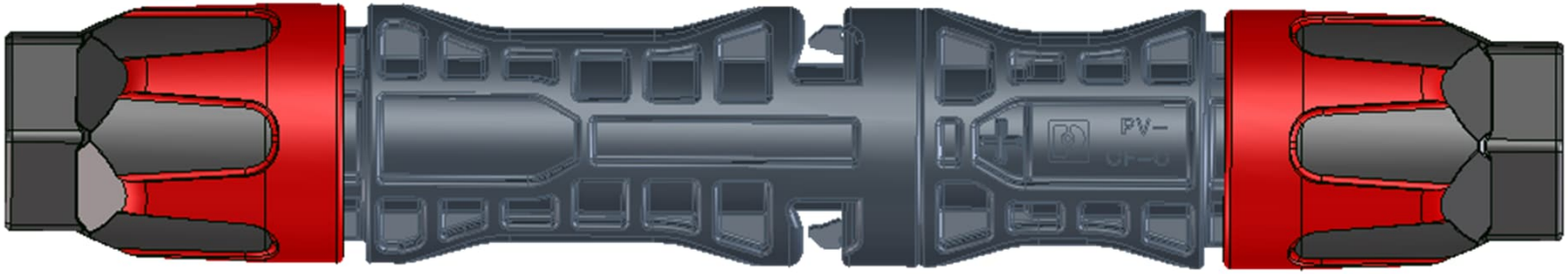
Criteria:

- Tested rapid prototypes or development samples and/or 3D models are available
- The manufacturing costs are calculated and do not exceed the costs
- The manufacturing process can be realized with known methods
- The availability of all purchased parts is secured
- A requirement specification is available for the pending production equipment
- A process FMEA was performed

