

ADDITIONAL BENEFIT THROUGH COMPETENCY-ORIENTED BUSINESS SIMULATIONS

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ABSTRACT

This paper will give a general overview of a development framework for competency-oriented business simulations. Its implementation is described with special reference to the training of civil engineering students and professionals. It is intended to inspire other areas and is designed as universally applicable as possible to allow the transferability to other domains. In addition, this paper should contribute to a lively discussion on competency-orientation in the design of business simulations in human resource development and higher education at large.

INTRODUCTION

The primary motive frequently mentioned in the context of the conceptualization of business simulations is the general aim of promoting the cognitive and affective learning (Wilson et. al., 2008; Chin et. al., 2009). Fortmüller (2007) claims that objectives of business simulations are, e.g., the advancement of social aptitudes and the pooling of arguments and facts to reach the best possible result. Further aims are mentioned by Anderson & Lawton (2008) and include the examination of the own perspective as well as the improvement of the own decisiveness.

These examples demonstrate that a business simulation in general furthers certain competencies indeed, but it is not taken into consideration whether it complies with the current professional needs of the target group and in how far it allows single participants to learn and develop specific skills and expertise for their occupational activities. Therefore the current and specific demands on the skills and expertise of the target group are often separate from the concept of the business simulation. Today, the consideration of occupationally relevant competencies is explicitly demanded, especially in the field of academic further training and education.

The Bologna Declaration (1999) and the Berlin Communiqué (2003) had a particular and noticeable impact on the education sector of the European Union. As a consequence, the common European Qualification Framework (EQF) was developed, which is to be seen as a competency - and output-oriented translation system. According to the ECTS Users' Guide (2004), the learning goal of a lecture or

seminar comprises a variety of competencies. These are a dynamic combination of attributes, skills and attitudes.

This is the basis on which accreditation agencies devise competency standards to be integrated into the development of curricula. These activities exert their influence on the engineering sciences with the specifications of the European Network for Accreditation of Engineering Education (ENAAE, 2008). Similar developments can also be found in other countries. In the USA, competency objectives, e.g., are set by the Accreditation Board for Engineering Technology (ABET, 2011). Study courses in Australia follow competency objectives outlined by the association Engineers Australia (EA, 2011).

These standards – if they are to be realized – influence both the conceptualization of whole study courses and the development of single events. Business simulations as a teaching method must not be exempt from this process.

If the focus of observation is extended from the academic further training and education to a larger quantity of individuals, the explicit consideration of current and occupationally relevant competency requirements plays a central role in the development of business simulations for the creation and preservation of employability and competitiveness of a whole domain. Consequently, to realize a successful human resource development with integration of business simulations, it is mandatory to include the systematic recording of competency requirements as well.

BACKGROUND

DEVELOPMENT OF THE TERM “COMPETENCY”

The Latin noun “competentia” is originally derived from the verb “competere”; meaning *to concur, to strive for something together, to require by law*, but also *to accord someone something, to be entitled to something*. Furthermore, Latin dictionaries began to offer the aspect of competitors vying for the same issue at the end of the 16th century (Huber, Lockemann & Scheibel, 2007).

Upon inspection of the English verb “to compete”, it seems that this idea has lent its meaning in the sense of *competing for or against something, rivaling someone or something, matching with someone* and similar (Muret, 2004). Similar can be found in French, where the adjective *compétent* has the meaning of *expert, skillful or specialized* and the noun “compétitivité” means *competitiveness* or

capacity to compete (Bleher & Epple, 1996). This, indeed, does not seem very surprising due to the same family of languages. All three languages are allocated to the Indo-European family of languages (Crystal, 1993). Independent of the fact that later both the German and the English language developed from the Germanic and the French from the Italian language family (whose most important language is Latin), the similarity of the three languages is less a question of coincidence than of language evolution – at least in the scope of these observations here.

However, the orientation towards competition seems to have established itself to a lesser degree in the German language. As a consequence, an individual who is called competent will be attributed with an aptitude on the one hand (individual skill in the sense of the capacity to act successfully) and an authorization (being allowed to do something in the sense of a permission) on the other hand.

DIFFERENT TYPES OF COMPETENCY

Before a further discussion of the term competency is conducted and the necessary categorization of competencies is introduced for the following observations, these competencies need to be clearly defined. Competencies can be separated into three groups: open competencies, pseudo-competencies and hidden competencies (Becker, 2005).

Both the detailed elaboration and the following business simulation concepts refer solely to the open competencies, as only these can be recorded and evaluated due to the lack of information asymmetries (Picot, 1991).

WHAT IS A COMPETENT INDIVIDUAL?

Depending on the observed field of scientific activities, many definitions of the term competency can be found today. In the given context of business simulations, the highly relevant areas of psychology, pedagogy and organization theory were taken into consideration.

