

# D2.1 Analysis report on competence services

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## **D2.1 Analysis Report on Competence Services**

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## 1 Introduction

This deliverable deals with competence and accessibility services for the OpenScout project. The analysis report should serve as a foundation for future discussions about implementations of services, that allow learners to find learning resources in the OpenScout environment based on competence related information and services that support special needs of users of the OpenScout environment. Due to the results of an initial questionnaire and several discussions within the consortium this analysis report also includes a theoretical chapter about competence based education in general and the scientific discussion about competences in the field of business and management education.

In the first chapter of the deliverable the theoretical background of competence based education in general is discussed. The reasons to use competences and competence descriptions in education are summarized and the history and dispute about the concept of competence and competency is summarized. Shortcomings of existing competence frameworks are reviewed and some standards for competences are discussed. Competences as problem solving skills is discussed and the need for a unified competence framework is formulated. Results of survey about views on competences in the OpenScout consortium are presented and discussed in the last part of the theoretical discussion.

In chapter three the scientific discussion of the concept of competences in the field of business and management education is reviewed on the basis of selected publication from the last 10 years. In chapter four several competence services from other (European) projects and commercial systems are analyzed and an initial implementation proposal for the OpenScout environment is discussed.

Chapter five deals with existing specifications and standards for competence descriptions and competence based education.

Chapter six deals with accessibility services and stakeholder groups with special needs.

In chapter seven the main findings are summarized and conclusions for the future work within the project are drawn.

## 2 Competence based education: rationale and state of the art

The OpenScout project strives for better facilitating continuous learning (i.e. lifelong learning) through accelerating the use, improvement and distribution of open educational resources in the field of management education and training, as well as exploiting the opportunities of web 2.0 communities to support such learning. For this purpose the project will implement a skill- and –competence based search functionality for open educational resources in the field of business and management education.

In the rapidly changing world where information and education takes the first place in order to advance the social, cultural and living standard of all citizens, lifelong learning is the key point. The Commission of the European Communities and the Member States has defined lifelong learning with the European Employment Strategy, as all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills, and competence

(Commission of European Communities, 2000). Lifelong learning is no longer just one aspect of education and training; it must become the guiding principle for provision and participation across the full continuum of learning contexts. The concept of lifelong learning refers to the activities people perform throughout their life to improve their knowledge, skills and competence in a particular field given some personal, societal or employment related motives. Such learning contexts can be either formal, non-formal or informal.

Taken the paradigm of lifelong learning, competence-based learning addresses directly the need of individuals to upgrade their knowledge, skills and competence in a discipline throughout their lives as required for a lifelong competence development.

Competence-based approaches in the field of formal and/or non-formal education are becoming more common and appear to offer the opportunity to develop flexible programmes that meet the needs of learners, trainers and potential employers. With the implementation of competence based education more tailored and personalized approaches are possible that allow very specific training and learning activities without the need to follow complete education programmes. In order to support and use effectively this link between competence and education, there is also the need to provide reusable definitions of competences, across the different systems.

Competences nowadays play a role in academic education in various places around the world, both in an inside-out and outside-in mode. Inside-out use of competence instruments takes place in the accountability and accreditation processes. Outside-in approaches are being followed when aligning learning plans and trajectories of the student, regarding learning objectives, course content, educational organisation and assessment of student achievement, to outcomes required at the labour market.

As such approaches are not limited to the domain of management, we will describe competence based approaches in general before tuning into the current practices in the domain of business and management education as well as position the concept 'skills' within such approaches. Although there is a lot of confusion about competences (Westera, 2001), there seems to be general agreement that competence-based learning will be needed to improve labour mobility (within jobs, between jobs, within countries, between countries). Evidently, such flexibility also serves managers. Finally, it is acknowledged that current offerings for management education often do not comply with the paradigm of competence-based learning. Exactly for this reason, services developed in the OpenScout project for improving already existing educational resources towards competence-based education are of paramount importance. Furthermore, users of the OpenScout infrastructure might also need some support in getting to know what kind of competence-development they should aim for, as this seems not obvious for most of them (Viitala, 2005).

## **2.1 Competence/competency: confusion, agreement & desires**

The concept of competence is strongly associated with post-secondary education (Mulder, Gulikers, Biemans, & Wesselink, 2009; Stoof, Martens, & van Merriënboer, 2007; Westera, 2001) as well as professional development (e.g. Eraut, 1994). Many work organisations and educational institutes use the concept of 'competence' for describing performance ability for particular occupations or jobs or for describing educational objectives. For instance, in the



Netherlands, the competence requirements of good quality teachers are classified in seven competences: interpersonal competence, pedagogical competence, subject knowledge & methodological competence, organizational competence, competence for collaboration with colleagues, competence for collaboration with the working environment, and competence for reflection and development (SBL, 2004).

In the last decades, competence-based education – mostly formal - has moved away from improving behaviour-oriented skills towards a more integrated approach of developing interrelated clusters of knowledge, skills and attitudes that are relevant for the introduction into a field of study, employment and career development. Various EU member states have their national competence-based qualification frameworks. Like in the US, there is also much attention in the EU for competence development for employee management in public and private organisations. Recent EU policy developments have underlined the importance of skills regimes and the impact that national qualification frameworks have on labour mobility, which is at the heart of the single European labour market and critical for attaining the Lisbon objectives (Winterton, 2009).

Starting with a historical overview of the concepts of ‘competence’ and ‘competency’ (2.2) we propose a working definition for those two concepts (2.3) before digging into the criticism on competence-approaches (2.4). After identifying shortcomings of current Competence frameworks (2.5) we will underpin the need for an univocal competence framework (2.6). Finally, competences as problem solving skills are discussed (2.7) and a brief touch upon standardization and competence frameworks (2.8) boils down into the practical recommendations of all aforementioned issues for OpenScouts’ competence frameworks for management education (2.9). Finally results of an internal questionnaire are presented.

## 2.2 History of competence-competency

The concept of competence can have quite different connotations and definitions (Cheetham & Chivers, 2005; Mulder, Gulikers, Biemans, & Wesselink, 2009; Stoof, Martens, & van Merrienboer, 2007; Westera, 2001; Winterton, 2009). There are two tensions that are apparent in virtually all countries: between formal education and workplace learning; and between national approaches and global constructs of competence. It should also be noted that there is a distinction in the literature between the term ‘competence’ and the term ‘competency’ (De Coi et al., 2007; Eraut, 1994). According to Winterton (2009), most often competency (competencies in plural) is used to denote *characteristics of an individual that are associated with superior performance in a job*, in a sense in which McClelland (1973) used the term, and in which it was subsequently used by other authors (Boyatzis, 1982; Hay Group et al., 1996; Klemp and Spencer, 1982; Spencer et al., 1997; Spencer and Spencer, 1993). Similarly competence (competences in plural) is most often used to *describe what a person needs to know and be able to do in order to undertake the tasks associated with a particular occupation*.

In an attempt to simplify this situation, some authors have associated competency with the American approach and described this as an “input” in terms of attributes an individual must possess in order to perform competently, distinguishing this from competence associated with the British approach as an “output” reflecting the demands of a job. Moreover, notwithstanding apparent differences in American and British usage, the terms competence and competency are frequently conflated and used interchangeably (e.g. Boam and Sparrow,

1992; Brown, 1994; Dale and Iles, 1992; Mitrani et al., 1992; Smith, 1993). This has even become more complicated as American practitioners since the 1990s also developed more comprehensive approaches to competence that included job activities as well as individual characteristics. The O\*NET database, the most widely-used source of occupational information in the US, similarly includes in its so-called content model not only occupational features (job-oriented descriptors), but also person characteristics (worker-oriented descriptors). According to Winterton, the O\*NET approach continues to exert major influence on approaches to competence around the world and needs to be taken into account in developing European competence frameworks (p.685, Winterton; 2009). Within the worker-oriented approaches competence is primarily seen as constituted by attributes possessed by workers, typically represented as knowledge, skills, abilities (KSAs) and personal traits required for effective work performance. In the work-oriented approach, competence is also regarded as a specific set of attributes. However, advocates of this approach take the work as the point of departure. By doing so, they are able to generate more concrete and detailed descriptions of what constitutes competence and, thus largely overcome the problem of generating descriptions of competence that are too general.

In sum: Competency is given a generic or holistic meaning and refers to a person's overall capacity whereas competence refers to specific capabilities (knowledge, skill, attitude, ability).

