Project Orientated Teaching for Industry University Cooperation

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Date: 24th of March 2014

Agenda

- Challenges of value creation
- Qualification as enabler
- International project orientated teaching
- National project orientated teaching

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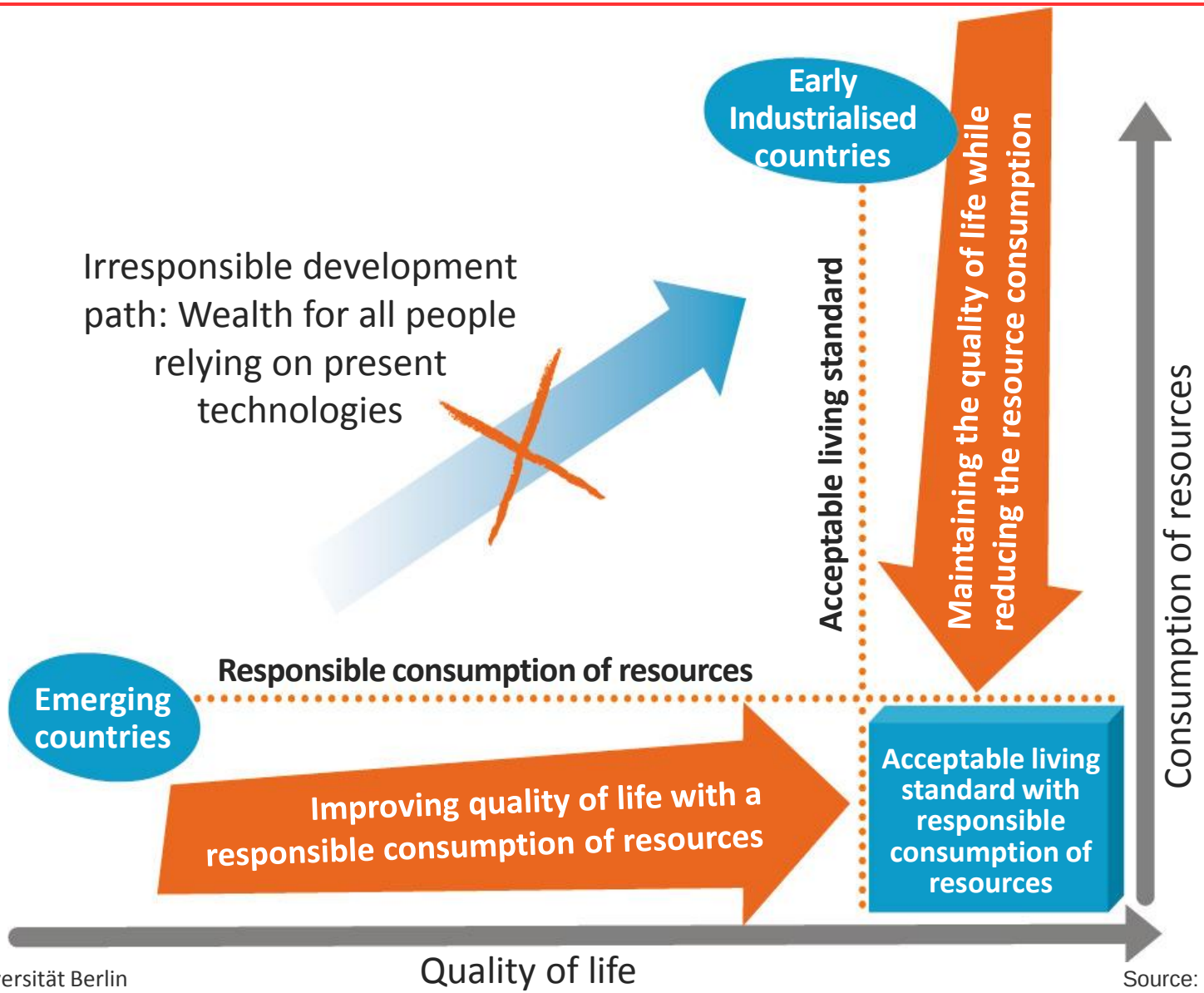
Resource challenge

Source: [Seliger, 2010]

Quality of life and consumption of resources



Source: [Seliger, 2010]