Business Case PHOENIX CONTACT Part III

Example: SUNCLIX – 3D CAD

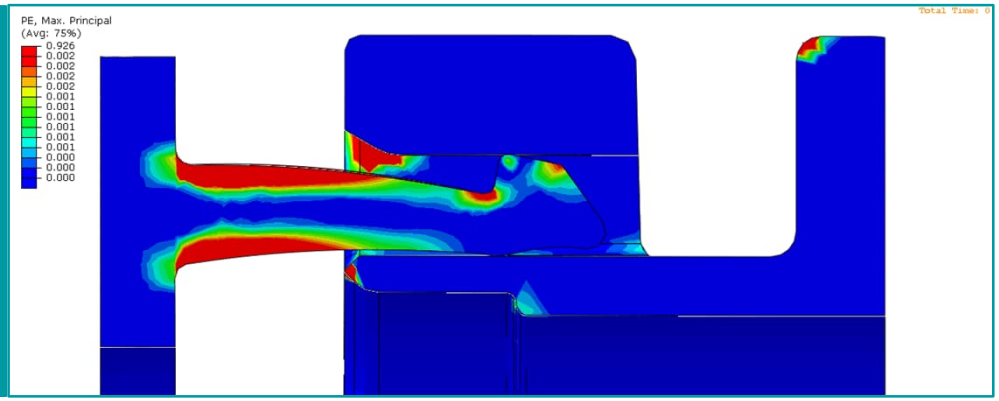
3D CAD model



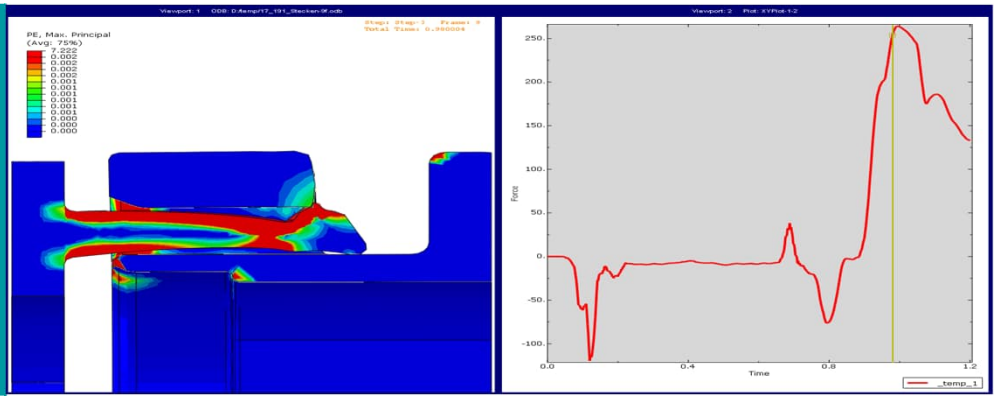
Business Case PHOENIX CONTACT Part III

Example: SUNCLIX – FEM analysis

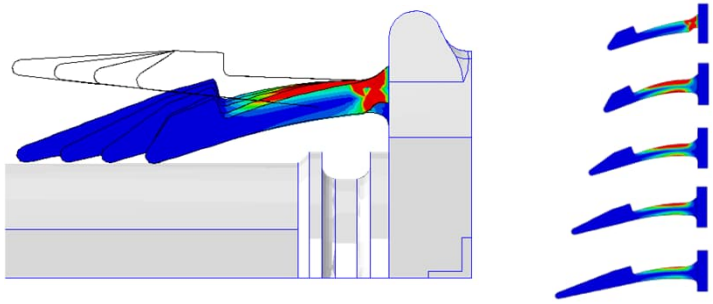
Mounting force



Pull-out force



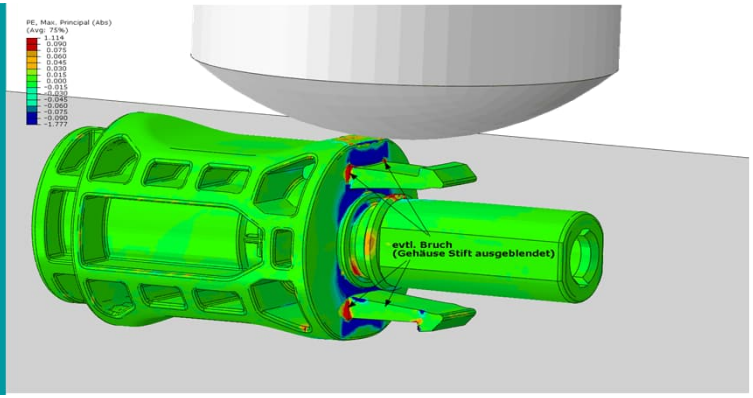
Different variants



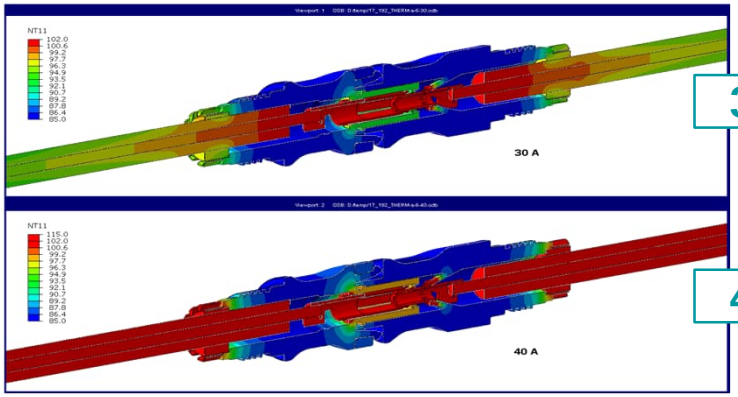
Business Case PHOENIX CONTACT Part III

Example: SUNCLIX – FEM analysis

Cold impact