Cheetham and Chivers (2005) offer the following rather general definition of competence:

“Effective overall performance within an occupation, which may range from the basic level of proficiency through the highest levels of excellence.”

Please note that proficiency levels are included in the definition to allow for a more differentiated perspective towards acquired competence than the ‘yes/no’ dichotomy from the British tradition.

Stoof et al. (2002), on the other hand, postulate that the meaning of the concept of competence is very unclear. They give a short overview of recent history of ‘competence’ and provide examples of current definitions, such as “a cluster of knowledge, skills and attitudes” or “the ability to handle a situation”. Stoof and colleagues conclude that it is useless to look for the true definition of competence and argue that everyone may construct their own competence definition instead, as long as it is viable. Viability of a competence definition increases when it is clear what the representations and opinions about competences are of the people who construct the competence definition. In addition, the goal of the competence definition should be made clear in order to construct a suitable and useful definition. Finally, it should be clear who the intended users of the definition are (Stoof et al., 2002).

However, knowing the users of a definition does not exclude the need for an univocal conceptual competence framework for such user group (see section 2.6).

In the following section, we propose a first working definition for competence and competency, taking for granted that the discussion about these concepts has not ceased and that this definition will be needed for and by stakeholders in the field of management education.

### 2.3 Working definition for competence-competency

Although we don't dispute Winterton's excellent historical overview of the conceptual development for the terms competence and competency, we propose to comply with the conceptual definitions for those terms that were taken in several European projects (e.g. TenCompetence & MACE)

- *Competence:*

Effective performance in a domain at different levels of proficiency.

Competences can be classified into: (1) cognitive competence (knowledge), (2) functional competence (skills or competencies), (3) personal competence (e.g., intelligence, flexibility), (4) ethical competence (attitudes), and (5) trans-/metacompetences (e.g. communication skills)

- *Competency:*

Any form of skill that can be described in a context of learning, education or training.

It is important here that this working definition of competence includes also skills similarly like in the European Qualification Framework (EQF).

### 2.4 Criticism on competence-approaches- too narrow & lack of context

Competence-based approaches have been widely criticised for being reductionist: that is to say for attempting to reduce the complexity of work activities in a series of atomised tasks, in the execution of which an individual needs to show proficiency. This reflects the so-called lowest denominator approach (Winterton, 2009) which is associated with narrow job tasks and "monkey-see, monkey-do" functional competencies (skills, sic!) based on standard operating procedures, whereas the highest common factor approach emphasises a more holistic view of competences for jobs that entail more autonomy and the use of self judgement.

Indeed, within OpenScout we hint at the highest common factor approach, also acknowledging that the social and cultural context in which the learning will take place should be taken into account. The importance of the work context is indicated by several authors (Attewell, 1990; Canning, 1990; Fischer et al., 1993; Hodkinson, 1992; Norris, 1991; Sandberg, 1994; Sandberg 2000, Tessmer & Richey, 1997). Indeed, abstract, overly narrow and simplified descriptions of competence inevitably fail adequately to reflect the complexity of competence in work performance. Alternative interpretative approaches, derived from phenomenology, view competence as governed by the context in which it is applied. An important representative of this approach is Sandberg. Sandberg formulates as basic criticism on the work-oriented approach that this leads towards a list of work activities which does not sufficiently indicate the attributes required to accomplish those activities efficiently. Even the multi-method approach (combining worker-oriented and work-oriented approach) also regards competence as an attribute-based phenomenon. More specifically, within these rationalistic approaches, human competence is described as constituted by a specific set of

attributes what workers use to accomplish their work. Hence, those who perform their particular work more competently than others are regarded as possessing a superior set of attributes. Furthermore, attributes are primarily seen as context-independent. That is, a specific attribute is regarded as having a fixed meaning in itself; it is viewed as independent of context and thus as able to be adopted in a range of work activities. Sandberg (2000) disagrees with this rationalistic operationalization of attributes for competence as their quantitative measures often result in abstract and overly narrow and simplified descriptions that may not adequately represent the complexity of competence in work performance. Such descriptions demonstrate neither whether the workers use these attributes, nor *how* they use them in accomplishing their work. By Sandberg and many others, competence is seen as constituted by the meaning work takes on for the worker in his or her experience of it. A consequence of this is that attributes used in accomplishing work are not primarily context-free but are situational, or context-dependent. More specifically, the attributes used in particular work acquire their context-dependence through the workers' way of experiencing that work. Peoples' ways of experiencing work are more fundamental to their competence than the attributes themselves. Indeed, given the importance of experiential learning in knowledge transfer, tacit knowledge and skills constitute a major reason for adopting a competence-based approach (Collardyn and Bjørnåvold, 2004).

To conclude, one should prevent being too narrow or too general in competence descriptions and one should take context into account when designing and developing competence-based education. However, it is recommended to exclude 'context' from competence descriptions, but link context to competence descriptions (De Coi et al., 2006) in order to maximize reuse of standardized competence frameworks (see section 2.7).

## 2.5 Shortcomings of current Competence frameworks

Winterton postulates that “despite the central role of competence in policy initiatives, conceptual approaches to competence vary not only between but also within different member states. This diversity embodies not only language issues but also fundamental cultural differences in approaches to skill formation” (p 681, Winterton; 2009).

In 2004, CEDEFOP (European Centre for the Development of Vocational Training) commissioned three issues: (1) reference levels for the qualification (the vertical dimension), (2) a typology of knowledge, skills and competence (the horizontal dimension); and (3) a system for credit transfer. These lied at the basis of the development of the European Qualifications Framework for Lifelong Learning (EQF) which has subsequently been done within CEDEFOP.

The European Qualification Framework for Lifelong Learning differentiates between knowledge, skills and competences (European Parliament Council, 2008):

- Knowledge: In the context of EQF, knowledge is described as theoretical and/or factual.
- Skills: In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments).

- **Competence:** In the context of EQF, competence is described in terms of responsibility and autonomy.

These 3 perspectives are combined in the EQF with 8 proficiency levels which range from beginner to expert level.

Although CEDEFOP (Le-Deist and Winterton, 2005) proposed a multi-dimensional holistic model of competence for ECVET taking all previous issues into account, based on earlier work of Cheetham and Chivers and considering the analytical coherence and simplicity of the French model, as well as the holistic nature of the occupationally-grounded German approach, confusion continued. For Markowitsch and Loumi-Messerer (2008) this confusion is explained by the fact that the emerging EQF can only be understood by distinguishing three implicit hierarchies: an educational hierarchy; an occupational hierarchy; and a skills (or competence) hierarchy. Through the lens of each hierarchy, the EQF takes a different aspect and the three exhibit considerable concordance with the three analytically distinct dimensions of knowledge, skills and competence. In the EQF a competence “means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development[...], competence is described in terms of responsibility and autonomy” (European Parliament Council, 2008).

Although the EQF is formally adopted by the European Parliament on April 23, 2008, this is no more than a facilitating framework or meta-framework without a clearly defined conceptual framework for competence. It is acknowledged that one should not impose a uniform approach, but have a sufficiently rigorous conceptual framework within which the different national frameworks can be comfortably situated. The EUCLID (European Competence: Learning, Innovation, Development) network plays a key role in arriving at such a conceptual framework on an European level.

## **2.6 Need for univocal conceptual competence framework**

Despite initiatives like the EQF there is unfortunately still no consensus for adopting a common competence model and policy discussions continue to reveal confusion.

However such a model is clearly an essential prerequisite to remove barriers to *labour mobility*. Furthermore, idiosyncratic definitions of competence are insufficient for enabling *system-based reasoning*, as for example personal recommendations for selecting adequate Competence Development Programs (CDPs). Such recommendations could be based on learners’ needs (i.e., their competence goals), their preferences (e.g., preferred study mode, preferred learning style, preferred delivery mode, preferred task characteristics), and CDP-related information. Thus, for personal recommendations, retrieval, exchange and reuse of learning units for international educational institutes is needed. A learning unit refers to each unit where learning can take place, and it can be large or small. Examples are a course, a module, and a CDP. For an effective exchange of learning units, educational institutes need to use a common format of competence description. In the same vein, a common format of competence description is needed when educational designers aim to design formal CDPs that could be used and reused by international educational institutes.

