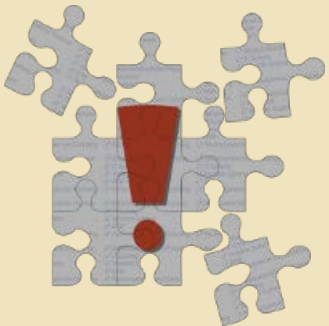


What do I have to know and to do?

Development of a Theory-based, Normative Competence Description for
the Profession of Computer Specialist



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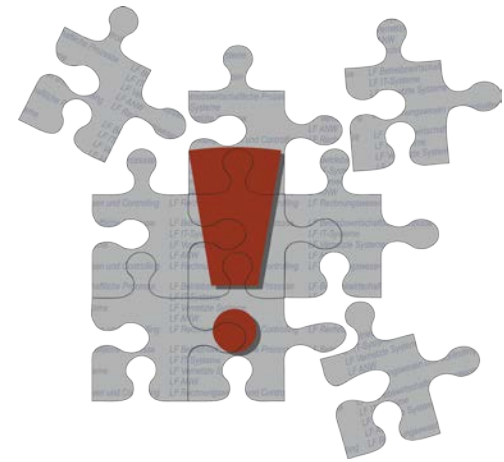
1. Motivation and Existing Problems

2. Research Questions

3. Research Process

4. Resulting Model

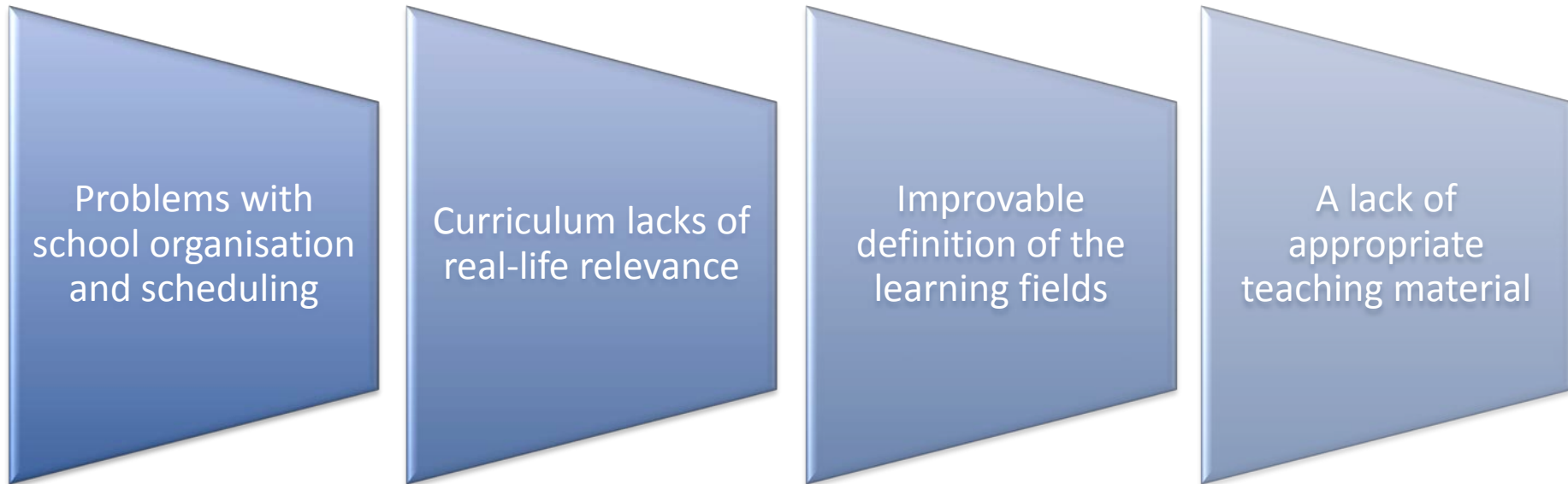
5. Summary and Conclusion



- Vocational schools in Germany are part of the mandatory school system
 - Students attend vocational schools after general education
 - *Dual vocational education* as important part of vocational education
- *Dual vocational education* consists of
 - Practical training at the company and
 - Theoretical education at (part-time) schools
- The curriculum for the profession as computer specialist is oriented towards the “*concept of learning fields*”
- *Learning fields*:
 - Describe competencies students should achieve
 - Describe specific content students should know
 - Are based on real-life working processes