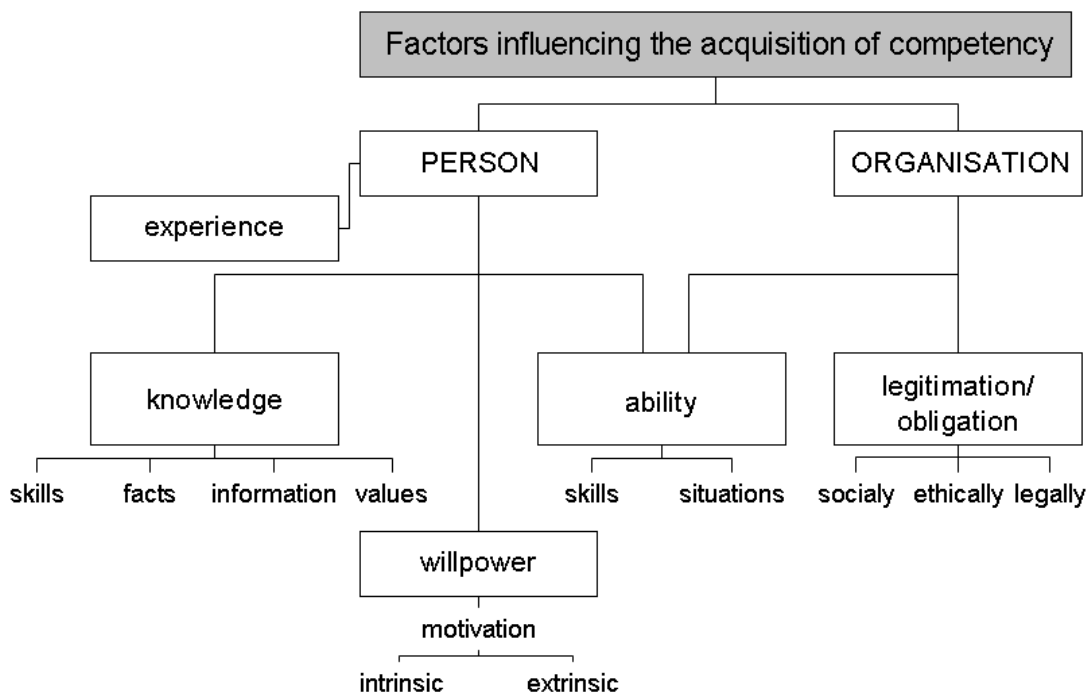
All in all, it can be stated that the term competency is similarly defined in the aforementioned areas, whereupon the individual's capacity to act is a central notion in all scientific domains (Robinson, 1967; Weinert, 2001; Becker, 2005; Schmidt-Rathjens, 2007). The influence of experience is taken into greater account in occupational education (Hölterhoff & Becker, 1989). The aspect of legitimation is treated similarly, it is substantially valued in organizational theory (Kosiol, 1962; Bleicher, 1980).

Upon closer inspection of the different definitions, it can be noted that the aspect of competition or an individual's competitiveness is not explicitly included, although the competitiveness could be derived from, e.g., employability – which could itself be derived again from the capacity to act.

ACQUISITION OF COMPETENCIES

An isolated inspection of the term competency does not sufficiently prepare the ground for the full understanding of what it is that makes a competent individual. To

Exhibit 1
Factors influencing the acquisition of competency



reach this aim, the additional question of how competencies can be acquired needs to be answered as well.

The aspects of *ability* and *legitimation/obligation* are insufficient to understand the acquisition of competency. For the development of a competent personality a goal-oriented action is needed, realized through willpower – no matter whether the individual motivation is intrinsic or extrinsic (Brandstätter & Schnelle, 2007). The creation of competency is always based on the availability of knowledge (Erpenbeck & Heyse, 2007). Therefore, the first indispensable step of the acquisition of competency is the availability of facts and information which are comprehensible anatomically, mentally and in regard to content.

The handling of this offer of knowledge is, according to Schmidt (1992), more to be seen as construction work and less as a storage activity. Due to this, in the next step the offered knowledge is evaluated and integrated in regard to the current situation, the accumulated experience as well as in correlation to previously acquired skills. The newly created competency to act is then consolidated through experience to make it available on a longterm basis.

Thus previously acquired experience implies the generation of additional skills and influences the competency development of an individual.

As a result, experience affects both factors relevant for the acquisition of competency, i.e. ability and knowledge. However, experience also influences motivation and, thereby, the willpower of an individual. In conclusion it can be stated that the relevant and influential factors for the acquisition of competency, i.e. ability, knowledge and willpower, are influenced by the individually and previously accumulated body of experience.

Summarisingly, the following definition can be stated:

A motivated and experienced individual is seen as competent if, first of all, he or she has a social or legal authorization and/or obligation at his or her disposal. Then, the individual needs to possess the skill to transfer facts into know-how with the aim to apply it appropriately to tasks as a dedicated skill in a competitive environment. Finally, the aforementioned has to be deployed responsibly and successfully for a specific aim.

COMPETENCIES IN THE CONTEXT OF BUSINESS SIMULATIONS

Considering the above-mentioned definition, business simulations as an activity-based method aiming at the acquisition of experience clearly lend themselves to the fields of further education and training as well as personality development in general.

The business simulation comprises a significant quantity of conflict- and problem settings (Rebmann, 2001) and helps the participants to experience consequences of their decisions and their behavior (Taylor & Walford, 1974). This bridge between activities and individual knowledge allows participants to accumulate valuable experience very

quickly (Crookall & Thorngate, 2009). Due to this, the development of the competency to act is explicitly supported in business simulations by their primary orientation towards action (Blötz, 2005).

In view of this, business simulations as a method for further training and education achieve high relevance in the context of the current discussions on competencies and their acquisition.