These designers of CDPs, as well as the users of the programs, need to know what learners should be able to do when learners have completed a CDP, that is, which competences should be acquired in the CDP. Thus, designers should make sure that they explicitly describe the

necessary elements of the competence aimed at in the designed CDPs. Moreover, learners want to know what competences are needed for a particular job (the so-called job profile or required competence profile), what competences they already have acquired (their acquired competence profile, e.g., accreditation of prior learning), what competences still have to be acquired (their competence gap profile), and where to find existing CDPs to reduce the gap between the acquired competence profile and job profile. For the goals of learners, educational designers, and educational institutes, a sound competence description or model that specifies all relevant ingredients is needed (Prins et al., 2008).

In the same vein, within OpenScout some system-based reasoning will be needed to select adequate open educational resources in the area of management education (which are in fact similar to concept of open learning units). This not only holds true for predesigned educational offerings (formal), but also for educational offerings that emerge bottom up through using Web 2.0 services.

## 2.7 Competence as problem solving skill

The EQF definition described above can also be seen as a skill or ability to solve problems. Pawlowski et al. (2010) define competences as “[...] a collection of skills, abilities, and attitudes to solve a problem in a given context. [...] Generally, we need to describe

- **Competences** containing skills, abilities and attitudes at a certain level of complexity.
- **Problems** denoting situation in which competencies are applied and
- **Context** in which the problem solving is performed.”

This view can be supported from the first meetings of the OpenScout consortium in which the following issues were identified:

- Competences are often not explicit or understandable for users – not all learners think in terms of competences or proficiency levels (as also many curricula do not yet state clear learning outcomes and competencies).
- Competence based search is not familiar to users: Most users using search engines or repositories are used to search for contents, but not for competencies. There is a lack of understanding how to describe a competency in a google-alike search field.
- Some stakeholders such as SMEs use learning and training activities for a very pragmatic reason and short to medium time horizon: in order to solve problems!

Based on those observations and experiences, an alternative approach is to relate competencies, context and, in particular problems – users might be able to describe the problems to be solved better than underlying / necessary competences. Based on this assumption, Pawlowski et al. (2010) have described the following description of competences in relation to problems:

| Concept      | Description   | Sample Attributes   |
|--------------|---|---|
| Competencies | Description of competencies /& learning outcomes to perform a | Type of competencies, description, subject, level (proficiency level from |



|         |   |   |
|---------|---|---|
|         | task  | EQF), complexity  |
| Problem | Description of a problem in which a competency should be applied                      | Situation description, actors, type of tasks, expected outcomes   |
| Context | Description of the environment and influence factors in which a competency is applied | Descriptions of cultural (e.g., country, country characteristics), institutional (e.g., Higher Education, enterprise), economic (e.g., time & budget constraints), location (geographic location, environment), technical (technical requirements, systems) context |

Based on this description format, competences can be related to problem, enabling for example a combination of competence- and problem-based search.

## 2.8 Standardization and competence frameworks

Some valuable initiatives on standardization of modelling *competencies* exist, such as those of IMS RDCEO (2002), IEEE-RCD (2006), and HR-XML (2006). The main purpose of these initiatives is to enable interoperability among learning systems that deal with competence information by providing a means for them to refer to common definitions with common meanings (see also chapter 5 of this deliverable for a more detailed overview). Central repositories are build that define competencies and these competence definitions can be referenced by external data structures. All three definitions include titles and descriptions that need to be interpreted by human beings. Furthermore, the objective of these descriptions is to represent formally the key characteristics of a competence, independently of its use in any particular context or environment. Thus, these approaches to modelling competencies exclude ‘context’ from their definitions, because when information concerning context becomes part of the competence definition, its reusability is drastically reduced (De Coi et al., 2006). On the other hand, when selecting an adequate CDP, the context to which a CDP refers to may be very important to the learner. For instance, a professional teacher who wants to develop her teaching competences may particularly look for urban, cross-cultural work situations.

Thus, for adequate recommendations, Personal Recommendation Systems (PRSs) should be able to retrieve and exchange information concerning context. Several authors (e.g., Sandberg, 2000) argue that competences used in accomplishing work are not primarily context-free but are situational, or context dependent. Also Koper (2006), in his definition of competence, links competence to context or situations, by him labelled as ‘ecological niche’ (an occupation, a hobby, a market, a sport, etc.). As stated by Muller et al. (2009): “Competencies only get meaning in a specific context and when they are sufficiently specified”. We conclude that context is an important element related to competence and that context should be modelled. In order to maximize reuse, competence and context should be considered as different dimensions that should be modelled separately (De Coi et al., 2006). It should also be acknowledged that HR-XML and IMS RDCEO also have (severe)

shortcomings in the area of assessment. This is important as assessment is seen as a paramount and critical issue in competence based education.

## 2.9 OpenScout: competence frameworks for management education

While formulating competencies, over-generalization and over-specialisation should be avoided (Muller et al, 2009). In our opinion, this ‘balancing act’ is also needed within the domain of business and management education. Too much emphasis on specialization could result in too much behaviour oriented skills training (too narrow scoped, job related instead of occupation related), whereas too much emphasis on generalization could result in too isolated skills training (non-meaningful). Even more important, a too narrowed focus on skills should also be prevented, as competent professionals need to develop *interrelated* clusters of knowledge, skills and attitudes. Indeed, although the concepts ‘skill’ and ‘competency’ are interchangeable in some theoretical discussions, the concept competence in which skill is one of the five possible categories (skill = functional competence) seems to deserve its own right as it reflects a specific, general preferred view towards training and education for lifelong learning. Furthermore, it is important to take into account that for example problem solving abilities are highly dependent on domain-specific knowledge rather than on general problem solving skills (“case specificity”, Elstein et al., 1978). Wimmers et al. (2007) demonstrate that “case specificity” is not solely a result of content knowledge but also of the level of experience and the level of case difficulty. In their research it is shown that a combination of specific preclinical knowledge and general ability is required for clinical problem solving. The level of performance is not entirely dependent on content knowledge, but is highly dependent on level of experience and level of case difficulty. A general problem solving ability will therefore also be dependent on level of experience and level of case difficulty. A general ability has a strong knowledge requirement: one cannot be developed without the other. This study seems to support the notion that specific knowledge and general abilities are both necessary conditions for clinical problem solving.

Finally, it is evident that standardized framework is needed to allow system-based reasoning. Although it is irrelevant from a technical point of view whether this framework takes skills or competences as departing point, it still matters from a conceptual – ontological - point of view.

The practical use of these concepts (competence, skills) for individuals wanting to improve their knowledge, skills, and competence could be limited when searching for adequate educational offerings. Some individuals might better benefit from being able to specify their “learning goals” in terms of problems they want to solve as they occur such problems during their work/live. In other words, such individuals don’t specify their learning goals in the sense of “acquiring some specific competence”. Viitala (2005) suggest to adopt competence models as a starting point when formulating individual and organization specific development needs. This recommendation stems from the outcome of Viitala’s research that managers are not consciousness about their development needs and often have too narrowly understood/beliefs and content-specific interpretation of the concept of competence: “Managers in organizations should first be educated in management competencies, management development and learning issues, before they can become thoroughly conscious about their own competencies



and development needs.” (p. 448, Viitala, 2005). Technically spoken, problems might be related to cases, which in their turn could be related to competences.

As a result, it seems relevant to support users in their articulation of their desired competences or to develop alternative representations of competence related information. One interesting alternative besides the direct formulation of competences is the modelling of problems in the domain. Each stakeholder group of the project could formulate and update a list of urgent problems they are facing in their daily practices. We expect that problems are much easier to formulate for stakeholders than competences.

Due to the special role of the “case study” format in business and management education it will be interesting to see if cases work as complex problem descriptions for the stakeholders of the project.

## 2.10 Competence survey

To capture the theoretical foundations of consortium members of the OpenScout project about competences and competence based education WP2 has organized a questionnaire in month 4 of the project (n=15). In this questionnaire project members have been asked about the use of competence models and the European Qualification Framework (EQF) in their institutions.