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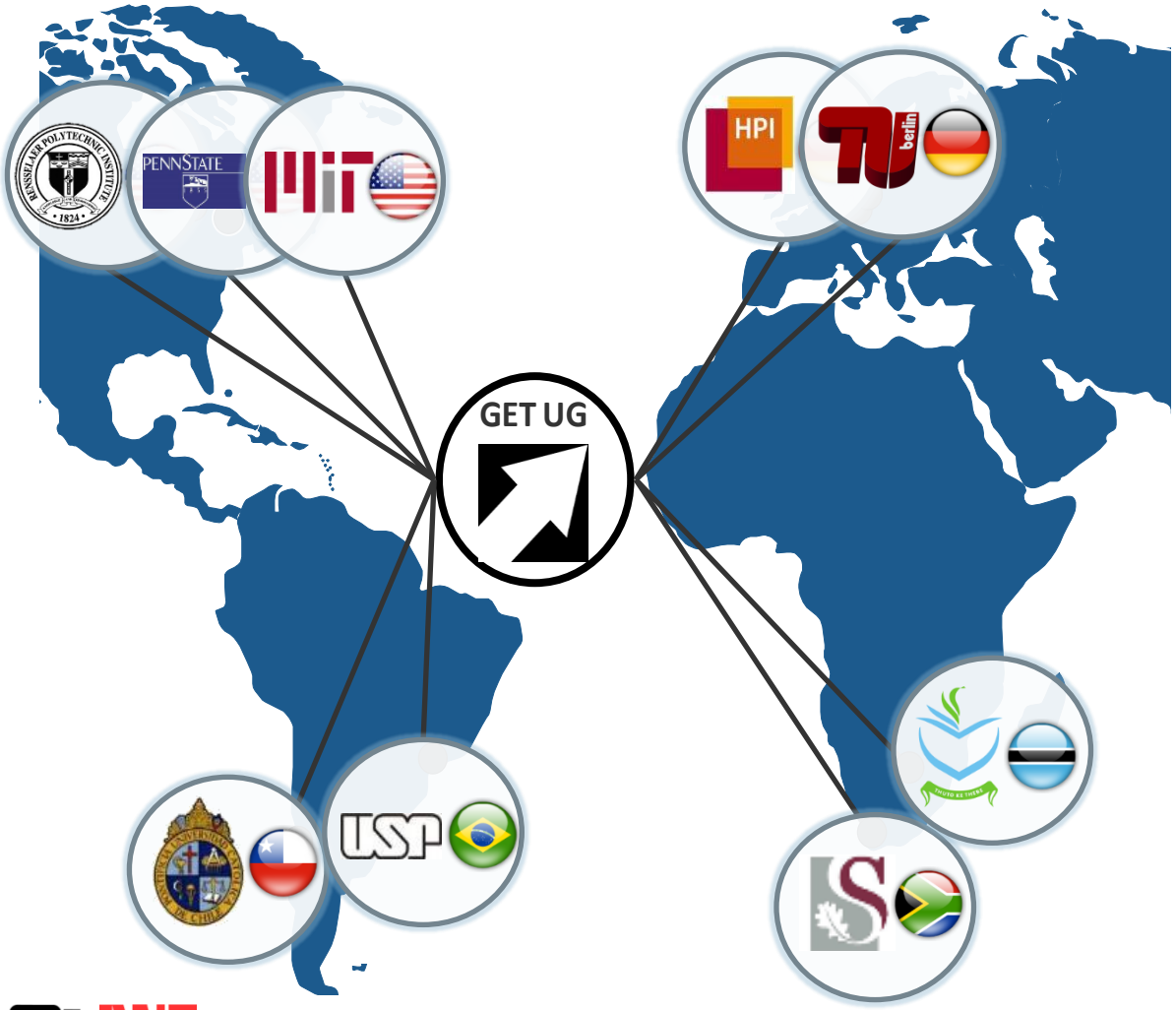
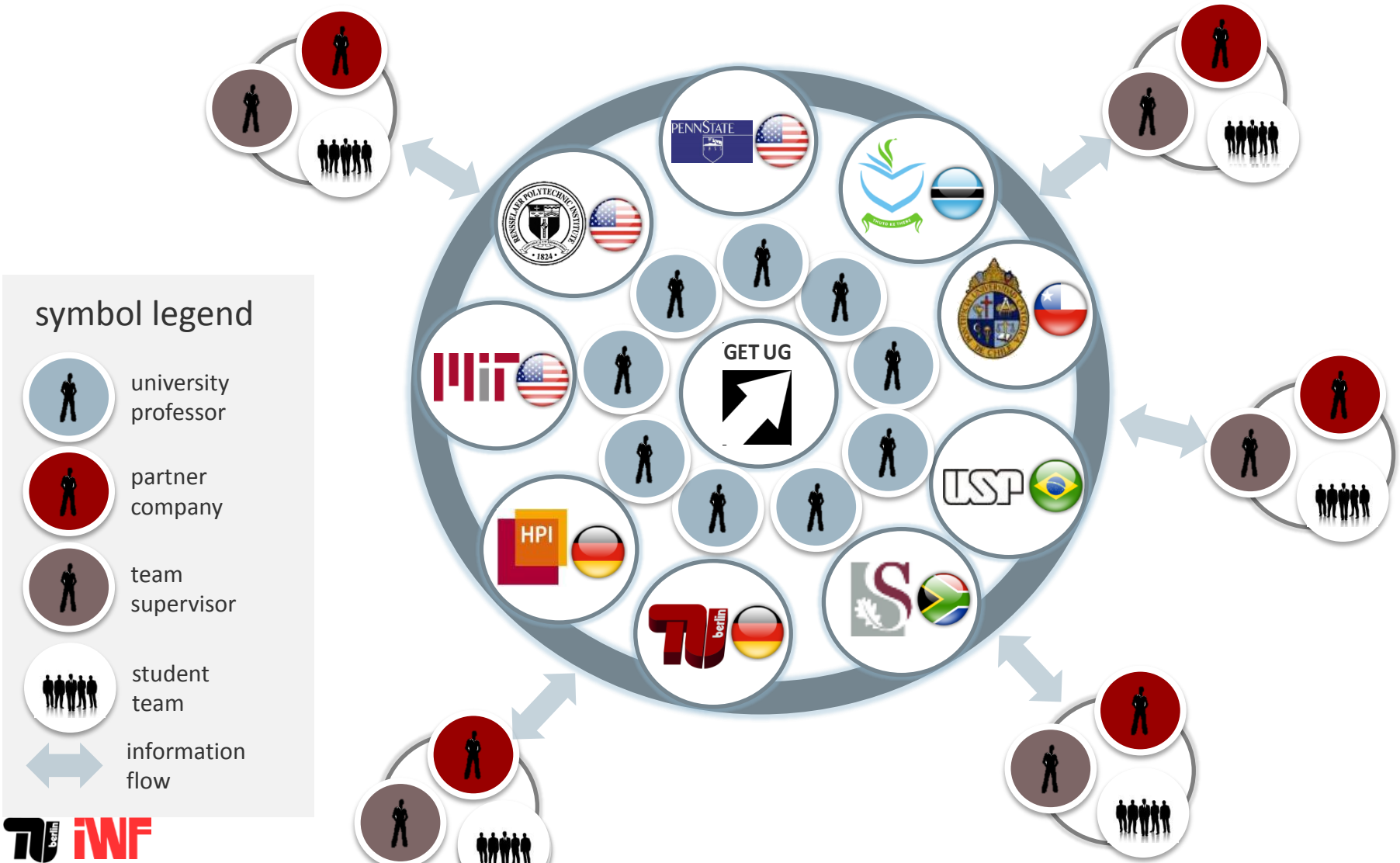
- Challenges of value creation
- Qualification as enabler
- International project orientated teaching
  - Global Engineering Teams
    Housing-Manufacturing-Water
- National project orientated teaching

Global Engineering Teams (GET): Partners



- **Africa**
  Universiteit Stellenbosch (SA), South Africa;
  University of Botswana (UOB), Botswana
- **Europe**
  Technische Universität Berlin (TUB), Germany;
  Hasso-Plattner-Institute (HPI)
- **North America**
  Pennsylvania State University (PennState), USA;
  Massachusetts Institute of Technology (MIT), USA,
  Renssealaer Polytechnic Institute (RPI), USA
- **South America**
  Universidade de São Paulo (USP), Brazil;
  Pontificia Universidad Católica de Chile (PUC), Chile

Main Stakeholders and Communication Scheme



Technische Universität Berlin
Department of Machine Tools and Factory Management
Univ.-Prof. Dr.-Ing. Günther Seliger

GET Program milestones description

Kick-Off Meeting
Define project work packages and team organisation, team building.

1. Milestone
Conceptual design
State of the art analyse, first theorical concepts.

2. Milestone
Detailled design
Evaluation and selection of design elements, final theorical concept.

3. Milestone
Prototype
Realization of final prototype including all requested functions. Partner companies and professors decide upon project continuation.