- Curricular concept of learning fields has not been completely implemented into daily lesson
- Possible reasons are:



→ Development of a *Comprehensive, Normative Competence Description* could improve the situation

Further Advantages of a Competence Model

Basis for further research upon vocational competence development

Basis for a revision of school curricula and in-company training regulation

Support for teachers in developing teaching material

Contribution for further improvement of EQF and DQR

Contribution to teacher education

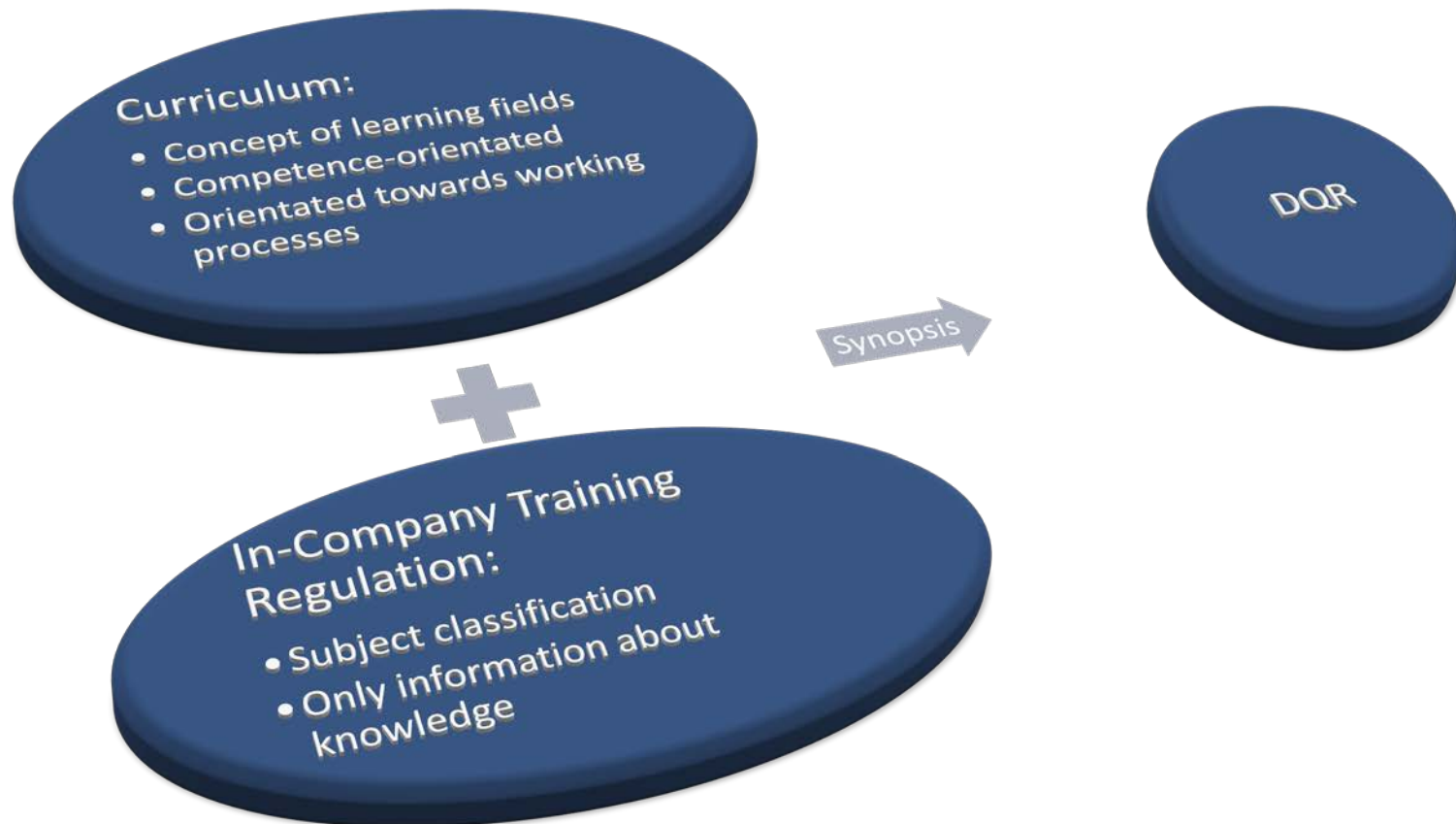
Support to connect teaching concepts from general and vocational education