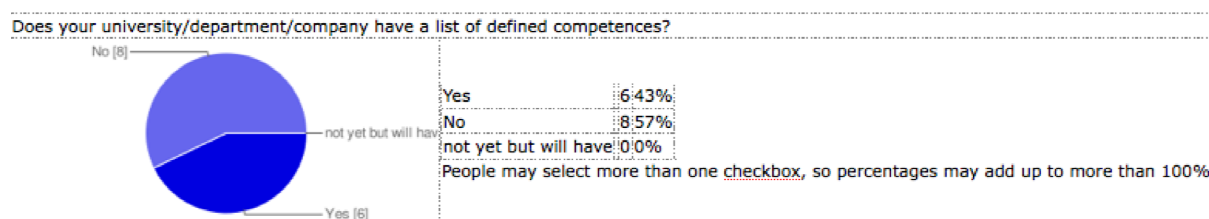


Figure 1: Competence models in the OpenScout consortium

In this survey it became clear that the majority of institutions within the consortium does not use competence models. The institutions that use competences or competence models use them to define learning objectives or target competences of courses and learning resources (see fig. 2 )

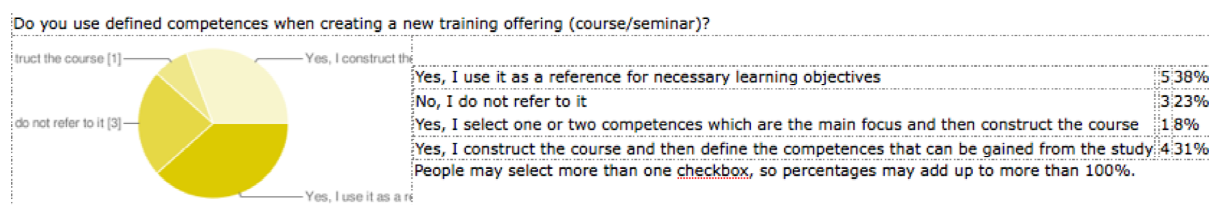


Figure 2: Competences and training material

The following use cases have been selected as most appropriate for the competence services. Users of the OpenScout environment should be able to explore learning content by target

competences and explore learning content that is required to reach a specific competence development goal. As third option the “peer recommendation” is mentioned (see fig. 3).

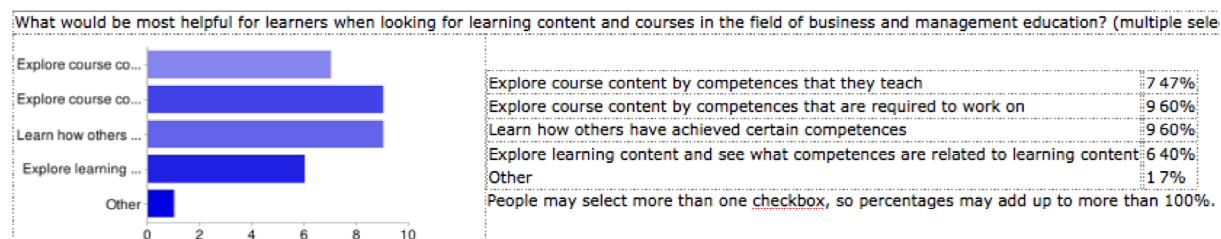


Figure 3: Use cases for competence services

In the next chapter we will discuss several selected models for competences in the field of business and management education. The full questionnaire results are available in the appendix.

### 3 Competence models and frameworks for management education

Evidently, in a continuously changing society it has become impossible to manage and conduct business without sustained personal development. For example, managers of bigger organizations face the globalization of business, rapid technological change, continual reorganizing and competence-based competitions. Indeed, such developments challenge the skills, competencies and capabilities of managers in organizations. Although SME’s managers might not be confronted with the same extent to such changes, they have similar challenges in keeping their personal development up to date. In the light of such changes, it is of paramount importance that managers’ competencies also need to be renewed on a regular basis. In practice, the responsibility for management development is often left to managers themselves. It therefore depends on their own perceptions and motivation as to which areas they intentionally seek to develop or whether they participate in various development processes (Viitala, 2005).

The expressed intent for developing frameworks of competence is usually to help individuals and/or organisations improve their performance (Boyatzis, 1982; Goleman et al., 2002; Hay Group, 2003; Conger and Ready, 2004). By making explicit the competences/skills that are required, or the outcomes that should be achieved, frameworks of competences have the opportunity to provide valuable support for all who are involved in recruitment, training, appraisal, promotion and self-development. Such frameworks can also facilitate greater flexibility in working practices and support systems of more equitable pay and remuneration. The most common use of such frameworks by organisations is for performance management/appraisal, followed by recruitment, followed by training and development (Rankin, 2008). Finally, such competence frameworks lie at the basis of technological frameworks (like OpenScout) proliferating and provisioning life long learning services. Such technological frameworks require some system based reasoning based on competence frameworks. Such frameworks might, besides from competences, also incorporate or refer to

cases, problems, and content. As has been argued before (2.4), competences are preferably linked with context.

Competence frameworks for management education can guide the development of educational offerings and can make these offerings better accessible. Such frameworks are developed by various stakeholders in the domain and need regular maintenance to keep them up to date. Various techniques are informing their development, such as domain analysis, job analysis, occupation analysis, observations at work or in simulations, analysing critical incidents during business development (e.g., Man, Lau, & Chan, 2008). Furthermore managers are often questioned to induce and elicit their beliefs about competencies and effective role performance.

In spite of the variances in priorities and emphasis on different competences in different management contexts, it can be assumed that some degree of generalizability exists. Indeed, it is argued that many of the competences managers need are transferable and generic in nature, which subsequently form the basis for all organized management development (Mumford et al., 2000).

Educational offerings in management education should not be restricted to tangible (electronic) artefacts (whether or not produced in social networks), but should be extended with opportunities to get in (virtual) touch with representatives of aforementioned social networks. Indeed, skills and knowledge of the SME's managers/owners are largely acquired through their social relationship within and outside their organizations, which is extended beyond the SME and towards a broader spectrum including suppliers, customers, bank managers, previous companies, university education, professional membership, parents, and mentors (Deakins and Freel, 1998; Down, 1999; Sullivan, 2000).

Albanese (1989) concludes from extended research amongst different stakeholders (experts, teachers, trainers, students) in the domain of management and CBME (Competency Based Management Education) in the US that:

- It is possible to identify a set of competencies and it is desirable to do so
- Managers and potential managers can be trained to acquire and perfect managerial competencies (although there is some concern where the training should occur (on job sites or in classroom), who should do it (industry trainers or college professors), who should receive it (employees, undergraduates or graduate students) and which competencies are most likely to benefit from training.
- Competent managers make a difference in the level of organisational performance.

This research by Albanese also clarified that no one advocates eliminating cognitive learning, but there was and is a call for more balance between cognitive learning and skill training. CBME allows for the *measurement* of identifiable competencies. This offers a way a college, university, training institute can demonstrate its accountability. But more than that, it is a reflection of faculty and student receptiveness to the idea that it is not enough to know *about* management but it is also important to devote time to learning *how* to manage.

Albanese (1989) mentions several sets of managerial competencies that are currently discussed. The developers of these competency sets (i.e., competence frameworks) do not claim their competencies are the "final word" on the skills needed for managerial

effectiveness. They contend that no single set of competencies can fully capture the mystery of the managerial role. And, of course, there are many job-specific skills that influence effectiveness in particular managerial jobs. As was already indicated in the previous chapter, on top of this context should be taken into consideration when developing CBME.

In this chapter, various selected important competence frameworks for management education will be globally described. Please note that this is not a fully developed literature review but a discussion of several publications in the last 10 years that could be identified via a literature search in Google Scholar, Ebscohost and other databases. Although different, such frameworks could be used as a starting point for developing an univocal framework for management education throughout Europe or for identification of mechanisms (i.e., mappings) that could be exploited when interpreting and exchanging educational offerings between various frameworks for management education throughout Europe. Indeed, this is a huge challenge, but at the same time there is an urgent need for system based-reasoning and optimizing labour mobility in the domain of management. An ‘observatory approach’ (see 4.2) might be a suitable vehicle for reaching agreement with respect to such competency frameworks. Nonetheless, the starting point for implementing a first version of the competence services will take one of the models presented here as a basis.

### **3.1 Pyramid Competence framework by Viitala**

According to Viitala, competence and skills are used interchangeably in the relevant literature. Furthermore, there exists considerable doubt whether competencies can be extensively categorized and labelled as they often overlap, and thus commonly suffer from ambiguity (Viitala, 2005).

Six clusters of managerial competencies could be established by Viitala when integrating elements from different competency models introduced in the literature (Klagge, 1998; Mumford et al., 2000; Katz, 1974; Pavett and Lau, 1983; Hogan & Warrenfeltz, 2003; Conger, 2001; Carrington, 1994).