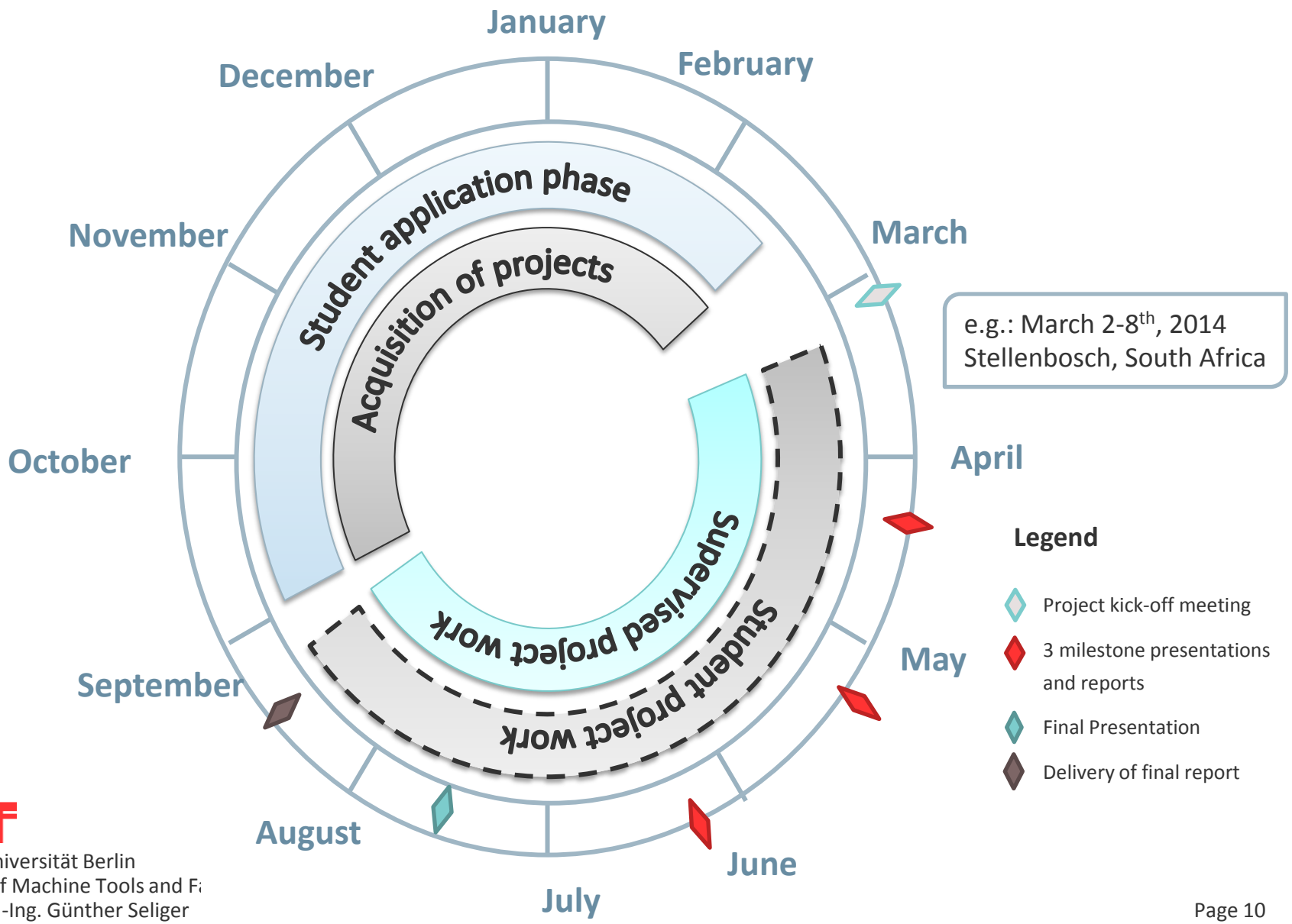
Final Meeting
The team presents the developped solution and the next steps.

02-08.03.2014
South Africa

Online teamwork

July 2014

Phases of Global Engineering Teams



Costs of a GET project

- Cost of a GET project is € 30,000 for 4 students
- This cost **includes:**
  - **Travel costs** for the students and the supervisor to attend **kick off and final presentation,**
  - **organizational costs** for meetings, material and knowledge management,
  - **overhead costs** for GET UG and the partner universities.
- This cost does not include:
  - Prototype costs
  - Optional travel costs to and from your company and for your company staff.

- Benefits

Potential for innovative solution finding	**Contact to outstanding engineers**	**International knowledge network**	**Public awareness effects**

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Existing Competence

- Improving the living conditions of the urban poor

- Sustainable access to **safe drinking water and basic sanitation.**
- Reduce by **two thirds the under-five mortality rate.**

- Improve the lives of **slum dwellers.**

- Achieve full and **productive employment and decent work** for all.

Bundling Competence

- Provide platform to integrate competences in “Think Tank”

- Central management unit, supported by the President of TU Berlin.
- Competence fields are both mutually interdependent and supportive

“Housing-Manufacturing-Water”-Projekt (HMW)

Motivation

- Achievement of Millennium goals,
- create an interdisciplinary international network,
- responsible for building up an educational structure regarding the housing, manufacturing and water competence fields through:
  - Individual projects,
  - yearly joint seminar / short course,
  - building of local capacity,
  - development of interdisciplinary global communities

HMW Partners

Technische Universität Berlin, Germany

Universidade de São Paulo, Brazil

Universidade Federal de Espírito Santo, Brazil

Stellenbosch University, South Africa

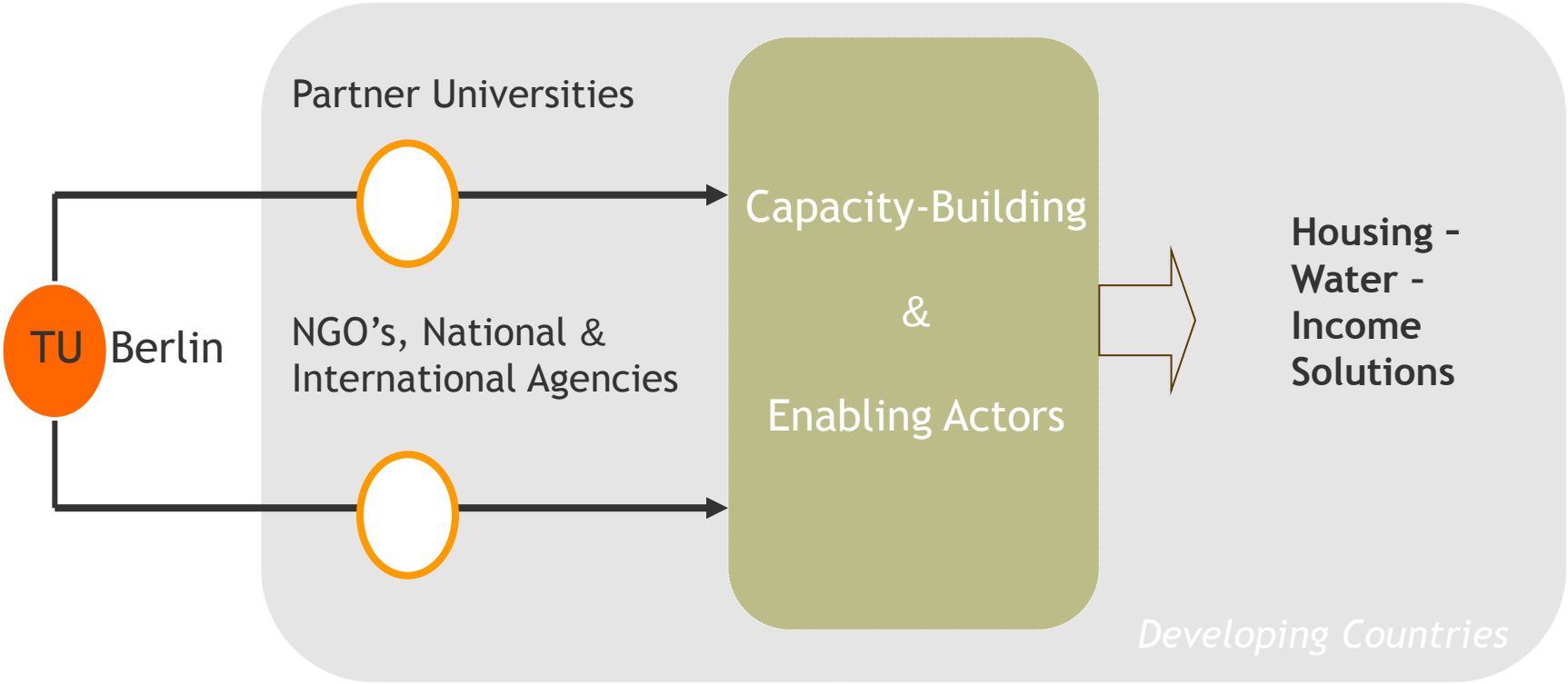
Pontificia Universidad Católica de Chile, Chile

University of Botswana, Botswana

Kamla Raheja Vidyanidhi, Insitute for Architecture and Environmental Studies, India