Which fields of actions describe the profession of a computer specialist?

Which competencies and skills should be acquired during apprenticeship to gain the ability to work on these fields of action?



First Step: Review of Curriculum and In-Company Training Regulation



The EQF (European Qualification Framework for lifelong learning) / DQR

Segment of the DQR

- Examples of professional fields
- Without levels (here: 5) and their reasoning

Competence definition describes learning outcomes

Personal competency has been described in a very general way

Reference to in-company training regulation and outline curriculum

| List of professional fields | Professional Competency | | Personal Competency | |
|---|--|--|--|--|
| | TR and LF No. | Knowledge | Skills (instrumental and systematic assessment ability) | Social Competency (capacity for teamwork, communication, contribution) |
| 1. Shaping an operational organisation No. 1, 3 & LF 1, 3, (5) | <p>CSp have knowledge of general conditions of national economies and structure of economic systems. They assess the role and structure of companies in economic systems. They understand market structures and the role of production factors for performance.</p> <p>They understand operational connections and participate in operational processes in an active way.</p> <p>They have knowledge about occupational safety and environmental protection.</p> | <p>CSp have the ability to gather information (also in English), to analyse sources of information (e.g. technical descriptions, manuals etc.) concerning specific tasks of IT and occupational processes, to evaluate and select the information for their work.</p> <p>They use various techniques to organise their work.</p> | <p>CSp plan tasks in their teams.</p> <p>They shape cooperation actively in their organisation.</p> <p>They use various techniques for communication and creativity.</p> | <p>CSp have a sense of responsibility and they work efficiently.</p> <p>The develop strategies for independent working and learning.</p> <p>CSp know English technical terms and terms of expressions in their working area.</p> |
| 8. Supply of IT Service No. 7 & LF 10 | <p>CSp know procedures for maintenance of IT systems. CSp know rules of service.</p> <p>CSp have in-depth knowledge of communication and presentation techniques.</p> <p>CSp know fundamental pedagogical and didactical concepts to carry out IT training.</p> | <p>CSp conduct expert advice, support and training for customers and users.</p> <p>CSp instruct users in IT systems.</p> <p>They carry out IT training; they can prepare subject content in a didactical way and present it easily accessible.</p> | <p>CSp master communication techniques. They can teach strategies on how to learn.</p> | <p>The curricula list only little explicit information, but customer orientation demands positive attitude, kindness and belief in the respective topic.</p> |
| ... | ... | ... | ... | ... |

TR: In-company training regulation ("Ausbildungsordnung") LF: Learning field from outline curriculum
CSp: Computer specialists for application development