This integration ended up in a competence pyramid. This pyramid consists of competencies, starting from tip (most visible) to base (least visible) (see fig. 4):

- Technical competencies
- Business competencies
- Knowledge management competencies
- Leadership competencies
- Social competencies
- Intrapersonal competencies

(more detailed descriptions: see Viitala, 2005: pp 440-441)



Figure 4: Competence pyramid

The competencies can be seen as a continuum from personal related competencies to work-role related competencies. The closer to the top a competency is, the more it is connected to education and specific work experience. The closer to the bottom the competency is, the more it is connected to a manager's personal traits and personal growth as a human being. In this sense, whilst the upper level competencies are easier to develop, those on the bottom are more difficult.

### 3.2 AACSB model

The AACSB (American Assembly of Collegiate Schools of Business) model relates educational outcomes (competences) to content, skills and personal characteristics (see Figure 5).

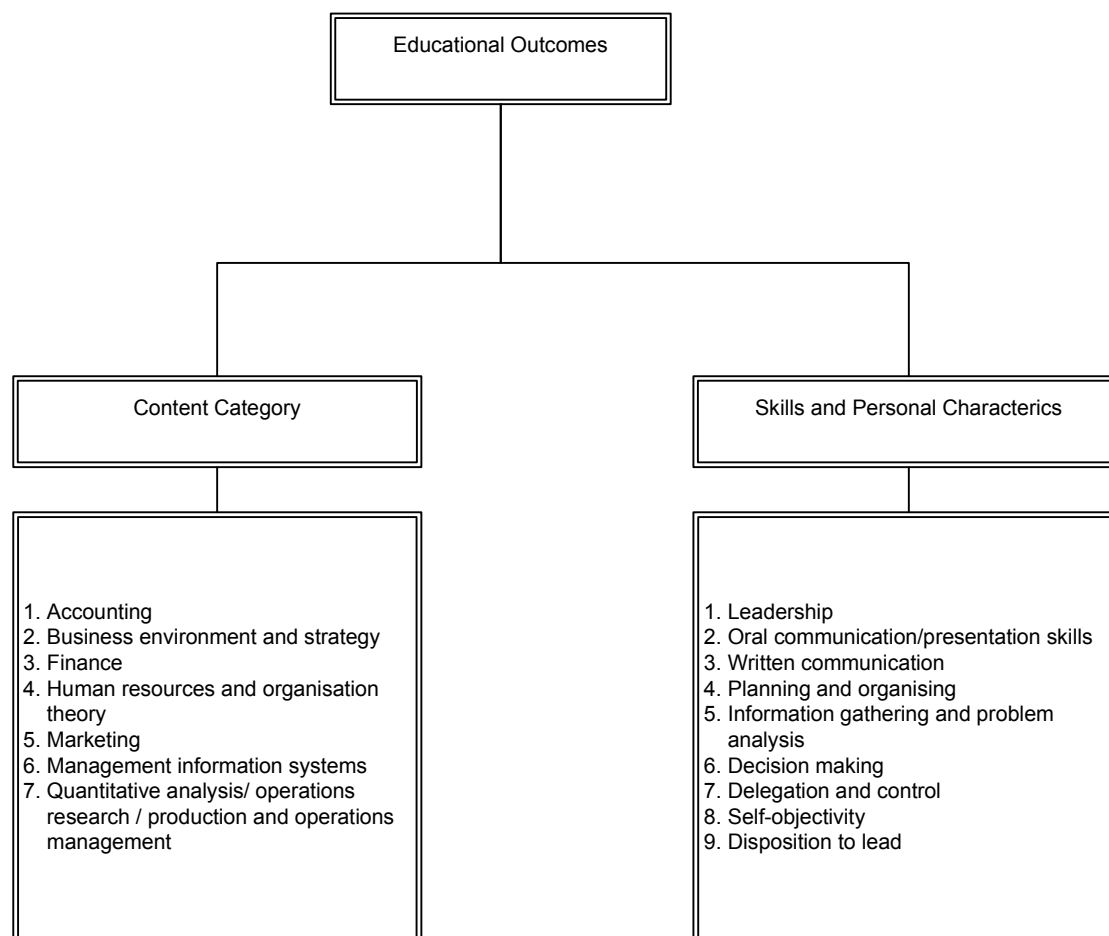


Figure 5: AACSB model for management competences (taken from Albanese, 1989)

This separation of content knowledge and skills and personal characteristics is more or less the opposite of integrated contextualized competence models as proposed by authors like Eraut (1994).

### 3.3 AMA/McBer

AMA/McBer (American Management Association) views the set of managerial competencies as a system in which single parts are viewed in relation to the other parts (Albanese, 1989). Similarly, the AMA/McBer model reflects the view that a manager's competence can be understood only if each of the competencies is examined in the context of the entire set. For this purpose the model proposes five clusters of competencies:

- a. Goal and Action Management Cluster
  - Efficiency Orientation, Proactivity, Diagnostic Use of Concepts, Concern with Impact

- b. Leadership Cluster
  - Self-confidence, use of oral presentations, logical thought, conceptualisation
- c. Human Resource Management Cluster
  - use of socialised power, positive reward, managing group process, accurate self-assessment
- d. Directing Subordinates Cluster
  - developing others, use of unilateral power, spontaneity
- e. Focus on Others Cluster
  - self control, perceptual objectivity, stamina and adaptability, concern with close relationships

### 3.4 The Whetten and Cameron Learning Model

Whetten and Cameron (US) place their approach to Competency Based Management Education (CBME) in the context of three pedagogical traditions that dominate management education: principles of management (i.e. focus on knowledge acquisition, little to no skills training), behavioural science (assumes that rigorous thinking about behavioural issues and experience in analysing and conducting behavioural research will help make students better managers, again: little emphasis on skills training) and experiential learning (e.g., Kolb, 1984), with focus on developing self awareness and behavioural skills (Whetten & Cameron, 1984). However, such exercises and discussions often took place in a theoretical vacuum. Whetten and Cameron recognize the value of all three pedagogical traditions and *integrate* them into their skill training approach (five step learning approach: skill pre-assessment, skill learning, skill analysis, skill practice, skill application). This learning approach is followed for each of their set of nine skills: (1) developing self-awareness, (2) managing personal stress, (3) solving problems creatively, (4) establishing supportive communication, (5) gaining power and influence, (6) improving employee performance through motivation, (7) delegating and decision making, (8) managing conflict, and (9) conducting effective group meetings.



### 3.5 Ashridge Business School

The Ashridge business school is one of the few business schools that publish their competence model. In a management self assessment questionnaire they present the following competences:

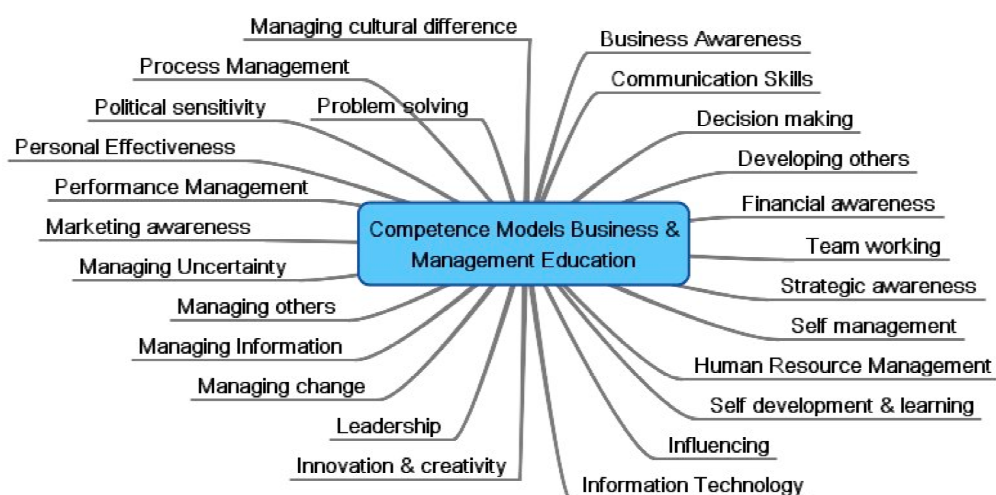


Figure 6: Competence model Ashridge Business school

Since the model above was only extracted from a self-evaluation questionnaire it can not be identified if there are sets of competences defined or interrelations.