Housing – Water – Income for the Urban Poor

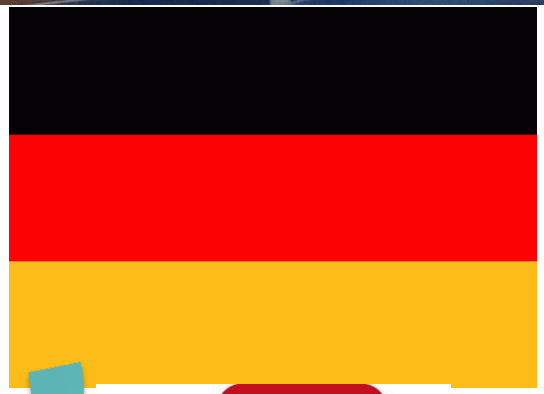
- Enabling actors and capacity building for appropriate technologies



Housing Manufacturing Water: Example (1/5)
Kick-off meeting – Vitoria- Brazil March 2013

NGO Ateliê de Idéias

[WIK-13]



UFES Universidade Federal do Espírito Santo

USP Escola de Engenharia de São Carlos
Universidade de São Paulo

Technische Universität Berlin

Housing Manufacturing Water: Example (2/5)
Kick-off – Stakeholder meeting

- Participants:
  - German professors and students,
  - brazilian professors and students and a
  - local NGO.
- Goal definition: **Factory** that produces **bricks** out of **recycled aggregates** for the brazilian favellas.
- Criteria:
  - Total cost: R $ 180.000,00
  - Noise restriction: max. 78 dB
  - Eco-friendly, no waste production
  - Size limitations
  - No man work inside the container
  - …

The signed project charter

Joint lectures

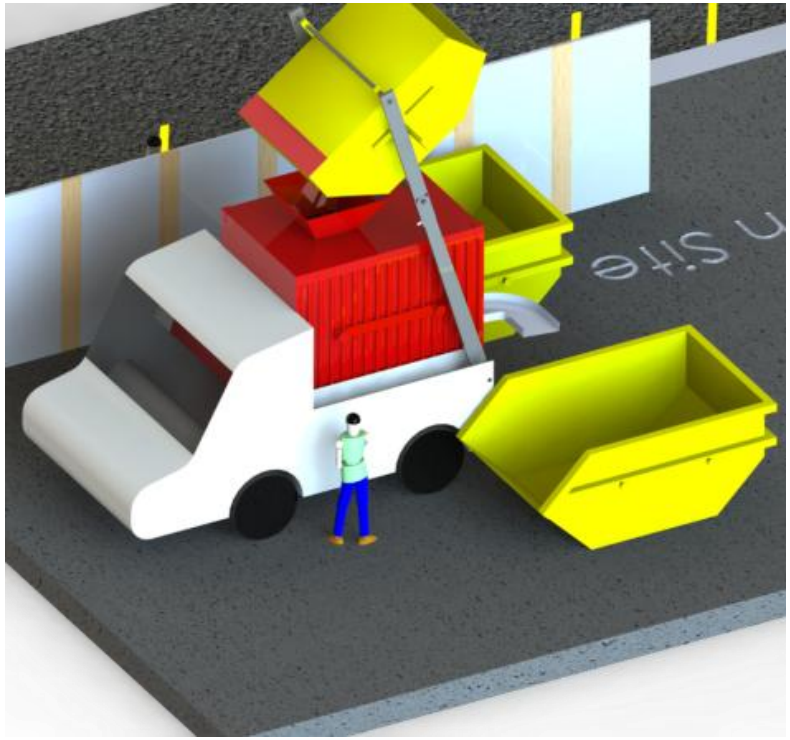
Housing Manufacturing Water: Example (3/5)
Project structure – Team division

- Division into groups:
  - Business, Marketing and Law,
  - Process, Energy & Layout,
  - Design & Development,
  - Project Management.
- Project charter as a guideline
- Regular overall meetings in groups

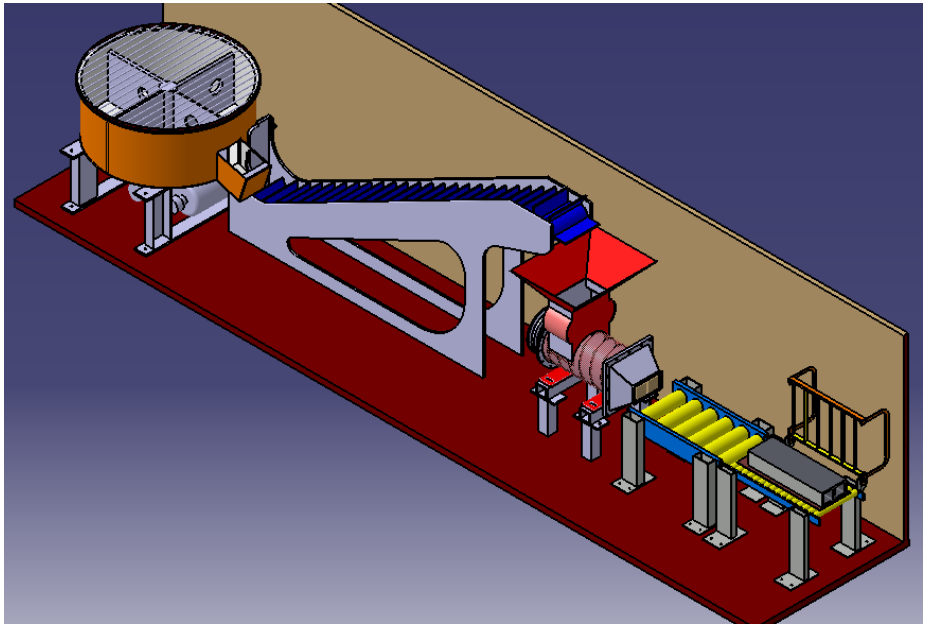
M - Team Project : Design of "Decentralized mini value creation unit"			
Team Structure			
Rev No.	0		
Date	25-Mar-13		
Project Management	Marketing, Business and Law	Energy Procurement, Process and layout	Design and Development
Monica	Nicholas	Carlos	Roberto
Bernhard	David	Elisa	Sarah
Total Members : 5	Total Members : 5	Total Members : 12	Total Members : 9

Team Structure

Housing Manufacturing Water: Example (4/5)
The outcomes (Manufacturing perspective)