Heating



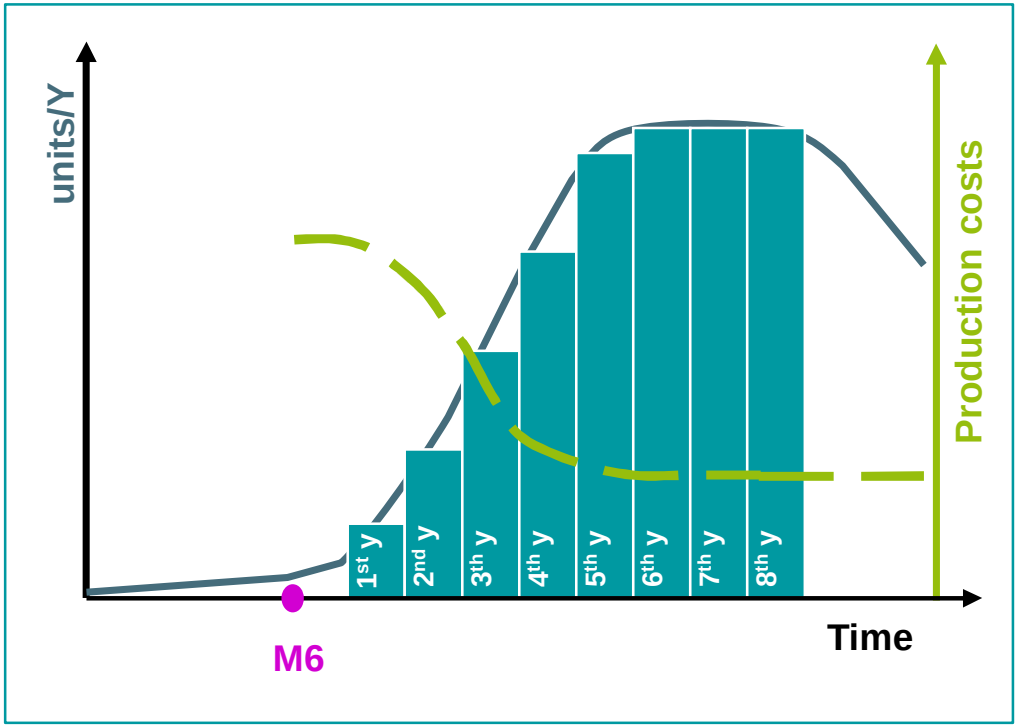
30 A

40 A

Business Case PHOENIX CONTACT Part III

M4 evaluation: profitability assessment

Forecast of costs & units sold over 8 years



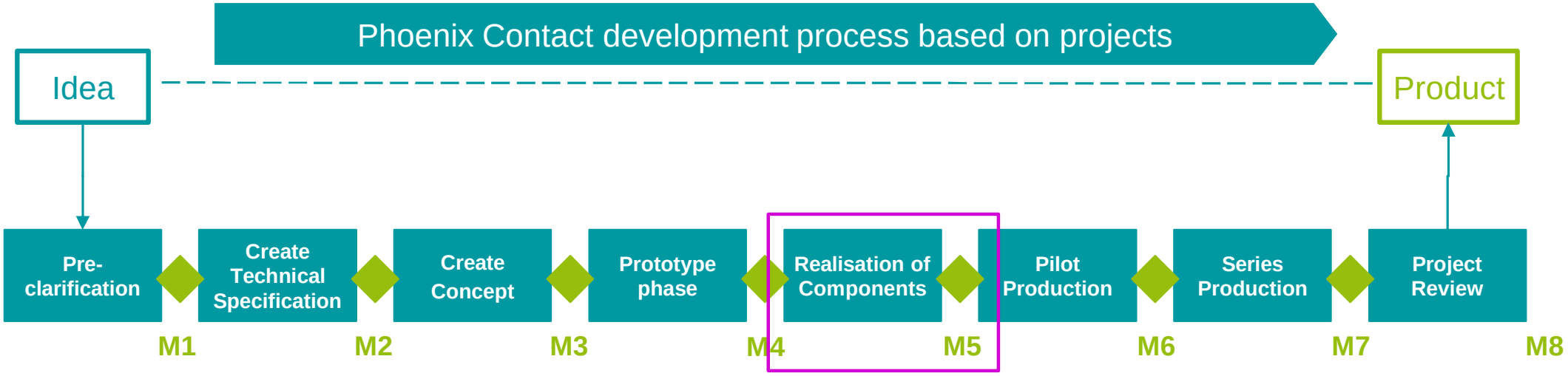
Accumulated returns vs. costs

Overall turnover	17,272,600 €
PC for total quantity	7,390,100 €

Traffic light to estimate profitability

Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

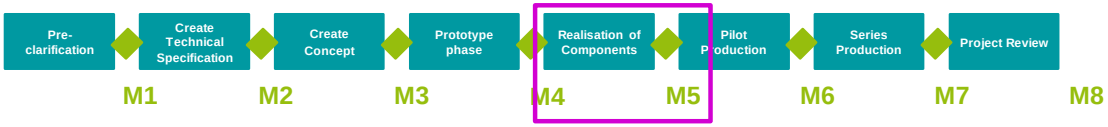


Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Release of individual parts

pre-series with individual parts / M5



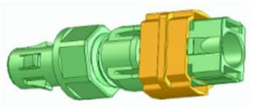
→ M5 gate meeting: The coordinated move onto pre-series with individual parts that correspond to the requirements of the technical specification took place.

Criteria:

- Samples of all drawing-based individual parts are available and are measured. They correspond to the current valid drawings and are approved for pre-series.
- Product documents for production of the pre-series are available