Interview Study among Certified Trainers

9 Trainers

Companies
with Different
Profiles and
Sizes

Assignment of
Working
Processes to
Curriculum

Problem:
No clear
assignment
possible

| <i>Learning field - number</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | ... | 10 | 11 |
|--|---------------------------------|---|--|-------------------|--|---|----------------------|-----|---------------------------|----------------------------|
| <i>Learning field - name</i> | The company and its environment | Business processes and operational organisation | Sources of information and working methods | Simple IT systems | Professional English for technical occupations | Application development and programming | Networked IT systems | ... | Maintenance of IT systems | Accounting and controlling |
| <i>Occupational working processes</i> | | | | | | | | | | |
| A new working place for an employee | d | | d | a | d | | b | | | |
| User help desk | d | | b | b | d | | c | | a | |
| Installation, maintenance and support of servers | | c | d | | b | | a | | b | |
| ... | | | | | | | | | | |
| Application development for collection department or accounting department | d | b | d | | d | a | | | | b |
| Planning, documenting and accounting an application development project | b | | d | | d | a | | | | b |
| Implementation of project plans into functional SW | b | | d | | d | a | | | | b |

Main topic of the respective working process

Alternate topic of the working process

- a:** **Main learning objective;** apprentice/student has to deal actively with the problem to learn the topics of the learning field
- b:** Apprentice/student uses mainly previous knowledge from the respective learning field to deal actively with the problem
- c:** Apprentice/student uses previous knowledge as background for decision making processes
- d:** Apprentice/student uses the knowledge from the learning field implicitly

Working Processes assigned to DQR

| Fields of Action - Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|------------------------|----------------------------|---|-----------------------|---|------------------------------|----------------------|--|
| Field of action - Name | Contributing to Organisational Structures | Designing Business Processes in IT and CS | Configuring IT Systems | Developing Simple Software | Developing Database Systems to Customer Request | Networking IT Systems | Organizing and Implementing (Complex) IT Projects | Delivering IT Service | Marketing IT Systems | Calculating Economic Efficiency of IT Services |
| Occupational Working Process | | | | | | | | | | |
| User help desk | | | c | | | c | | not assigned | | |
| Software Installation, Update and Configuration of Clients | d | | a | | | | a/b | | | |
| Software Installation and Configuration of Servers | | | | | | a | a/b | a/b | | |
| Maintenance of Telephone Systems | | | | | | b | aspects of service not named | | | |
| Installation and Support of Customer IT Solutions, Including all Hard- and Software | c | | | | | | a/b | aspects of service not named | | |
| Customer Advisory Service | | | | | | | a/b (new and existing) | a (new) | | c |
| Application Development for Different Company Departments | d | | | a | a/b | | | | | c/d |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

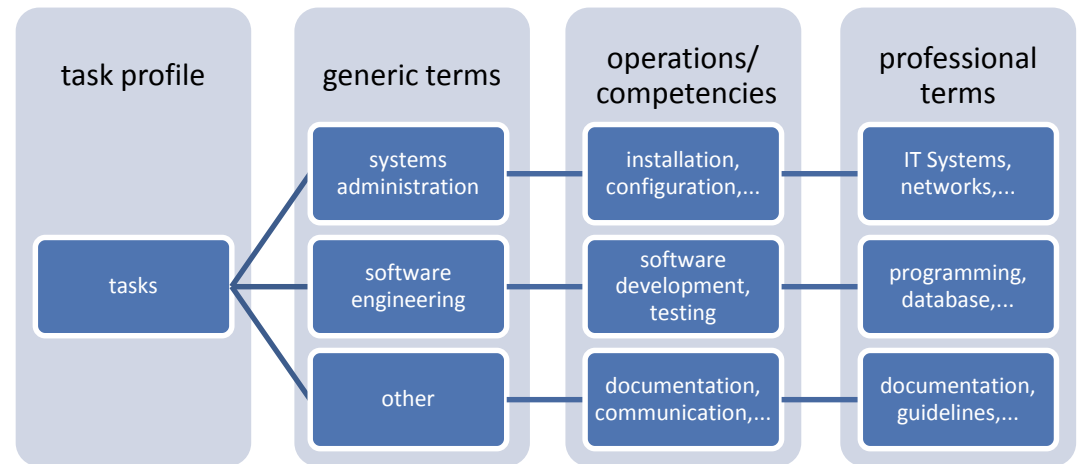
Main topic of the respective working process