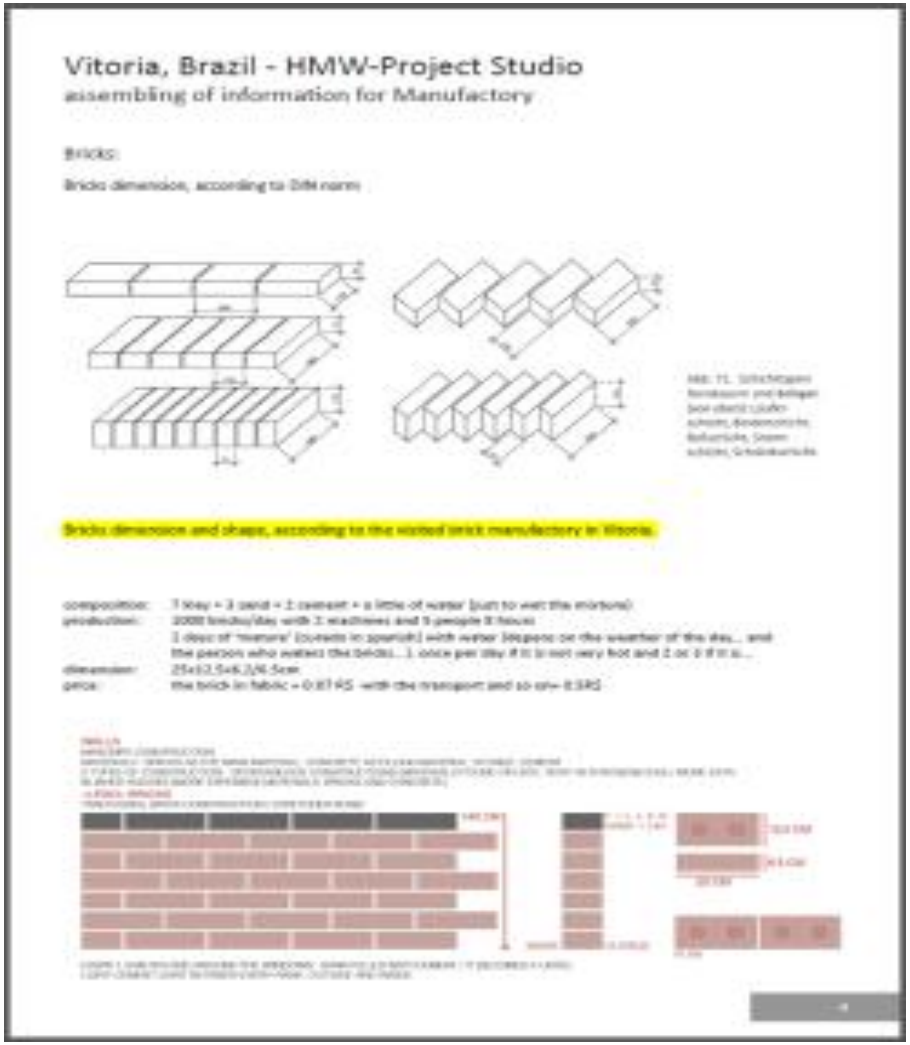


Mobile mini factory I for the creation of recycled aggregate



Mobile mini factory II for the creation of bricks

Housing Manufacturing Water: Example (5/5)
H & W Integration



Example for information exchange between the housing and manufacturing team

- Exchange of information, e.g. construction material market
- Planning steps including each other's needs
  - Housing: Construction material data base
  - Water & Housing: input for product development
- Input to each other
  - Follow up in presentations and meetings
- Design enables markets
  - Construction plans based on the factories output

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- ▶ National project orientated teaching

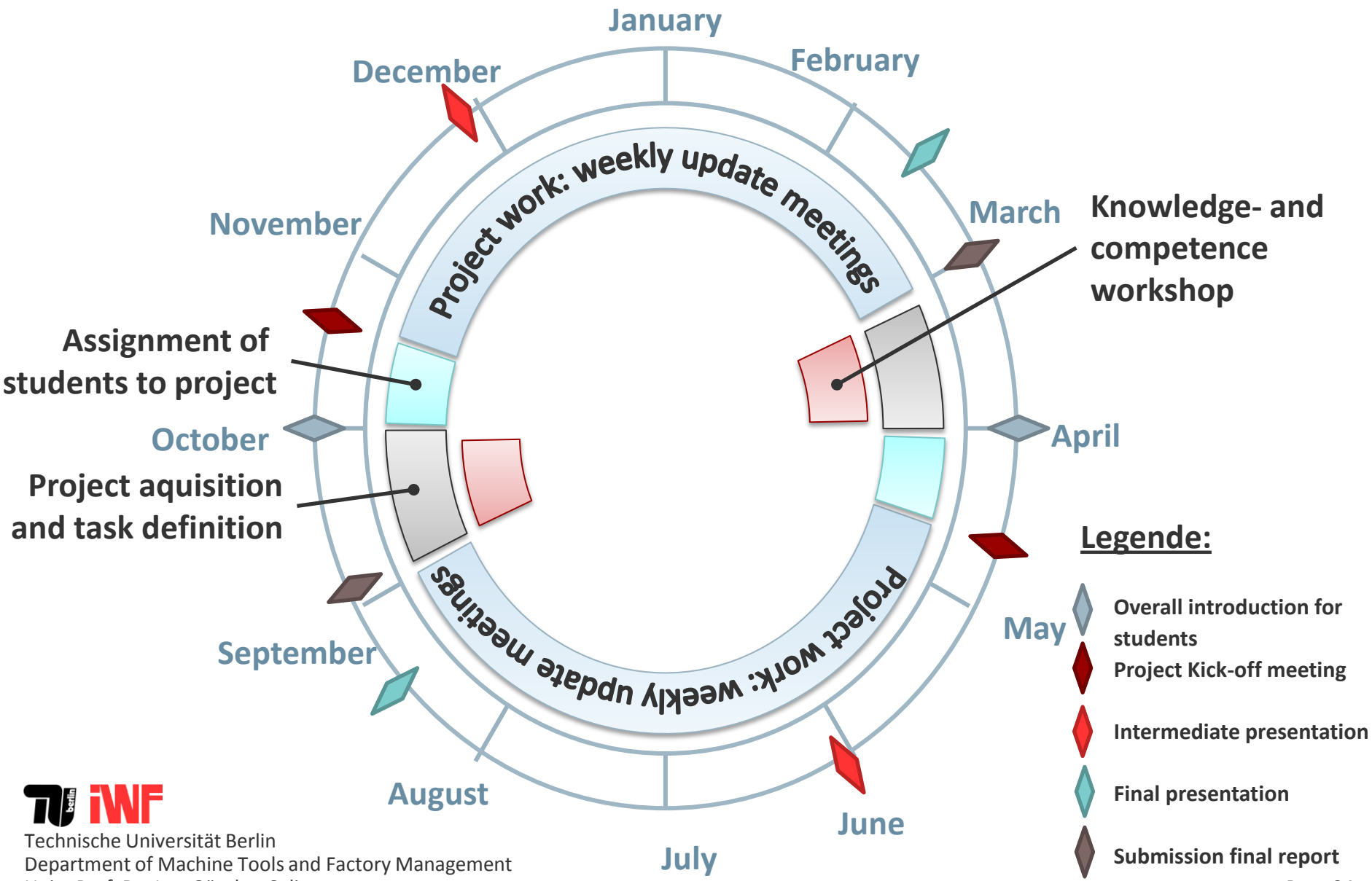
Project orientated teaching at the department of machine tools and factory management – TU Berlin

- The department of Machine Tools and Factory Management **offers project oriented courses** (PMF).
- These projects are **supervised by research assistants,** often in collaboration with local industry partners.
- PMF:
  - Ideal for mini research topics,
  - Teams with 4-6 students,
  - Effective research time: 500 – 1.000 hours*,
  - Costs for customer: 5.000 €.
- Benefits:

Potential for innovative solution finding	Contact to outstanding engineers	International knowledge network	Public awareness effects