Business Case PHOENIX CONTACT Part III

Example: SUNCLIX production concept



Insert: O-ring

Insert: cable seal

Attachment: nut

Insert: clamping body

Assembly: O-ring on mating face

Pre-snap: mating face

Assembly: unlock

Port

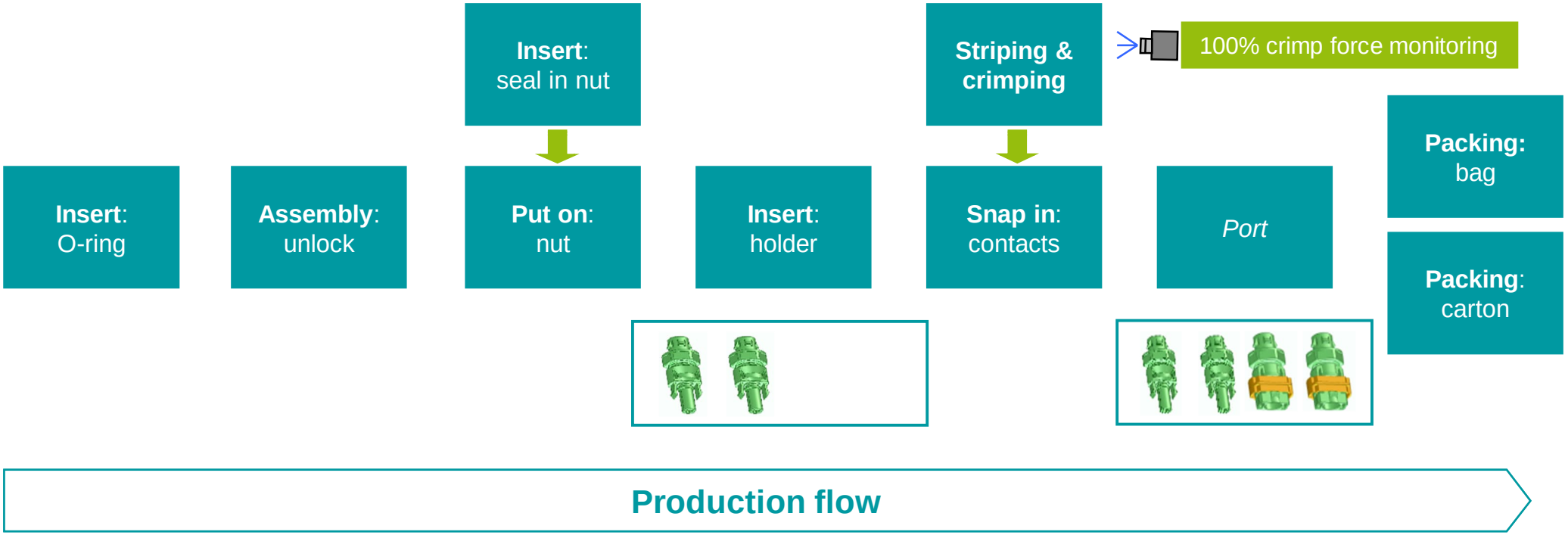
Packing: bag

Packing: carton

Production flow

Business Case PHOENIX CONTACT Part III

Example: SUNCLIX production concept

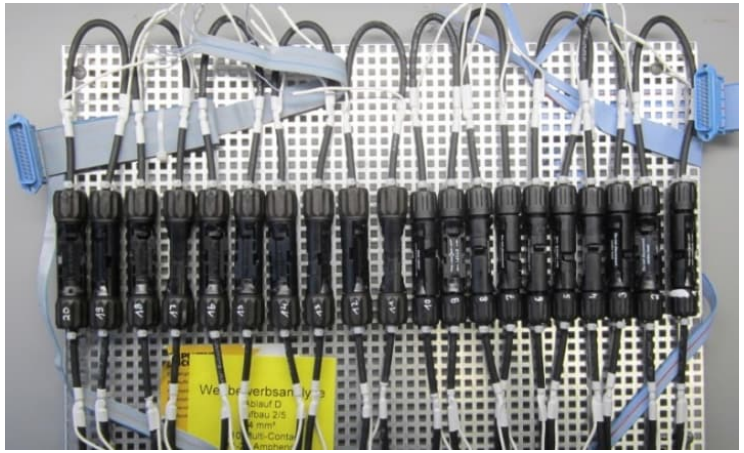


Business Case PHOENIX CONTACT Part III

Example: SUNCLIX laboratory tests

Lab tests

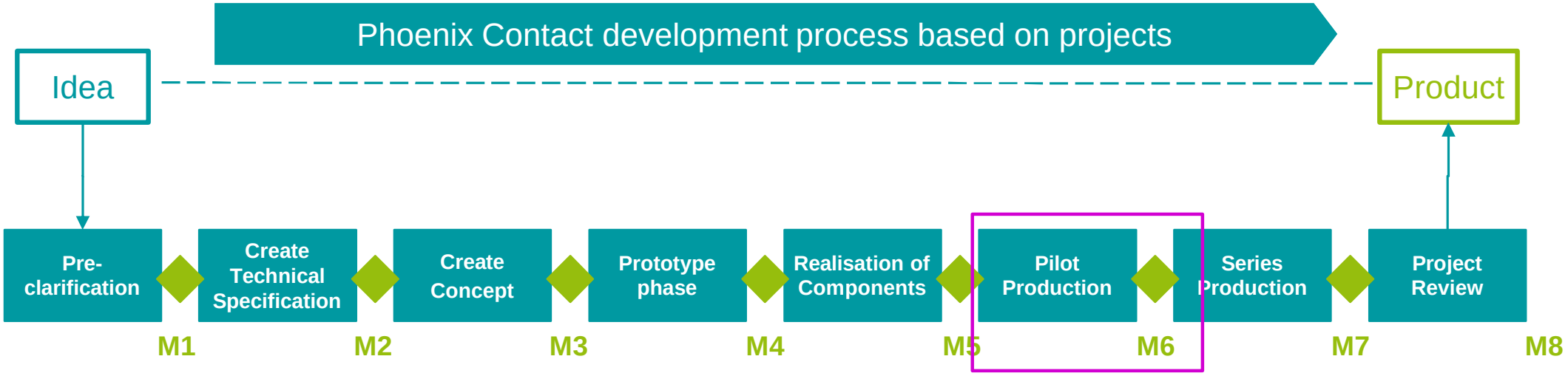
- Temperature shocks + 85°C / -40°C (200 times)
- Storage in damp heat 1.000h / +85°C / 85% humidity
- Storage in the heat 1.000h / +105°C
- Withstand voltage 2.000V + 4x rated voltage for 60s
- Mechanical stress tests
- …