### 3.6 PRO-NET 2000

The PRO-NET 2000 initiative is sponsored by the US Department of Education and identifies management competencies (for managing adult education programs) which reflect seven broadly defined categories:

1. Leadership skills
2. Instructional leadership
3. Resource management and allocation
4. Staff supervision
5. Program monitoring and reporting
6. Professional development practices
7. Community collaboration

Performance indicators operationally define each competence. These performance indicators identify skills, behaviours, or practices that demonstrate the existence of the competence ('evidence', not necessarily a formal document) (see e.g, Sherman et al., 2000). The project has developed a Management Competencies Assessment Instrument (MCAI) with 4 competence levels.



### 3.7 CIPD NVQ Management

The Chartered Institute of Personnel and Development (CIPD) in the UK offers accreditation in their National Vocational Qualifications programme (NVQ). They offer an accreditation in management on several competence levels:

- Level 3 in Management: Competence in a broad range of varied work activities performed in a wide variety of contexts most of which are complex and non-routine. There is considerable responsibility and autonomy, and control or guidance of others is required.
- Level 4 in Management: Competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources is often present.
- Level 5 in Management: Competence which involves the application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources feature strongly, as do personal accountabilities for analysis and diagnosis, design, planning, execution and evaluation.

Although the NVQ does not publish an explicit competence model the programme has an implicit model that can be recognized in the following exemplary programme structure from management on level 4:

- *Basic requirements*
  - Manage the Use of Financial Resources
  - Evaluate and Develop Own Practice
  - Enable and Support Others to Carry Out Personnel Services
  - Monitor and Evaluate the Delivery of Personnel Services to Customers
  - Design, Deliver and Evaluate Procedures to Promote Equality of Opportunity and Diversity
  - Design, Deliver and Evaluate Employee and Stakeholder Communication Procedures
- Resourcing and Retention
  - Design, Deliver and Evaluate Changes to Organisational Structure
  - Contribute to the Design, Delivery and Evaluation of Work Procedures
  - Design, Deliver and Evaluate Recruitment Procedures
  - Design, Deliver and Evaluate Selection Procedures
  - Design, Deliver and Evaluate Employee Reward and Benefits Procedures
  - Design, Deliver and Evaluate Employee Support Procedures
  - Design, Deliver and Evaluate the Delivery of Personnel Procedures in International Contexts
- Employee Relations
  - Create Effective Working Relationships
  - Design, Deliver and Evaluate Grievance and Dismissal Procedures

- Develop a Strategy and Plan to Provide all People Resources for the Organisation
  - Design, Deliver and Evaluate Redundancy Procedures
  - Design, Deliver and Evaluate Retirement and Resignation Procedures
  - Design, Deliver and Evaluate Negotiation and Collective Bargaining Procedures
  - Develop a Strategy and Plan for the Promotion of Equality of Opportunity and Diversity
- Learning and Development
    - Design, Deliver and Evaluate Learning and Development Procedures
    - Design, Deliver and Evaluate Performance Management Procedures
- Health and Safety
    - Promote a Health and Safety Culture Within the Workplace
    - Investigate and Evaluate Incidents and Complaints in the Workplace
    - Conduct an Assessment of Risks in the Workplace

### **3.8 Technology oriented SME framework**

LeBrasseur et al. (2002) distinguish in their competence framework for CEO's of SME's five skills groupings:

1. Leadership competencies
2. Entrepreneurial competencies
3. Managerial roles
4. Functional competencies
5. Other competencies (networking, perseverance, judgement, intuition, conceptual skills, et cetera)

Through a questionnaire two different competence stages of SME managers could be identified that depend on the current situation of the company.

### **3.9 Summary and conclusion**

The here presented models differ mostly in terms of usage context they have been developed for, granularity (high level descriptions vs. fine grained skill descriptions) and performances connected to the competences defined. The AACSB model differentiates between content knowledge and personal characteristics and skills. This artificial separation does not support the target to offer contextualized competences. The PRONET approach has the advantage that an assessment plan with outcomes belongs to the competence descriptions.

For the different stakeholder groups (business schools & SMEs) we expect the need to define an initial competence model that allows to describe the competences on a high level like it is done in curricula of business schools but at the same time to allow a fine grained description of skills on different levels which seems to be the appropriate level for SME users of the OpenScout platform.

## 4 Competence Service Analysis

To offer user of the OpenScout portal the opportunity to find content related to competences in the field of business and management education several existing competence services can be integrated in the OpenScout infrastructure. For this purpose we review several existing services in this chapter of the deliverable. Please note that the review does not include a detailed technical evaluation. At a later stage, when the OpenScout environment has progressed and technical needs are clearer a technical and implementation feasibility analysis of these services can be done.

### 4.1 MACE Services

The MACE project has developed an infrastructure to discover learning resources for architecture from several repositories in a unified interface (Wolpers et al 2009). In this infrastructure a competence service allows users to browse learning resources related to competences and competence levels according to the European Qualification framework (EQF). This toolset offers users functionalities to “collect and catalogue competence descriptions, manage and maintain those descriptions and offer an open API to integrate services based on (...) a competence catalogue into different end user tagging applications” (Gruber & Börner, 2009). This toolset consists of several components:

- The *Competence Administration Application* allows end users to enter and maintain a number of competence catalogues. The competence catalogue contains competence domains and their related competences as well as external resources, experts, and a proficiency scale descriptions related to these competences.
- The *Competence Service* consists of an abstraction layer to the competence catalogue with one service for accessing and one service for administering the catalogue via an API. The competence services can be accessed via SOAP and several methods are defined to access or update the catalogue.
- On top of these services different applications and widgets can be used for displaying, dynamic updating, and editing competence metadata as well as for the administration of the competence catalogue. A *competence widget* visualizes the related competence metadata to learning resources and their levels. A *competence administration interface* allows to enter catalogue data and to change them. A *competence matrix* allows users to get an overview about available learning resources in specific competence areas and on specific levels.

### 4.2 TENCompetence services

The TENCompetence project had the target to build an infrastructure for lifelong learning (Koper & Specht 2009). Within the project several models and software components have been developed to support competence-based education.

- A *draft standard for competence models* and associated competence profiles has been developed by Vervenne (2010a). This draft is intended to be input for the IEEE Learning Technology Standardisation Committee (IEEE LTSC).
- A *competence observatory* has been developed and published (Zervas & Sampson, 2007/Vervenne 2010b). The observatory has been developed “in order to monitor and capture the competencies that have to be acquired in different professional and academic fields. The TenC Competence Observatory was envisioned by the TenCompetence project, in order to bring experts together to discuss and decide upon the competencies per job/function” (Boursinou 2006).
- A *competence matching portlet* that provides competence related information to job advertisements and allows a preference-based search mechanism (Herder 2009).
- The *PDP planning tool* that should support learners in planning their future competence development.

### 4.3 iCoper Services

The iCoper project is a best practice network that focuses on provide access to a critical mass of more than 12,500 hours of integrated educational content. A special interest group in the project is focusing on competences. The competency development working group has discussed critical issues around the use of competence descriptions for learning resources. Several models and methods have been developed in the project related to the competence services:

- The *iCoper Learning Outcome Definition (LOD)* has been developed in the iCoper project to describe and share the definitions of learning outcomes. This model should enable the storage, retrieval and exchange of learning outcomes across systems that deal with learning outcomes data.
- The *Personal Achievement Learning Outcomes* data model (PALO) is a model to store individual knowledge, competences and skills achieved by a learner and possible relations. The model should also provide information about contexts in which an achievement has been reached and connected evidences and levels. For this purpose the project is currently developing a *Personal Achievement Learning Outcomes repository*.

### 4.4 PROLIX Services

The PROLIX project has focused on improving the connection between business processes, competence gaps and daily work processes. Within the project the OBELIX reference

architecture has been developed (Open Business Enterprise Learning and Information Systems exchange Reference Architecture). Several components within this infrastructure have a relation to competence services:

- The *competency analyzer (CA)* has been developed to identify suitable candidates for a job or task and to identify learning needs connected to a job or task.
- The *competency repository and matching engine* is used as a repository for storing competency definitions and any binding between a competency and an object of any type in the system.
- The *competency oriented process simulator* is used to simulate the processes (both learning and business processes) and reporting on specific cost and benefit metrics.