However, within the current developments an appropriate basis is needed to further the establishment of the business simulation as a serious method on the one hand, and increase the quality of business simulation concepts in general on the other hand. Therefore, business simulations have to gain orientation towards valid and reliably developed, target group-oriented models of competency. This orientation is valid for the phase of conceptual design, the development, the execution and the completion of the business simulations. This is the first and decisive step to develop competency-oriented business simulations (Competency-Oriented Business Simulations: COBS). Upon inclusion of the above-mentioned definition of a competent individual, a COBS can be defined as follows:

A competency-oriented business simulation is aligned in each phase to a valid and reliably developed, target group-oriented competency model. This model should motivate participants to develop specific capacities to act due to experience acquired in a realistic setting with conflicts and problems. The goal is to apply these specific capacities to act responsibly and successfully in a real and competitive context.

METHOD

GENERAL FRAMEWORK FOR DEVELOPING BUSINESS SIMULATIONS

A successful formal concept for the development of business simulations is advocated by Lynch & Tunstall (2008), taking into account the different areas of conflict during the development stages and offering a high level of practical feasibility.

Within this framework of development, Lynch & Tunstall define the areas content, simulation design and system - and multimedia concept. The area of content comprises and defines the training style, the pedagogical framework settings and the specific content and aims. On this basis, the character of the simulation is developed in the area of simulation design with the realization of activity models. In the last area, based on the simulation design, the development of general functionalities and the production of the system as a whole takes place.

Due to these different areas and the resulting heterogeneous composition of the participating persons, Lynch & Tunstall suggested different stages of development.

Stage 1:

In this content-related phase the creation of the pedagogical framework has been recommended. At this point of time it is also necessary to decide how the application can be integrated into the course. Here, aspects like the predominant pedagogical philosophy, the teaching and learning strategy, and the available resources are of considerable importance.

Stage 2:

After the teaching and learning objectives have been defined in the pedagogical framework, the areas of simulation design and of the system- and multimedia concept collaborate in the second stage to devise the system as a whole. The required simulation elements and the potential user actions are set in the simulation design within the framework of the previously defined pedagogical framework. These form the functional requirements which the area of system- and multimedia concept needs to realize.

Stage 3:

This stadium is characterized by further cooperative activities in which the proposed model is tested thoroughly. Based on the previous conceptual design, activity models are developed to which the existing functionalities are adapted or additional ones devised. Furthermore, the compatibility of the previously set pedagogical framework to the hitherto developed system is verified.

As Lynch & Tunstall focus to a large degree on EDP-supported systems, only the stages one to three of the original sequence are considered here. Stages four to six (physical realization of the concept, testing of the alpha and beta versions) are not considered integral elements in the development framework of a COBS.

COMPETENCY-ORIENTED DEVELOPMENT FRAMEWORK FOR BUSINESS SIMULATIONS

Although the framework of Lynch & Tunstall lends itself to the development of a business simulation, it does not include an explicit orientation towards the demanded occupational competencies. Therefore it seems sensible to extend their framework by this aspect. In reference to the development of competency-oriented courses in the context of higher education, Karl (2010) devised the study module lifecycle, a five stage model of the competency-oriented development of study modules.

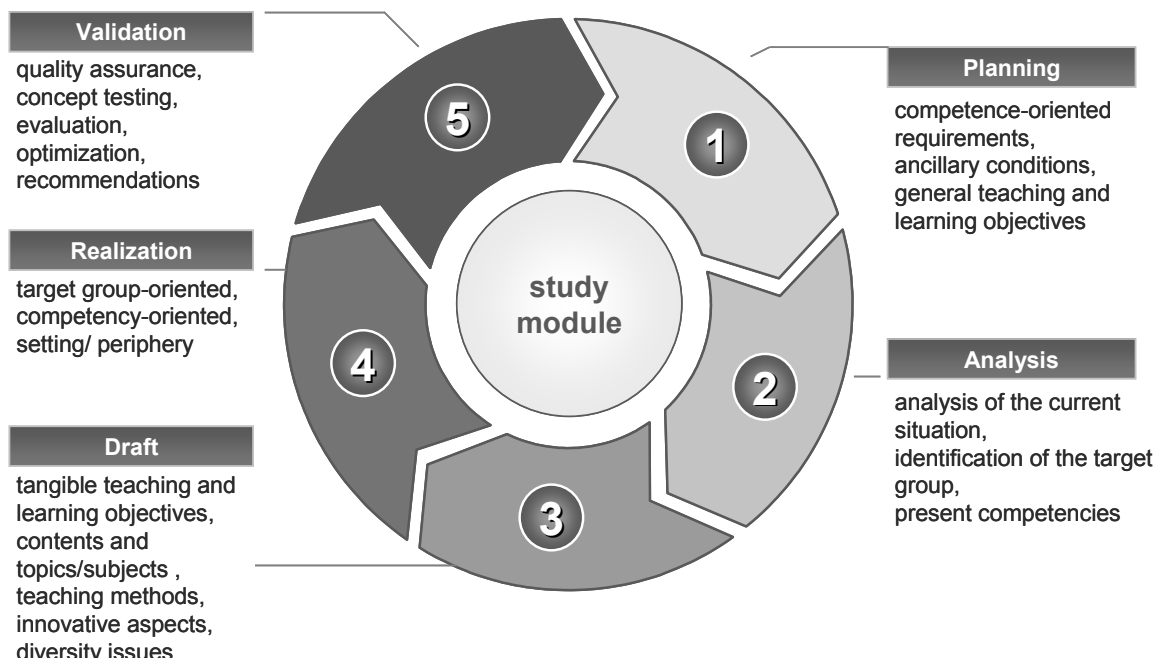
The study module lifecycle contains the five stages planning, analysis, draft, realization and validation. Compared with the development framework of Lynch & Tunstall, this plan displays both analogies and disparities.