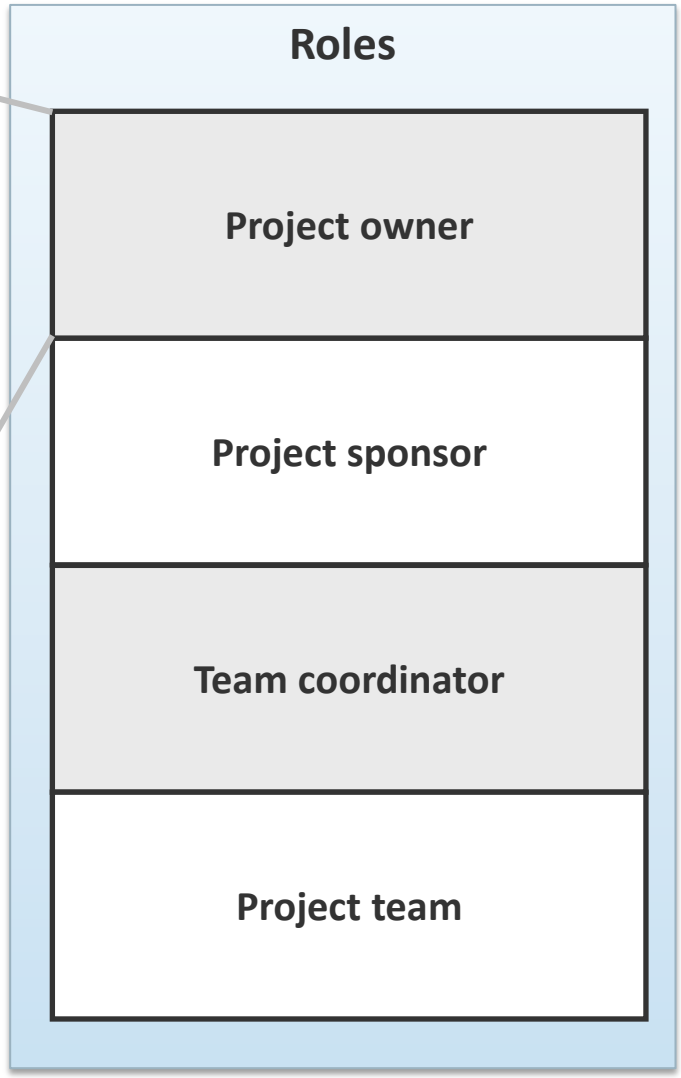
* Depending on the group size and the number of credit points.

PMF Phases


January
February
March
April
May
June
July
August
September
October
November
December
Project work: weekly update meetings
Project work: weekly update meetings
Knowledge- and competence workshop
Assignment of students to project
Project aquisition and task definition
Legende:
Overall introduction for students
Project Kick-off meeting
Intermediate presentation
Final presentation
Submission final report

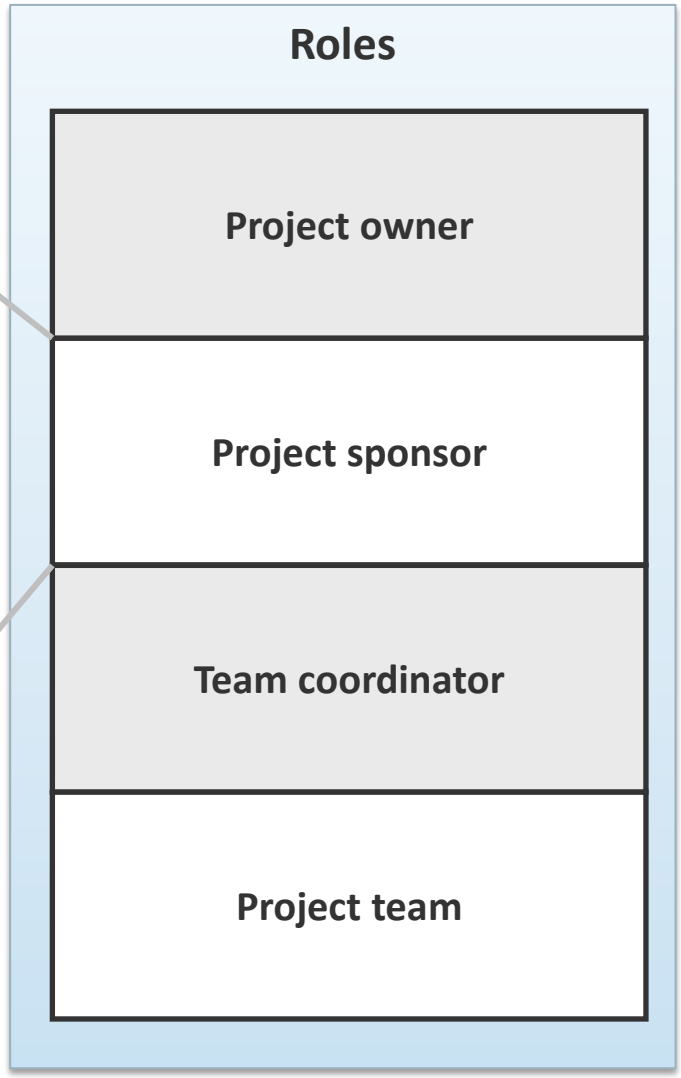
PMF Roles (I/IV)

- Who
  - Department of Machine Tools and Factory Management.
- What
  - Provides rough direction of project goals (according to current research projects).



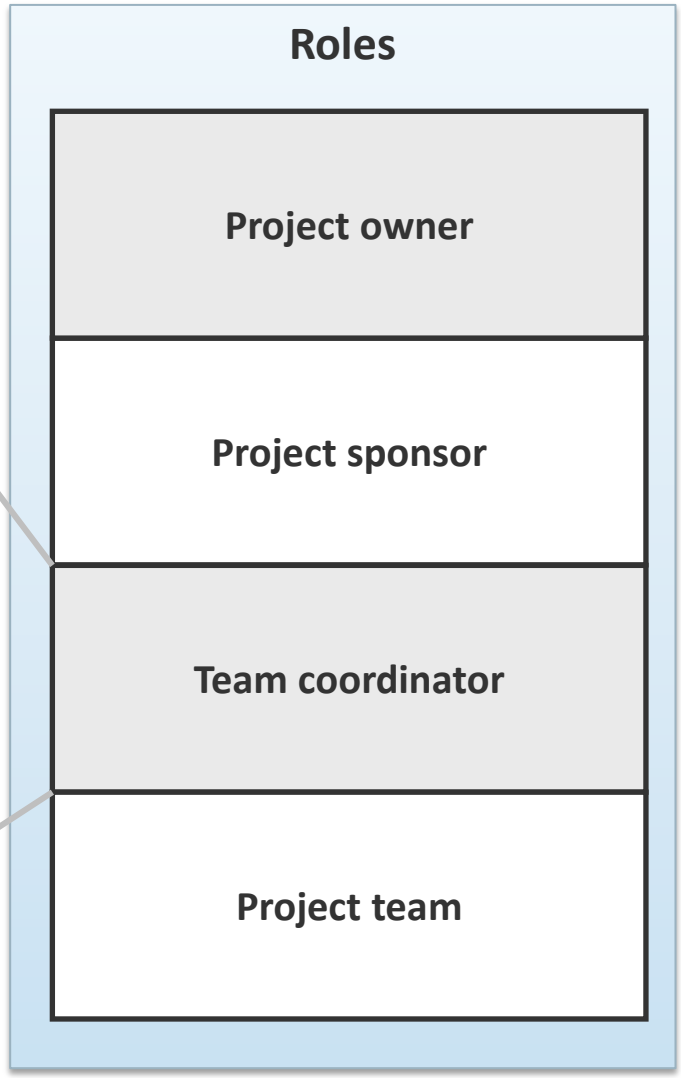
PMF Roles (II/IV)

- Who
  - Research assistant
  - Industry partner
- What
  - Provides the project goal,
  - supports team coordinator in organizational and technical issues,
  - provides necessary infrastructure (e.g. special literature and rooms),
  - evaluates the project results,
  - is **NOT** involved in the project work.