PHOENIX CONTACT
INSPIRING INNOVATIONS

Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process



PHOENIX CONTACT
INSPIRING INNOVATIONS

Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Production pilot

Pre series phase/ M6

→ M6 gate meeting: The development is completed. A pre-series was produced. The product was released and can be supplied without sample designation.

Criteria I:

- FSTR Release for all components is completed. The requirements according to the technical specification are achieved. The client has approved the product.
- The results of the release test are documented
- The produciability is ensured. The availability of single parts and end product is given
- The production process is released
- Assembly instructions, Test instruction and Packaging instruction are available

PHOENIX CONTACT INSPIRING INNOVATIONS

Business Case PHOENIX CONTACT Part III

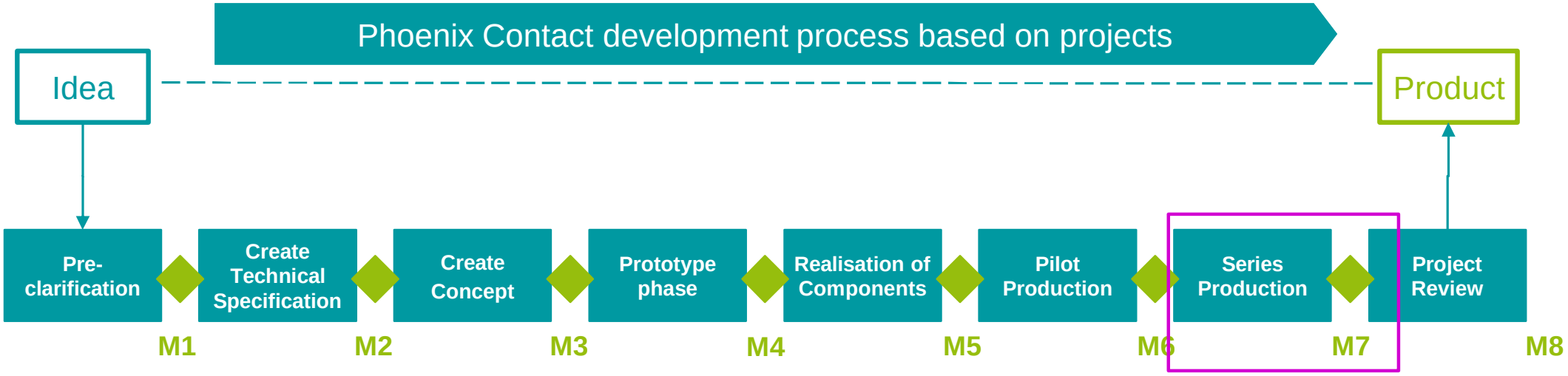
Example: SUNCLIX production sites

Production hall 7
completion in January 2010

Production hall 32
completion in July 2010

Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Sales release

Series phase/ M7

→ M7 gate meeting: The Supply capability according to agreed series startup planning is secured. The product can be sold

Criteria I:

- The new products were transferred to sales
- An availability date for the product is available
- Orders can be acquired from the named availability date
- The required series quantity in the series startup phase can be manufactured safely
- The required stock was set up
- Dispatch data is available