The stage of planning contains the framing of the competence-oriented requirements and ancillary conditions alike, allowing the development of general teaching and learning objectives. Whereas this step corresponds to the pedagogical framework regarding the definition of teaching and learning objectives, a strict setting of competence-oriented requirements is not demanded in Lynch & Tunstall's model.

Similarly, neither the analysis of the current situation and the belonging identification of the target groups nor the possibly present competencies to connect to are part of the development framework according to Lynch & Tunstall.

In contrast to that, the teaching methods, contents and topics/subjects set within the framework according to Karl

Exhibit 2
The study module lifecycle



can be equated with the creation of a pedagogical frame. On the other side, a continuative elaboration of tangible teaching and learning objectives into cognitive and activity-focused teaching objectives and affective learning objectives is not specifically demanded by Lynch & Tunstall.

Due to these dimensions, Lynch & Tunstall do not include this target group-oriented and competency-oriented realization in their discussion. However, the consideration of the periphery complies with the examination of the available resources.

The stage of validation, serving the purposes of quality assurance, evaluation, and optimization, is partly integrated in stages four to six of Lynch & Tunstall's model, but focuses only on the product, not the participants. The recording and evaluation of competencies is an important aspect in the current competency research. Therefore, the focus needs to be primarily on the participants in the phase of evaluation.

All in all, the following aspects need to be amended to the development framework of Lynch & Tunstall to allow the development of a COBS:

- Definition of competency-oriented requirements,
- Identification of target groups and potentially available competencies,
- Specification of tangible teaching and learning objectives on basis of competence models,
- Realization with an orientation towards target groups and competencies,
- Recording and evaluation of competencies.

With integration of the study module lifecycle according to Karl into the approach of Lynch & Tunstall, a development framework for the conceptualization of COBS is created.

As the stage of system and multimedia design in the concept of Lynch & Tunstall, in other words the creation of an executable overall system, is not part of this development framework, this stage is substituted with a realization concept. The concept includes room for the development of basic functions on the one hand and recommendations for the practical realization on the other hand.

FRAMEWORK FOR DEVELOPING COMPETENCY MODELS

Core element of the development framework is the formulation of competency models. These identify the knowledge and skills which are necessary for an individual to be able to successfully carry out certain tasks, work assignments or functions in an industry or an occupation (Schmidt-Rathjens, 2007). This means that the close examination of an individual's attributes as well as its current and future situation, i.e. the context in which the person should and will have to act, is crucial for the creation of a qualified competency model.

Keeping in mind that a model includes a pragmatic and a semantic function alike (Busse, 1998), the competency model that is basis of the business simulation should be

introduced and discussed with the participants no later than during the completion stage of the simulation. Usually, the participants focus on their assignments during the business simulation. As a consequence, a concluding discussion of the competence model delivers, among other things, an insight into the didactic background and projects the main know-how and skills for the future. Handing out a graphic illustration of the competency model further supports the goal of long-term remembrance through the visualization of the model.

These models can easily be based on given specifications, which can be found in, e.g., ENAEE (2008), ABET (2011) or EA (2011). However, more detailed is a basis composed of own research findings. The latter is especially recommendable if a business simulation is to be tailored to a specific customer or a specific corporation.

IMPLEMENTATION IN THE FIELD OF CONSTRUCTION MANAGEMENT

DEVELOPING A SPECIFIC COMPETENCY MODEL

A domain-specific competency model was developed following the authors six-stage framework for the conceptualization of competency models (Framework for the Development of Competency Models (FDCM). The latter was devised in the style of the Delphi method (Sackman, 1974) and, respectively, the Cooke method (Aspinall, 2010).

Stage 1: Background information

Starting point was a thorough analysis and synthesis of existing demands and standards with the help of literature reviews. The resulting collection of competencies was discussed in personal and situative interviews with representatives of different management levels of corporations and educational institutions.