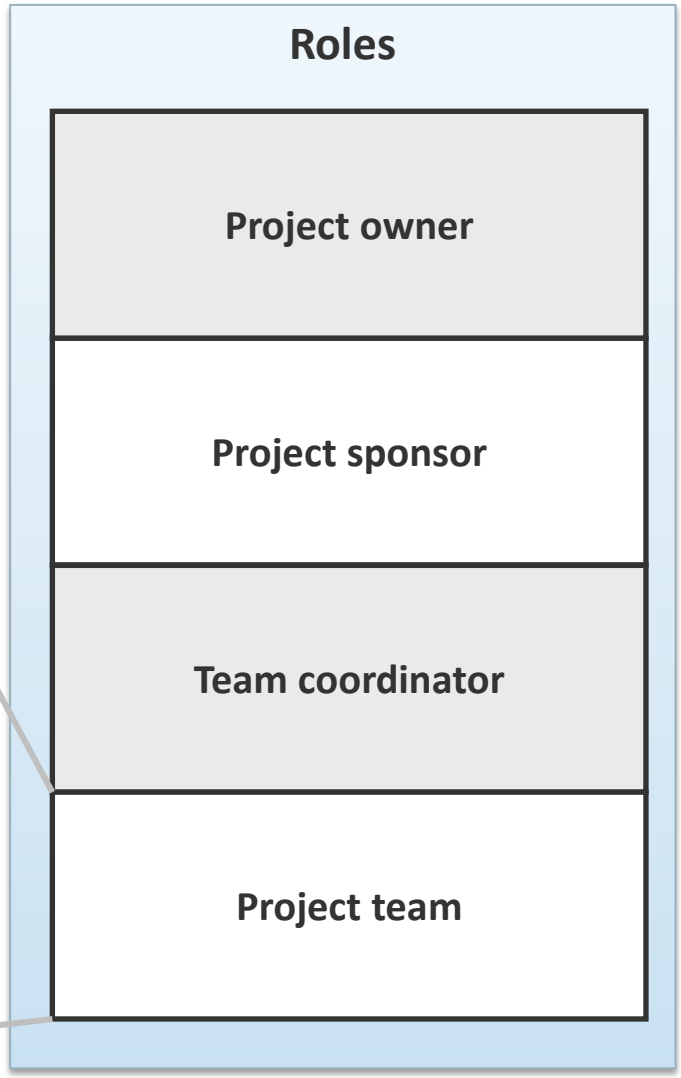
PMF Roles (III/IV)

- Who
  - One student
- What
  - Single point of contact to the project sponsor,
  - coordinates work proceedings,
  - circulates information,
  - supports conflict resolution in the project team.

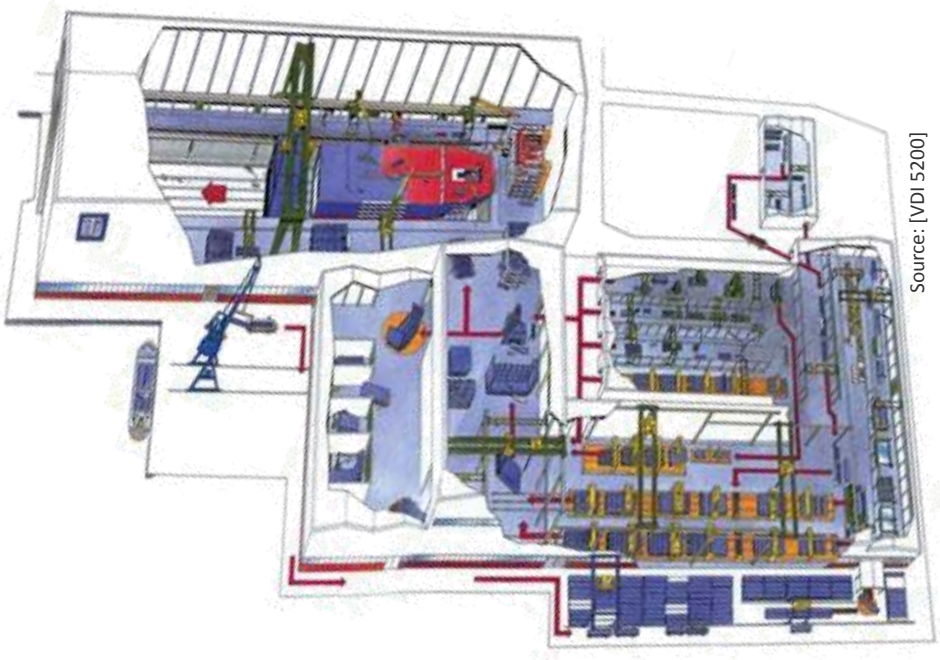


PMF Roles (IV/IV)

- Who
  - All students
- What
  - Generation of results by working on tasks,
  - taking decisions,
  - planning and definition of approaches to solve the task.



PMF Example (1/4)
Greenfield factory planning for a SME in Berlin



Source: [VDI 5200]

A SME is currently located in an industrial park, divided in a lot of separated rooms. The growing SME plans to move in their own building.

Goal

- Development and evaluation of **three layout alternatives** and proposing a **recommendation** based on the procedure model proposed in the VDI 5200 (guideline for German engineers).

Work content

- Goal definition in close cooperation with the customer,
- data aquisition (e.g. products, estate data, …),
- concept planning of three layout alternatives and
- concept evaluation and development of a recommendation for the customer.

SME = small and medium-sized enterprise
VDI = Vereinigung Deutscher Ingenieure = association of german engineers

PMF Example (2/4)

Project team of a PMF Group in the winter semester 2013/2014

- Team mit jeweiligem Planungsbereich und Studiengang

Max

Layout planning

Production technology (M.Sc.)

Martin

Layout planning

Mechanical engineering(M.Sc.)

Lukas

Technical building systems

Industrial engineering (B.Sc.)

Vincenz

Layout planning

Industrial engineering (B.Sc.)

Moritz

Team Coordinator

Layout planning

Production technology (M.Sc.)

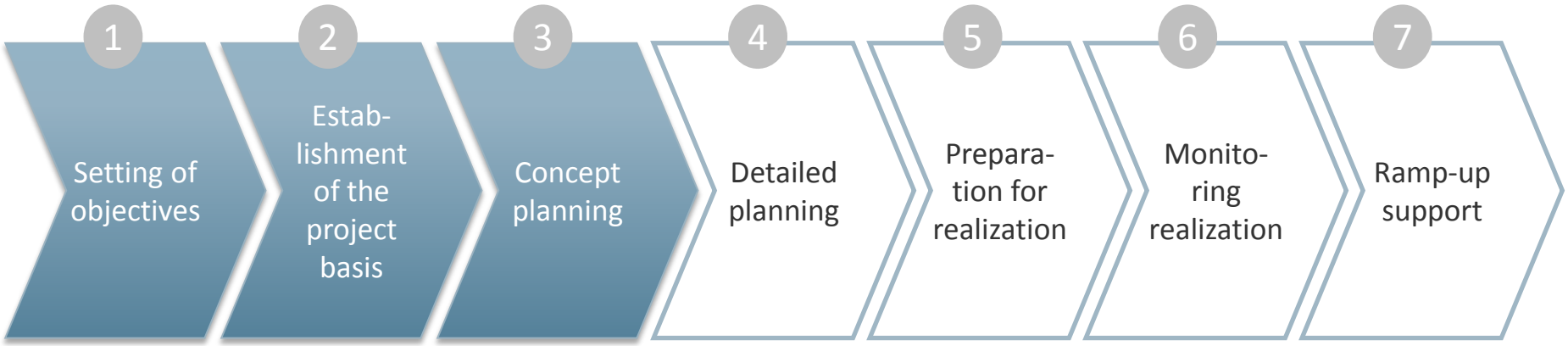
Angelina

Technical building systems

Production technology (M.Sc.)