#### 4.5 Other related research & development activities

Besides the projects mentioned here there are numerous other developments like competence maps, skill maps and competence ontologies. Skill maps (Meyer, Spiekermann & Hertlein 2005) are network representations of competences. More structured and formalized forms are developed as competence ontologies (Posea & Harzallah, 2004). These competence ontologies are machine readable hierarchical competence models with defined relations. In recent research a special focus has been given to the collaborative editing and development of such competence ontologies (Braun, Kunzmann & Schmidt, 2010).

Other developments focus more on representational aspects of competence models like competence trees (Sawyer & Gammack, 2006), competence pyramids (Walsh & Linton, 2001), competence architectures (Mills, Platts, Bourne, & Huw, 2002) or competence matrices (Roos & Von Krogh, 1992). These visualization approaches might play a role at later stages of the project.

#### 4.6 Commercial HR systems

Besides the mentioned projects and initiatives there are also commercial competence management systems. These systems allow to manage job and competence profiles and employee's profiles and to match these for an ideal staffing decisions for projects. Often competence management systems are included in large Human Resource Management Software Applications like SAP HR or Peoplesoft (now part of Oracle). In these software collections which are also subsumed under the concept of "Human Resource Management Systems" several modules like payrolls, time tracking, learning management and competence management are combined in an integrated environment. Since these application are proprietary and not accessible they do not play a role in the initial architecture of the competence services in the OpenScout project. Nonetheless the project might invest later time to offer interfaces to map selected competence models within commercial systems to the OpenScout infrastructure.

## 4.7 Summary

The services presented above are supporting competence based education in different phases (see fig. 7).

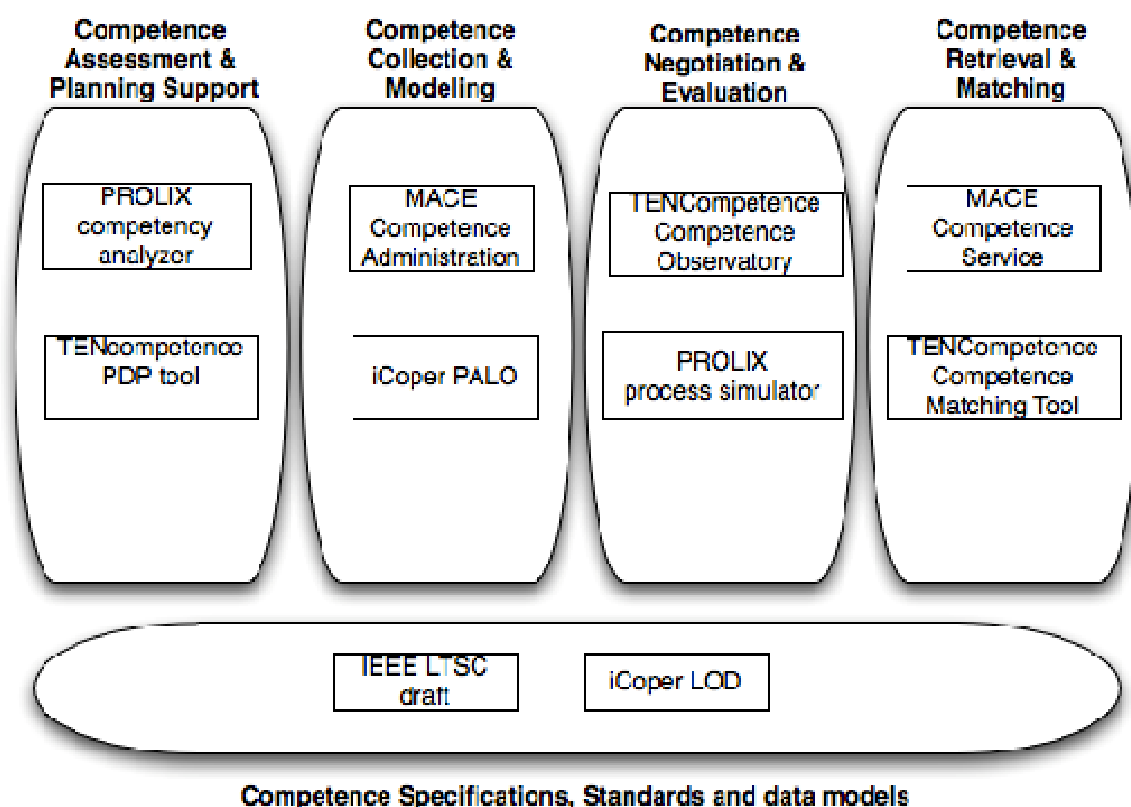


Figure 7: Competence Services Overview

From the perspective of the OpenScout project the most important aspect for the initial architecture is the competence modelling and competence based retrieval. For this purpose we will start with the competence services developed within the MACE project to implement the possibility to model competences from the field of business and management education.

In the next section we discuss an implementation proposal of competence services based on the existing MACE services. Since the negotiation about competence models for the different stakeholders of the project will be an ongoing process throughout the project runtime and thereafter we need a flexible implementation that leaves room for different adaptations of these models. In the next section we describe the implementation in detail.

## 4.8 Service implementation and integration

To provide access to content related to competences in the field of business and management education respective competence services need to be integrated into the OpenScout infrastructure. We see two possible interfaces between the services and the infrastructure to

do so. Based on the Competence Catalogue and its respective Competence Services developed for the MACE project, the existing implementation will be extended to provide an interface for the OpenScout Content Federation as well as existing Learning Management Systems (see figure 8).

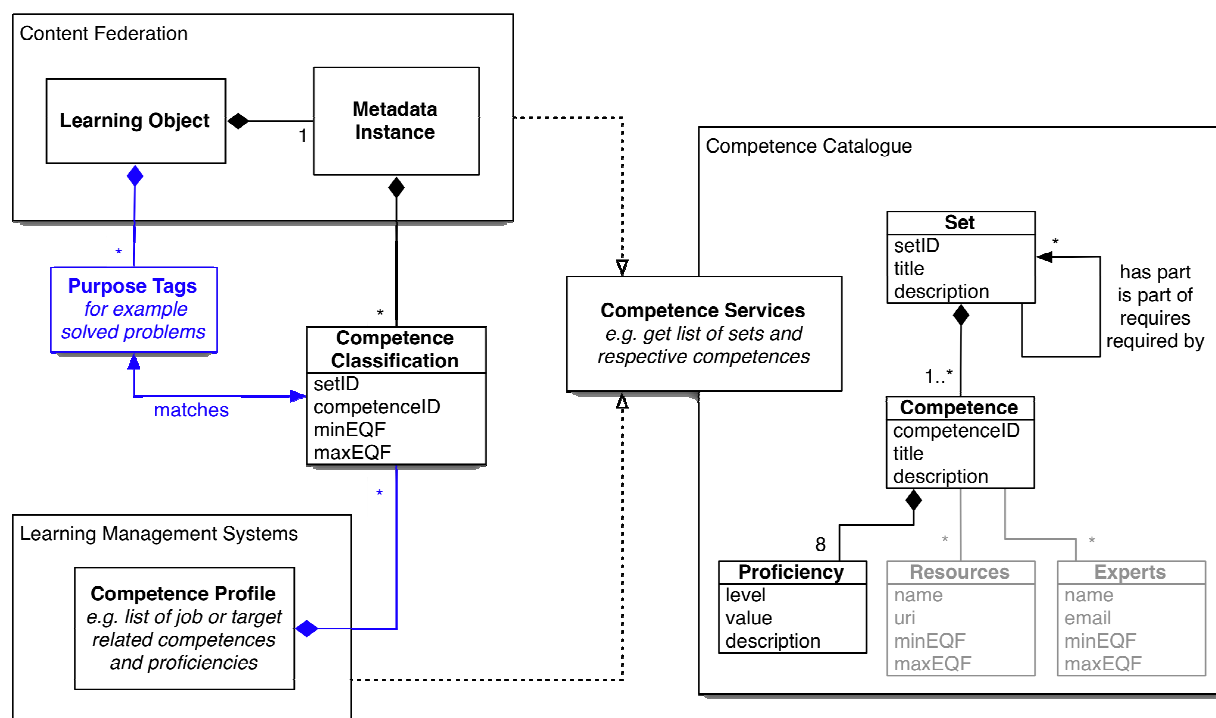


Figure 8: Implementation and Integration of Competence Services

The envisioned OpenScout content federation will ease the access to numerous Learning Objects (LOs) based on consistent metadata descriptions. Each object will be described by exactly one metadata instance, referred to the respective Learning Object Metadata (LOM). To access content related to competences the LOM must include the desired competence metadata. According to the IEEE Standard for LOM (IEEE, 2002) the LOM classification category can be used to describe particular classification systems the LO falls in. Therefore the competence metadata is included in the LOM classification category for each LO, consisting of one Competence Classification entry for any competence related to the object. The classification entries will also be used to create Competence Profiles within existing Learning Management Systems (LMS), which define for example a list of competences related to a specific job. As an implementation result each LO can then be described with competence related metadata and based on these metadata accessed through the OpenScout content federation as well as already existing LMS defining respective Competence Profiles.