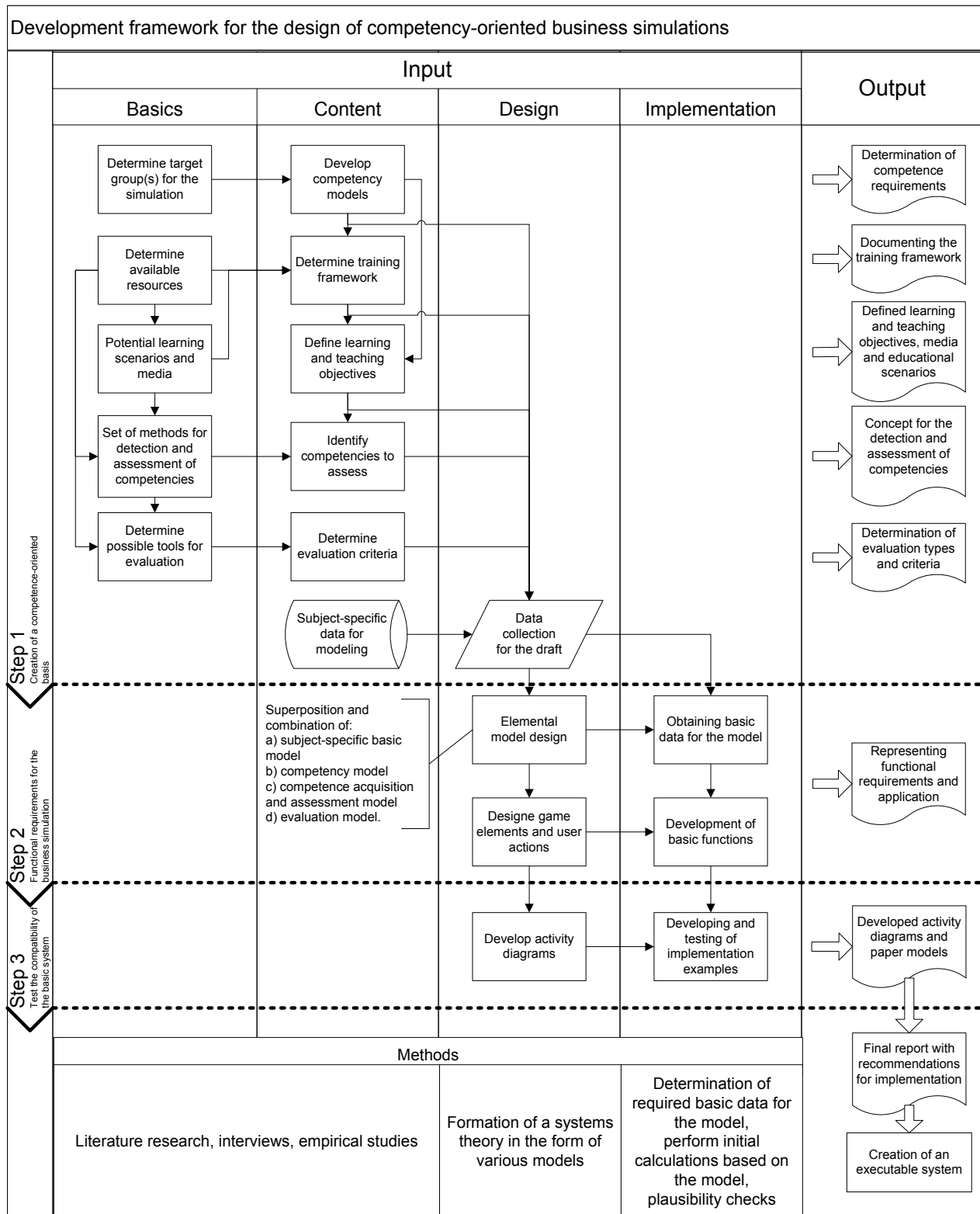
Stage 2: Development of the first model of a competency framework

The insight gained with the help of the interviews allowed to define a first sketch of a competency framework in form of a competency catalogue. The localised individual components were scrutinized and their properties and content substantiated in writing. Then, the individual components were clustered in five competency areas as preparation for the next step.

Stage 3: Feedback from the field

Based on the competency clustering, a structured survey was developed to receive the spectrum of opinions from a larger proportion of the target group. As the given aim was the development of a universally applicable business simulation, online surveys were carried out in German major enterprises of the construction industry (70 invitations, 59 participants, participation rate 84%) as well as personal interviews of construction site personnel with

Exhibit 3 Framework for the development of COBS



leading functions (30 invitations, 30 participants, participation rate 100%). Each invited expert assessed the relevance of the listed competencies for his or her area of activities.

Stage 4: Fundamental competency profiles

The summary of the data and the subsequent descriptive and multivariate evaluation served as a basis for the following generation of fundamental competency profiles.

It was found out that almost half of the substantial competencies are covered by the business simulation method itself (e.g. the ability to work in a team, decision-making ability, structured thinking etc.). On the other side, specific competencies would need to be covered by the business simulation model (e.g. problem-solving skill in construction site management, operational and contractual competencies etc.).

In this context, the hierarchical positions and the professional experience of the interviewees was used to establish rankings as preparation for the subsequent individual interviews.

Stage 5: Refinement of the competency profiles

Following stage four, the previously compiled competency profiles of randomly chosen, not yet involved experts were verified and rated in personal interviews. Possible discrepancies were discussed and rectified in the process. Apart from marginal adjustments within the specific competency profiles of the management levels, a general consensus existed in regard to the core competencies localized until then.

Stage 6: Final competency models

Finally, the conclusive competence model was set as basis for the business simulation development. In this, all competencies rated as very important in all areas were considered as minimum requirements (relative frequency in %):

- problem-solving skills in construction site management (81,33%),
- project communication skills (58,67%),
- construction management competencies (56,00%),
- negotiating skills (52,00%),

**Exhibit 4
Competencies for the construction industry**

Methodological skills	Expertise	Social and communication skills	Personal skills	Activity-related and implementation-related skills
(1) Analytical thinking (Erpenbeck & Heyse (2007))	(1) Construction management skills (Karl (2010))	(1) Ability to work in a team (Erpenbeck & Heyse (2007))	(1) Ability to work under pressure (Erpenbeck & Heyse (2007))	(1) Awareness of global economic connections (Karl (2010))
(2) Feeling for future developments (Erpenbeck & Heyse (2007))	(2) Economic competencies (Galloway (2008), Karl (2010))	(2) Project communication skills (Galloway (2008), Karl (2010))	(2) Openness (Erpenbeck & Heyse (2007))	(2) Decision making (Erpenbeck & Heyse (2007))
(3) Interdisciplinary thinking (Ertl (2005); Erpenbeck & Heyse (2007), Karl (2010))	(3) Problem-solving skills in construction site management (Karl (2010))	(3) Negotiation skills (Karl (2010))	(3) Willingness to perform (Erpenbeck & Heyse (2007))	(3) Skills to avoid risks (Karl (2010))
(4) Creativity and innovation (Erpenbeck & Heyse (2007))	(4) Contractual competencies (Galloway (2008), Karl (2010))	(4) Conflict resolution skills (Erpenbeck & Heyse (2007))	(4) Readiness to assume risk (Erpenbeck & Heyse (2007))	(4) Flexibility (Ertl (2005))
(5) Structured thinking (Erpenbeck & Heyse (2007))	(5) Professional and application-related English (Galloway (2008), Karl (2010))	(5) Representative / Representational ability (Karl (2010))	(5) Awareness of sustainability (Galloway (2008), Karl (2010))	(5) Initiative (Erpenbeck & Heyse (2007))
(6) Recognition of relationships and interactions (Erpenbeck & Heyse (2007))	(6) Skills in project development (I & F issues) (Galloway (2008), Karl (2010))	(6) Skills in public relations (Galloway (2008))	(6) Ethics Awareness (Galloway (2008))	(6) Optimism (Erpenbeck & Heyse (2007))