Business Case PHOENIX CONTACT Part III

Example: SUNCLIX – joint market launch

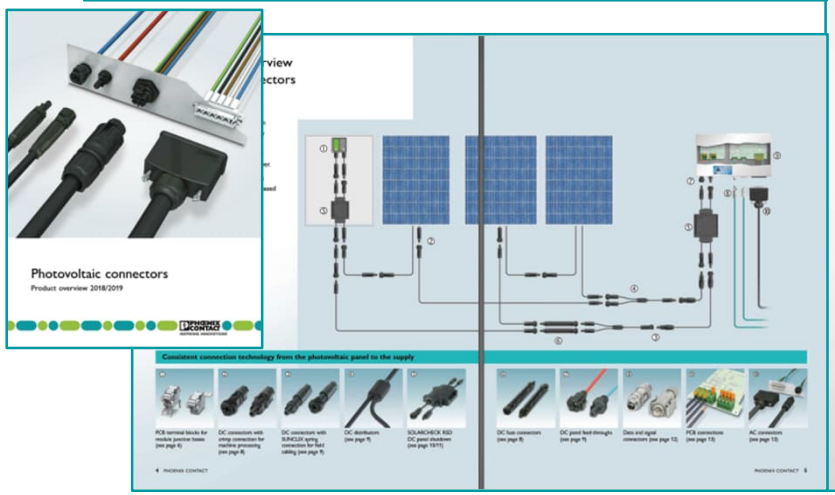
inter solar 2009

42 weeks

Business Case PHOENIX CONTACT Part III

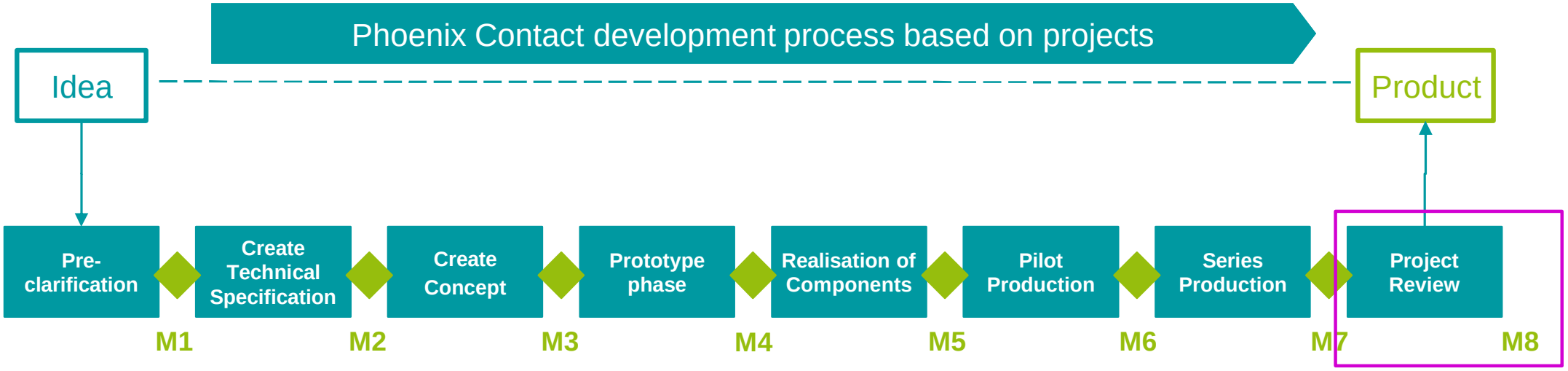
Example: SUNCLIX – sales promotion

Supporting market launch & sales: promotion videos / brochures / sample kits / …



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process



Business Case PHOENIX CONTACT Part III

Product development @ PxC: Milestone Process

Project review

M8

→ M8 gate meeting: The responsibility for supply is transferred entirely to production.

Criteria:

- The product is released for unlimited series production. The required production capacity within the framework of sales planning is available
- The target manufacturing costs are not exceeded at forecasted quantities.
- Sales planning corresponds to the current status and is in the continuous sales planning
- All required approvals in the technical specification are available
- A final product report is available.
- The project team disbands.

Many thanks for your attention.