PMF Example (3/4)
Factory planning according to VDI 5200

- Seven phases according to VDI 5200.
- Project scope: phases **1-3.**



- Additional focus on technical building systems.

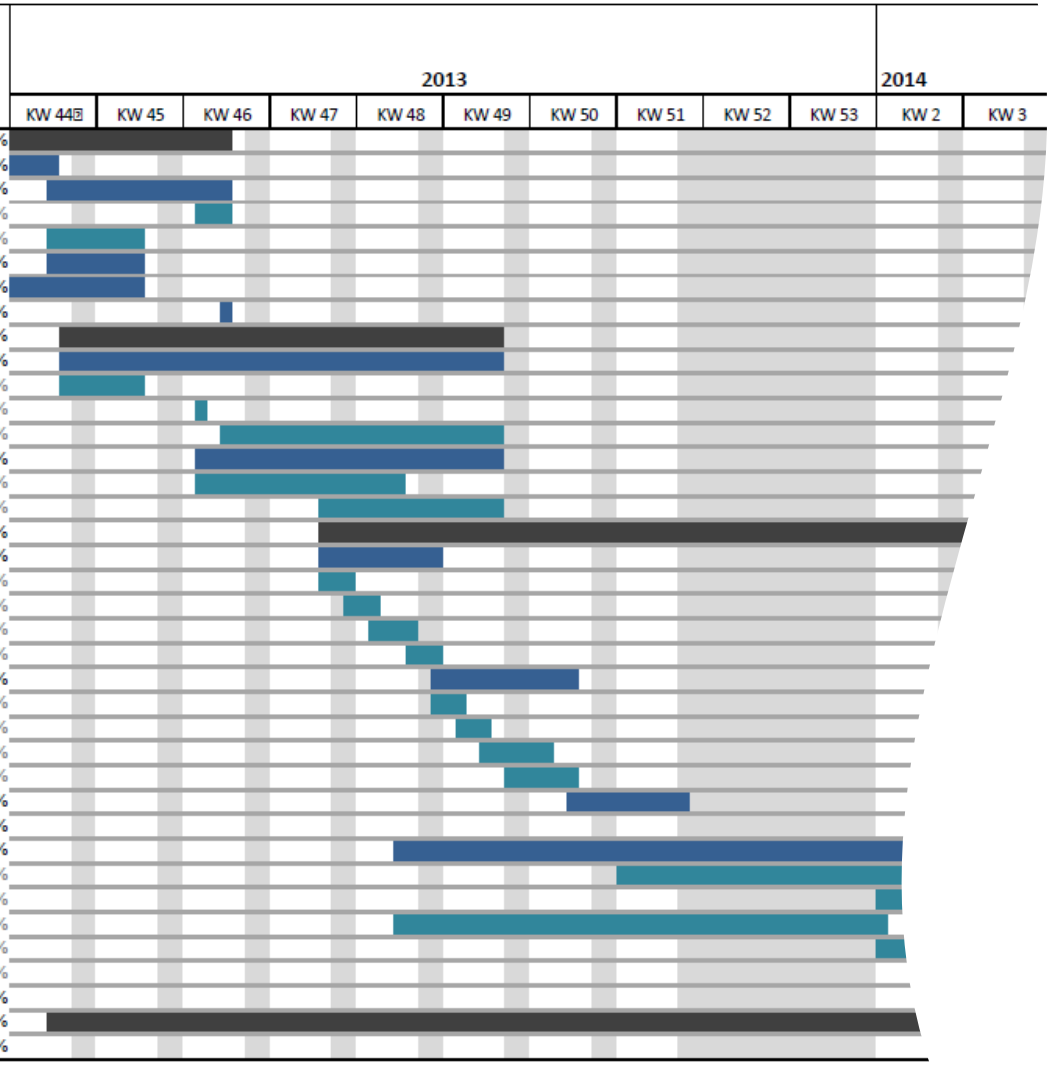
Source: [VDI-5200]

VDI = Vereinigung Deutscher Ingenieure = association of german engineers

PMF Example (4/4)

Gantt-Chart created by the students

Nr.	Work package	Start	End	Duration [days]	Progress [%]
1	Setting of objectives	28.10.2013	14.11.2013	18	100%
1.1	Analysis of corporate objectives and general constraints	28.10.2013	31.10.2013	4	100%
1.2	Setting the factory and project objectives	31.10.2013	14.11.2013	15	100%
1.2.1	####	12.11.2013	14.11.2013	3	100%
1.2.2	####	31.10.2013	07.11.2013	8	100%
1.3	Itemization of evaluative criteria	31.10.2013	07.11.2013	8	100%
1.4	Definition of work packages	28.10.2013	07.11.2013	11	100%
M1	Final goal definition	14.11.2013	14.11.2013	1	100%
2	Establishment of the product basis	01.11.2013	06.12.2013	36	100%
2.1	Procurement of information	01.11.2013	06.12.2013	36	100%
2.1.1	####	01.11.2013	07.11.2013	7	100%
2.1.2	####	12.11.2013	12.11.2013	1	100%
2.1.3	####	14.11.2013	06.12.2013	23	100%
2.2	Evaluation of information	12.11.2013	06.12.2013	25	100%
2.2.1	####	12.11.2013	28.11.2013	17	100%
2.2.2	####	22.11.2013	06.12.2013	15	100%
3	Concept planning	22.11.2013	07.03.2014	106	100%
3.1	Structure planning	22.11.2013	01.12.2013	10	100%
3.1.1	####	22.11.2013	24.11.2013	3	100%
3.1.2	####	24.11.2013	26.11.2013	3	100%
3.1.3	####	26.11.2013	29.11.2013	4	100%
3.1.4	####	29.11.2013	01.12.2013	3	100%
3.2	Dimensioning	01.12.2013	12.12.2013	12	100%
3.2.1	####	01.12.2013	03.12.2013	3	100%
3.2.2	####	03.12.2013	05.12.2013	3	100%
3.2.3	####	05.12.2013	10.12.2013	6	100%
3.2.4	####	07.12.2013	12.12.2013	6	100%
3.3	Ideal planning	12.12.2013	21.12.2013	10	100%
M2	Intermediate presentation	13.01.2014	17.01.2014	5	100%
3.4	Real planning	28.11.2013	02.03.2014	95	100%
3.4.1	####	16.12.2013	10.01.2014	26	100%
3.4.2	####	06.01.2014	21.02.2014	47	100%
3.4.3	####	28.11.2013	06.01.2014	40	100%
3.4.4	####	06.01.2014	21.02.2014	47	100%
3.4.5	####	10.02.2014	02.03.2014	21	100%
M3	Final presentation	03.03.2014	07.03.2014	5	100%
4	Documentation	31.10.2013	21.03.2014	142	60%
M4	Submit documentation	21.03.2014	21.03.2014	1	0%



Gantt-Chart created by the students in order to structure their group work

References

Abbreviation	Source
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