contractual competencies (42,67%),
economic competencies (37,33%).

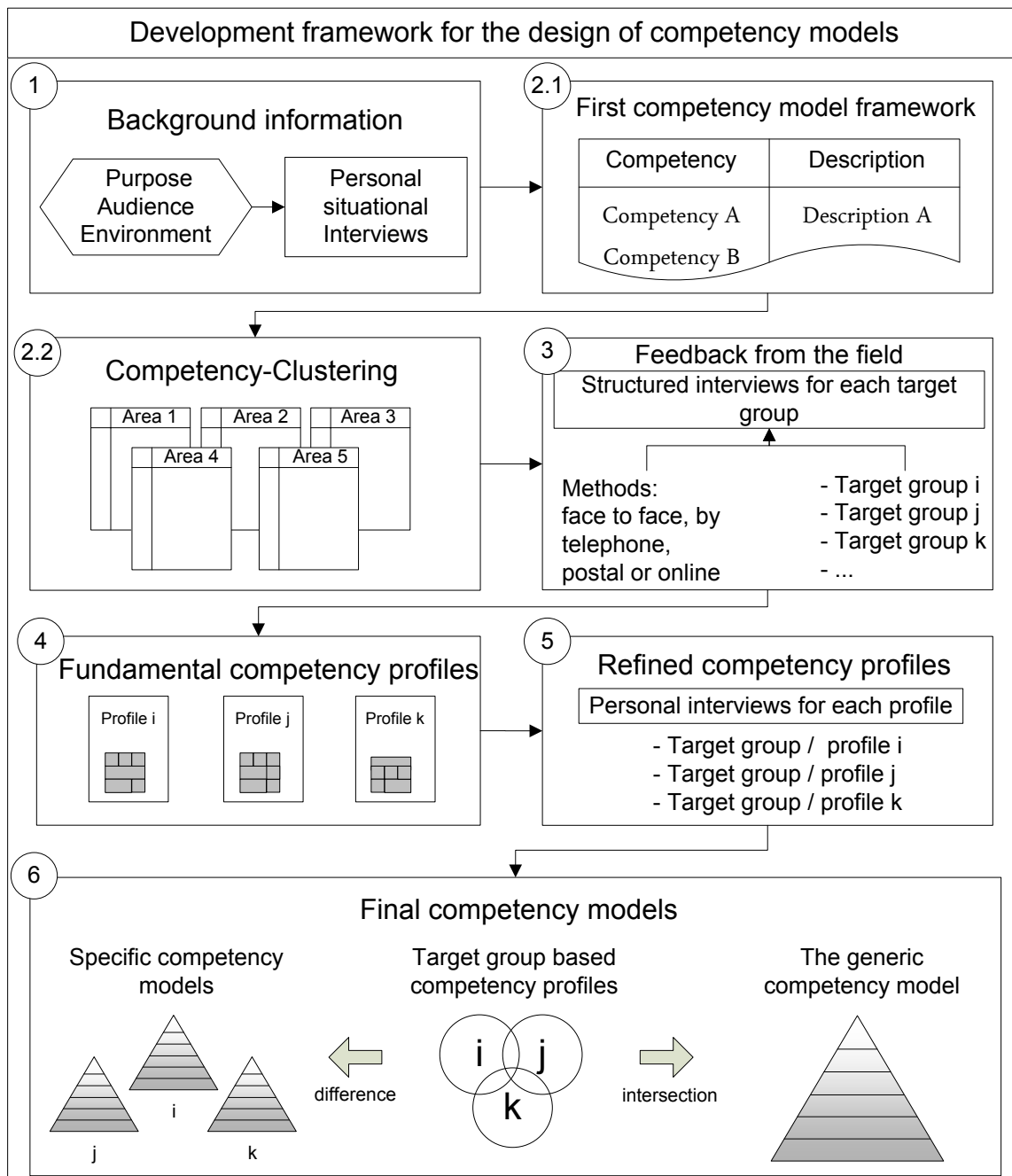
The intersection which was defined in this way presents the fundamental basis for the didactic concept of the business simulation and additionally serves as a configuration tool. Further evaluation allows relevant competencies to be localized depending on professional experience, management level and the type of industry. These attributes can also be supportive in the development and configuration of

a business simulation in order to devise target-group specific business simulations.

DIDACTICAL INPUT FOR THE BUSINESS SIMULATION

The competency models serve as basis for a business simulation event which can be developed accordingly and potentially complemented with other sensible teaching or

Exhibit 5
Framework for the Development of Competency Models (FDCM)



learning methods. The six core competencies to be taken into account require specific teaching and learning objectives. Usually, the listed items demand more elaborated considerations in regard to the cognitive, activity-focused and affective learning objectives.