Alternate topic of the working process

- a: **Main learning objective**; computer specialist has to deal actively with the problem to learn the topics of the learning field
- b: Computer specialists use actively previous knowledge und skills from the field of action - consolidation of skills
- c: Computer specialists actively use previous skills and knowledge for decision making processes
- d: Computer specialistes implicitly use previous knowledge from the field of action for different working processes



- 100 job offers from 4 online job agencies
- *Demanded requirements:*
 - Personal, operational & professional competencies
 - Formal requirements
 - Experience
- *Described tasks:*
 - Vocational operational fields
 - Description of working areas
- *Categorisation:*
 - Resulting Statements:
 - About 1300 requirements
 - About 980 tasks
 - Methods of content analysis
 - Categorisation based upon curriculum
 - Result: *Multilevel category system*

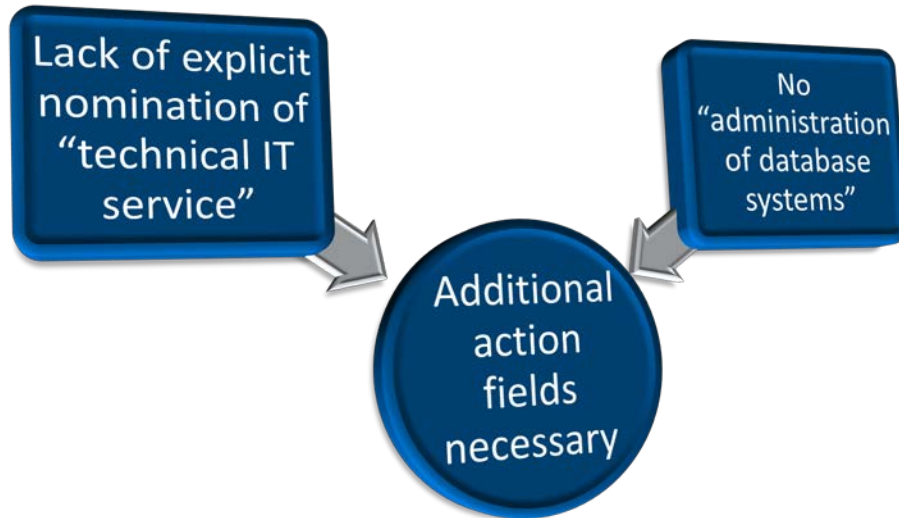


Extract from Category System

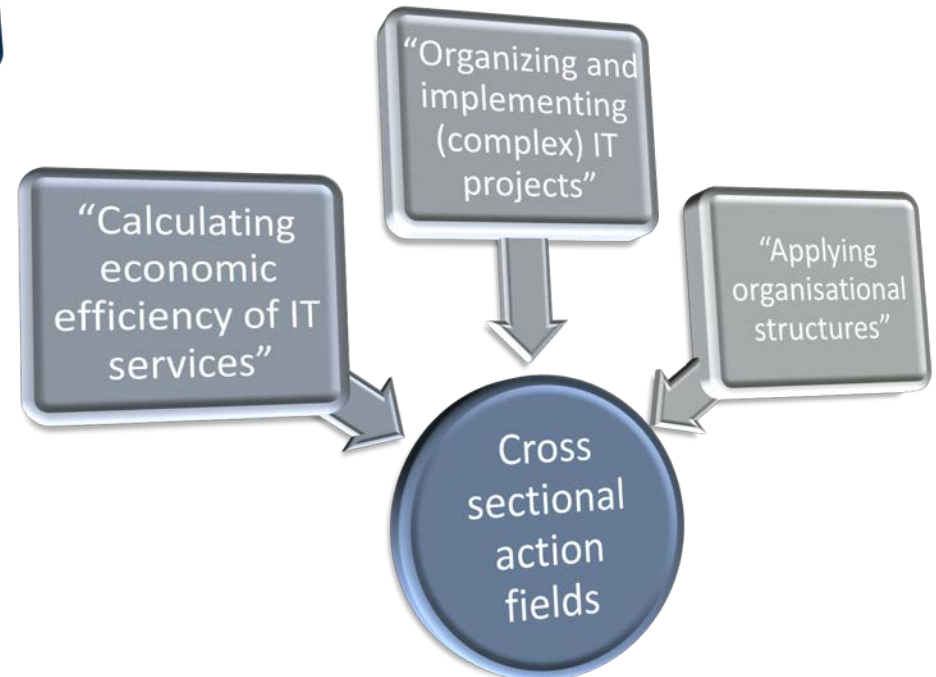


Assignment to
DQR

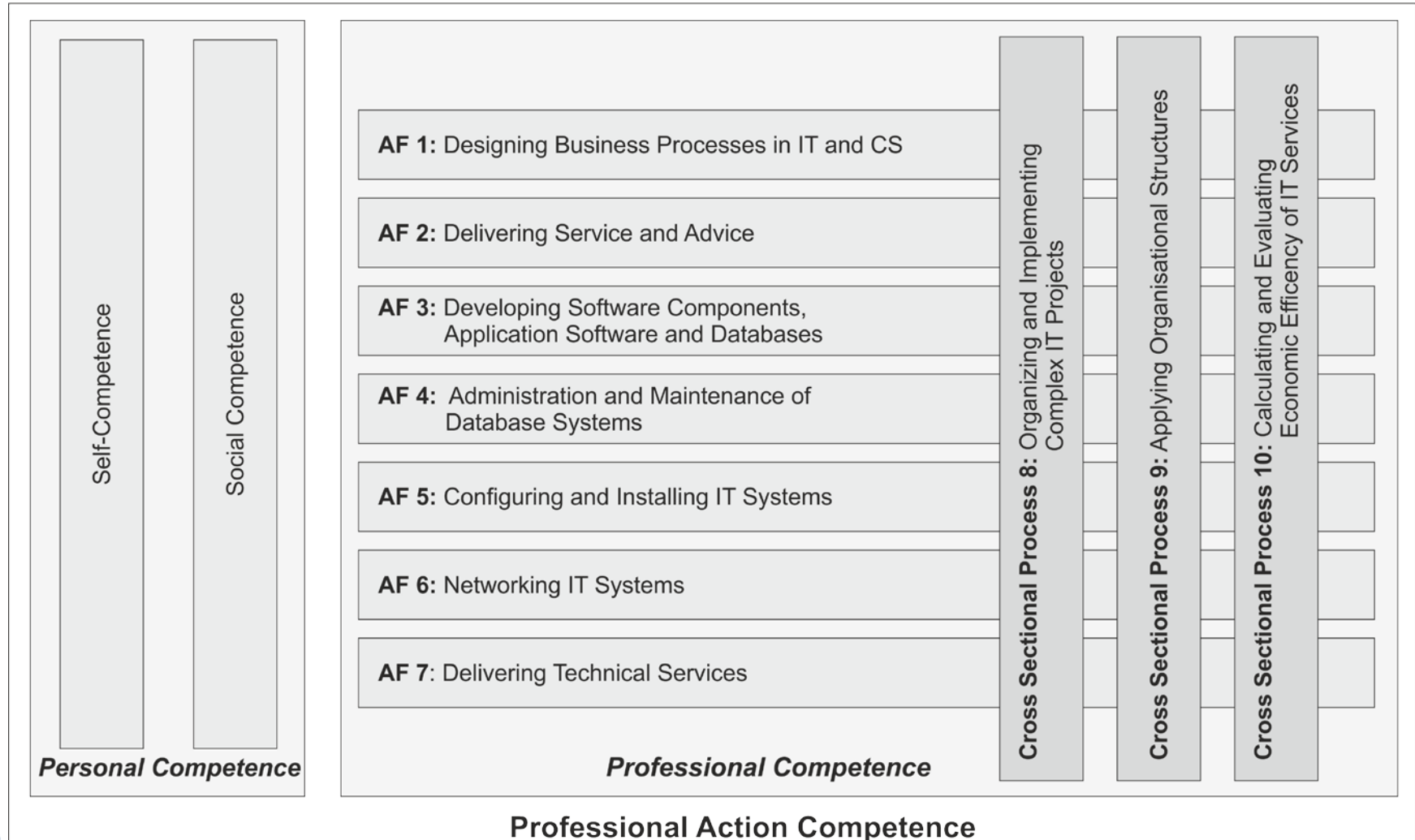
- The DQR as accepted model is a suitable basis for development
- Problems with DQR:



Development of a new, sound model required



Resulting Competence Model



Exemplary field of action: “*Delivering service and advice*”

Knowledge:

Computer specialists *know* the basic principles and rules of IT service. They *are aware* of basic pedagogical and didactic concepts for teaching IT. They *formulate* technical subjects *in* target group oriented and technically *appropriate ways*. They *have* comprehensive *knowledge* of communication and presentation techniques.

Competencies:

Computer specialists expertly *advise* customers and interested parties. They *analyse* need based by defined criteria. They *provide* recommendation and *select* service and components in a qualified way. They *prepare* didactically technical topics for different target groups and *teach* them easily comprehensible.

They *create* qualified offers for these situations. They *document* their work as well as technical issues appropriately for different target groups.

Social competence

- Computer specialists *communicate* with customers.
- They *analyse* requirements of the customers, they explain, advise and discuss appropriately and professionally by using technical language.
- They *work* in teams.
- When giving seminars, they *adapt* their technical language to their target group.
- They *use creativity and communication* techniques

Self- competence

- Computer specialists *try to understand* several business processes and discuss resulting conclusions.
- They *work independently* on their tasks. They *use their knowledge* target-oriented.
- They *study* further to keep themselves up-to-date.
- They *use* different *media* and *methods* to solve given problems.
- They *deal carefully* with data and information given by customers and partners. They *comply* with rules to protect personal data and trade secrets.
- They *weigh up* carefully their decisions and recommendations. They *look after* their customers in all conscience.

Assignment: Working Processes - Model

| Fields of Action - Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | CSP 8 | CSP 9 | CSP 10 |
|--|---|-------------------------------|--|--|---------------------------------------|-----------------------|-------------------------------|---|------------------------------------|---|
| Field of action - Name | Designing Business Processes in IT and CS | Delivering Service and Advice | Developing Software Components, Application Software and Databases | Administration and Maintenance of Database Systems | Configuring and Installing IT Systems | Networking IT Systems | Delivering Technical Services | Organizing and Implementing Complex IT Projects | Applying Organisational Structures | Calculating and Evaluating Economic Efficiency of IT Services |
| Occupational Working Process | | | | | | | | | | |
| <i>Design and Installation of IT Working Places</i> | | | | | X | | | | X | |
| <i>User help desk</i> | | | | | | | X | | X | |
| <i>Installation and Configuration of Telephone and Broadband Connection</i> | | | | | | X | | X | | |
| <i>Installation and Support of Customer IT Solutions, Including all Hard- and Software</i> | | | | | | | X | | (X) | (X) |
| <i>Modelling Business Processes by Using It Infrastructure</i> | X | | | | | | | X | X | |
| <i>Planning, Documenting and Accounting an Application Development Project</i> | | | X | | | | | X | | X |
| ... | | | ... | ... | ... | ... | ... | ... | ... | ... |

Validation by experts confirms the model

All working processes can be assigned to one single action field

Cross sectional processes complete description



- Theory-based normative competence description has been created
- Model has been based on empirical data
- Validation by several experts was successful
- Useful for further development of curriculum and in-company training regulation
- Can be also matched to e-CF

- Next possible steps:
 - Developing more teaching material based on these results
 - Developing of items for testing and evaluation



Thanks for your attention!

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Offen im Denken



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