The gained teaching and learning objectives form the basis for the development of the business simulation model. This model is superposed by, among others, a competency measurement model, which is supposed to allow the metering of the increased participant's competency.

COMPETENCY MEASUREMENT MODEL

Apart from the qualified definition of teaching and learning objectives, the competency models can be basis for the choice of equally adequate methods and instruments that allow a criteria-oriented interpretation of test and measurement results in regard to the defined teaching and learning objectives of the business simulation. Here, techniques and procedures are necessary to ascertain in how far the intended competencies have been developed by the participants and which individual or institutional conditioning factors further or inhibit progress. From the theoretical and methodological perspective, the empirical acquisition of competencies forms a substantial challenge (Hartig & Jude, 2007). Due to the possibilities of technology-based competency diagnostics, current EDP-supported methods seem highly suitable. The establishment of a standardized online assessment is reasonable, which allows the questioning of participants at different points of time to measure the realization of competencies, i.e. the performance.

This enables the examination of the teaching and learning objectives as well as the recording and measurement of competencies. It could be achieved with the help of cohort/panel studies, with which the trainer is able to monitor and to analyze the course of competency development in a longitudinal temporal section and, respectively, to balance on the basis of target/actual comparisons.

Hence, methods and instruments are available which are based on a) competency-oriented examinations (at the end of the business simulation), b) self-assessments (online assessment at any time), c) third-party assessments (by the trainer in the process of the business simulation).

In this way, reliable statements about the effectively gained competencies can be made, which would not be possible on basis of subjective evaluation and/or self-assessment alone. Apart from that, the employment of different assessment and measurement methods reduces the danger of penalizing groups of participants by the survey methodology (Zlatkin-Troitschanskaia & Kuhn, 2010).

PROTOTYPICAL APPLICATION

On the basis of the development framework for the conceptualization of a COBS as presented in this paper, a board-based business simulation (Construction-Giant: this business simulation is in use in the academic education as well as in the further education of civil engineers and project managers) and an online business simulation currently under development (Chameleon; realized with funding of the Association for the Promotion of German Science and Humanities (Stifterverband für die Deutsche Wissenschaft) in the support program of the German Academic Exchange

Exhibit 6
Teaching and learning objectives in a business simulation

Competency	Teaching and learning objectives
problem-solving skill in construction site management	increasing awareness of project risks, experiencing consequences of project events
project communication skills	generating, accumulating, disseminating and filing project information appropriately and in time, creation of an information and reporting system
Construction management competencies	learning and consolidation of calculation, understanding interrelations, experiencing consequences of miscalculations, planning material requirements and administering resources, both for individual projects and company-wide (personnel and device management)
negotiating skills	negotiations of workgroups with participants, organizing subcontractors, asserting interests of the corporation
contractual competencies	identification of "risky" construction contracts/ projects and awareness of consequences, enforcing of amendments, handling of warranty claims
economic competencies	taking decisions in planning, organisation and calculation of the corporation (accounting, cost calculation, controlling), professional settlement of the projects, profit and loss accounting, compiling a balance sheet for own company, devise and realize corporate strategies

Service “Innovationen in der Lehre: die internationale Dimension in der Lehre erfolgreich stärken“, for details refer to <http://www.chameleonbase.com>) have been and are designed to aid in the further education of the construction industry.

Both mentioned simulations offer the possibility to increase the level of difficulty and include additional assignments based on the elucidated competency models in order to be able to adjust the configuration during gameplay. These changes of the configuration are applicable both in relation to the target group as well as to the learning progress during the simulation.

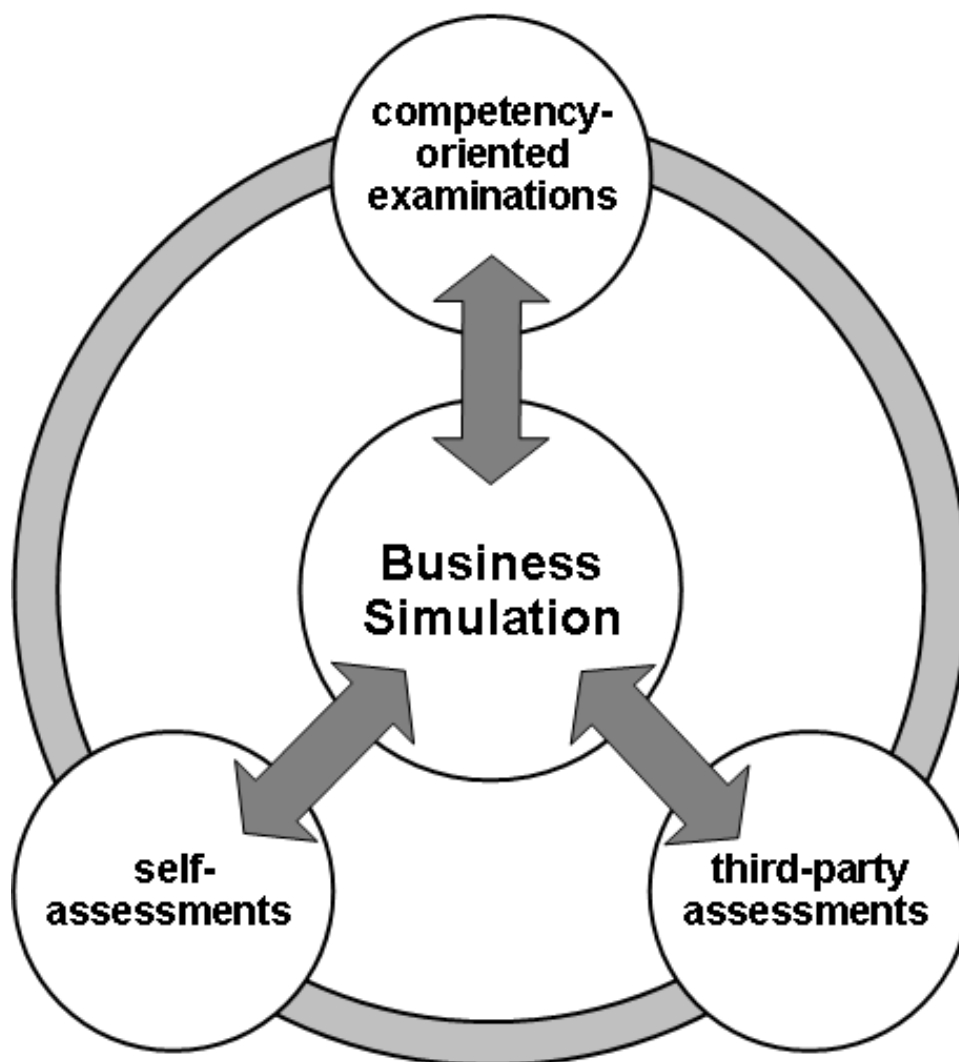
During previously conducted business simulation events, significant increases of competencies could be identified with the help of self-evaluations before and after the simulation. These increases, found especially in the areas of construction management and problem-solving skills, can be confirmed with the analyses of the participants ac-

tivities and the corporation data (part of the third-party assessment). The first results show that a competency-oriented conceptualization of business simulations offers an additional benefit indeed.

CONCLUSION

The presented development framework for the conceptualization of a COBS is a tool for designers of business simulations that allows the easy integration of occupationally demanded competency standards into business simulation models. Beyond this, the framework also offers the extraordinary advantage of modular and expandable business simulations, which are suitable for a significant number of user groups. Consequently, business simulation designers will be in the position to address one or more competencies with one model only.

Exhibit 7
3-D-model for competency assessment in business simulations



The integrated approach for the conceptualization of competency models offers a structured and scientifically-based method for the development of competency models, which can be practically employed both on a large scale or in one corporation only.

In contrast to previous development frameworks, a more differentiated inspection of the occupationally relevant competencies may seem more elaborate and time-consuming, but results in numerous possibilities to enhance the quality – and thereby the success – of the business simulation significantly. It is possible, for example, to influence the motivation of the participants with the help of domain-specific competency-oriented business simulation models, as the business simulation will not be taken and adapted from another domain, but originate from its own context. Furthermore, the assessment of competencies can be integrated into the business simulation on basis of the competency models. One successful example is the prototypical development of a business simulation on the basis of the development framework for the conceptualization of COBS.

In this context it must not be forgotten that the recording of competencies is always a multidimensional observation. Therefore, the suggested elements for the recording of competencies in business simulations present a reference point and invite further research to be conducted in this direction.

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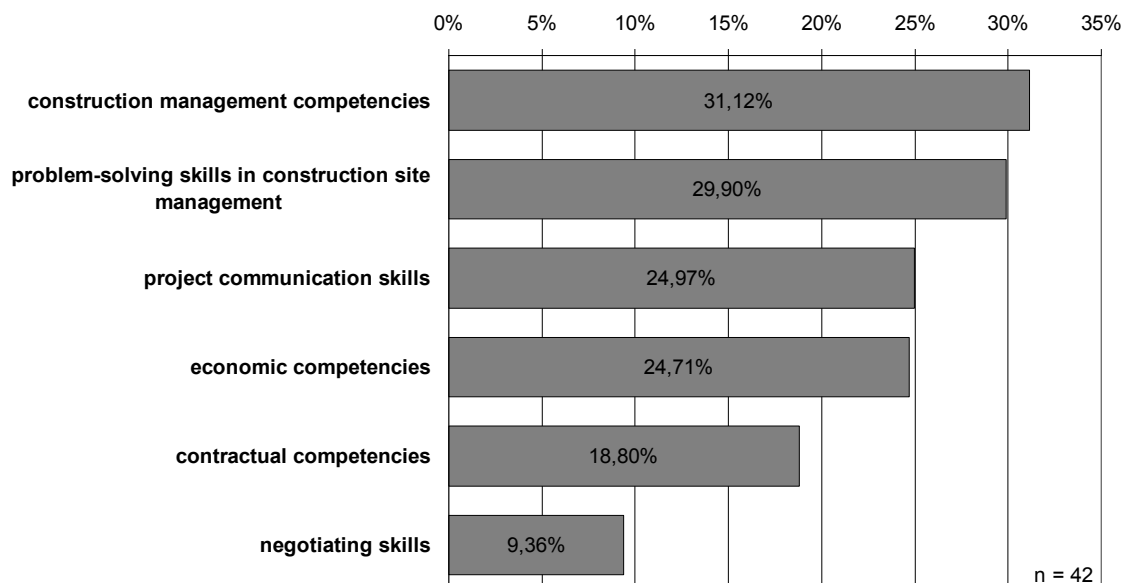
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Exhibit 8
Growth of competency



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