Beside the top-down approach of using competence metadata to access LOs, we want to introduce Purpose Tags as a bottom-up approach. Through tagging users will be able to create their own taxonomy that describes the used LOs for example in terms of problems that can be solved. In a later stage this taxonomy will then be matched with the existing competence metadata to provide recommendations and thereby a more holistic content access.



## 5 Metadata Standards for Competence Descriptions

### 5.1 IEEE LOM Competency Metadata

Learning Object Metadata (LOM) is a conceptual metadata schema that describes formally learning objects. In this Standard, a learning object is defined as any entity that may be used for learning, education or training.

The LOM metadata elements are classified into nine categories: general, life cycle, meta-metadata, technical, educational, rights, relation, annotation, and classification. LOM allows linguistic diversity of both learning objects and the metadata instances that describe them.

However, the LOM metadata specification does not support description of learning resources in terms of competency. Sampson & Fytros (2008) proposed a LOM-based competence application profile that can be used for tagging learning resources with competency-relevant information. Basically, a “competence” value can be introduced into the 9th category of LOM (9:Classification) to indicate the attainment of a particular competence (see also Sampson 2009).

### 5.2 IEEE Reusable Competency Definition (RCD)

IEEE Reusable Competency Definitions (RCD) is an international standard that formally defines key competency characteristics and aims to increase the interoperability of competency-based learning services and facilitate the description, referencing and sharing competency ontologies. This standard is supported by the Learning Technology Standards Committee of the IEEE Computer Society that defines a data model for IEEE-RCD conforms to the existing IMS specification entitled Reusable Definition of Competency or Educational Objective (IMS-RDCEO). It reuses some elements of the IEEE LOM standard. IEEE-RCD does not specify a particular extension mechanism, and does not specify any XML-binding for the data model, but the model can be referenced by other standards, and appropriate bindings can be defined for extension or interoperability purposes. The iCOPER eContentPlus project has adopted an application profile of this standard. The IEEE-RCD model does not differentiate between skills, knowledge, abilities, or attitudes. The value domains of this standard are not selected from other ontologies.

### 5.3 HR XML

HR-XML is an international standard for the formal description of competencies and learning outcomes. It is developed and supported by HR-XML Consortium, which is a membership-only organisation. The objective of this standard is to create an XML schema in order to provide businesses and workers with a standardized way of exchanging information about competencies across different business contexts. The HR-XML competency schema has been introduced as a part of the broader process-oriented HR schema, and includes information on (a) evidence of competency and (b) levels of competency. HR-XML is suitable for the purposes of comparing, measuring and matching of competencies (for example matching



workers' competencies with job descriptions), classifies competences in terms of skills, knowledge and attitudes, and supports recursive/hierarchical definition of competences.

The bindings of the HR-XML competency standard are in XML schema format. The standard is a non-extensible standard that does not allow addition of values from other schemas/ontologies. HR-XML offers interoperability with proprietary ERP/HR systems such as ADP, Lawson, Oracle and SAP. This metadata schema also enables mappings between different taxonomies of competences.

The HR-XML competency model meets the following requirements:

- To be simple, compact, and sufficiently flexible and generalized, so that the model is not prohibitively complex and is useful within a variety of business contexts.
- To provide “structure to enable easy comparison, ranking, and evaluation of competencies.
- To be capable of referencing a variety of competency taxonomies.

#### **5.4 IMS Metadata Standards: IMS Learning Design (IMS LD) & RDCEO**

IMS-LD is an international standard which formally describes learning processes. "The IMS Learning Design has many advantages and “aims to represent the learning design of units of learning in a semantic, formal and machine interpretable way.” (Koper 2005, p.13). It is mainly centred on outcomes/performance and is focused on defining personal learner/teacher roles, learning objects, and learning processes/activities. IMS-LD has a hierarchy of three levels, known as Level A, Level B, and Level C, with separate XML schemas provided for each level and higher levels incorporating fully the lower levels:

- Level A contains activities, environments, plays, acts, roles, services, etc.
- Level B contains all elements of Level A, and new elements which enable personalization and more elaborate sequencing and interactions based on learner portfolios.
- Level C contains all elements of Level B and a new element facilitating a Notification Service.

IMS LD takes other existing specifications into account (Jeffery & Currier 2003). The following standards relate to IMS LD:

- IMS Learning Resource Meta-data / IEEE Learning Object Metadata - IMS Learning Design includes placeholders for metadata in its structures.
- IMS Reusable Definition of Competency or Educational Objective (RDCEO) – Relevant elements in IMS Learning Design, such as learning objectives, can reference resources defined by this specification.
- IMS Enterprise can be used for mapping learners and staff to IMS Learning Design roles in certain circumstances.

In particular, the RDCEO specification of IMS provides a means to formally create and describe common descriptions of competencies, conceptualized in a very general sense that includes skills, knowledge, and learning outcomes. This model represents generic characteristics of a competency, independent of any particular context, and thus enables interoperability of competence descriptions among diverse communities, learning systems and

tools. Furthermore, IMS-RDCEO can support user-defined models of competence descriptions. Finally, the IMS- RDCEO specification provides XML bindings in XML format.

## 5.5 Other initiatives

### Personal Accomplished Learning Outcomes (PALO)

The Personal Achieved Learning Outcomes (PALO) standard provides a simple model for formally capturing and describing information on knowledge, skills and competences. PALO also incorporates context-specific and evidence-related information, relevant to the learning process or the learning outcomes. The PALO standard aims at promoting the exchange and interoperability of competency-based information between different learning management systems, e-portfolios, HRIS systems, and social web tools. Thus, PALO describes information about competency, as well as levels and ranking of attained competencies or achieved learning outcomes. The PALO data model has adopted data elements and concepts from other specifications such as:

- IEEE RCD and ICOPER LOD, which focus more on describing the characteristics of learning outcomes.
- HR-XML, which mainly focuses on describing evidence of competency attainment and learning outcome achievement.

### CEN Metadata for Learning Opportunities (MLO)

Metadata for Learning Opportunities (MLO) is an international standard for describing learning opportunities. It is developed and supported by CEN/ISSS WS-LT. The standard defines the electronic representation of learning opportunities and aims to facilitate the offering/promotion of learning opportunities, to provide information to prospective learners about learning opportunities and to enable them to make informed decisions about their learning options and locate/access suitable opportunities. The MLO standard is a lightweight model, aimed at European SMEs, which can be integrated with various learning systems and tools. The metadata elements of the MLO model are according to the ISO 15836:DC 1.1 schema. The value domains are taken from the Dublin Core Abstract Model (DCAM). Extension of the MLO standard is done by inclusion of various properties, vocabulary encoding schemas and syntax encoding schemas. The MLO standard provides XML bindings in RDF and XML format. The MLO does not deal with competencies, but only with learning opportunities, so competency profiles are not included in this model.

## 5.6 Selecting a competency metadata standard for OpenScout

A critical review of the of the above standards shows that there is no one standard that could not cover all the important dimensions of the OpenScout requirements in terms of a common “univocal” competence model. OpenScout will need to define a generic competence model, which meets all the user requirements and includes all the important dimensions of

competence. In particular, with regard to HR-XML or IMS-RDCEO, one can identify the following shortcomings (Sampson et al. 2007):

1. The concept of competency itself is not detailed in terms of knowledge, skills, and attitudes.
2. Levels can be both qualitative and quantitative, but there is no formal way to systematize them, as, for example, in the European Qualifications Framework (EQF).
3. They fail to deal with “context”, although it is an important dimension related to competence definition.

These three areas represent gaps of representation and fall clearly outside of their scope of these two standards. One of the main objectives of OpenScout is to provide interoperability between different competence descriptions, to address the challenge of heterogeneous data models and standards that different communities use to describe competency-related information.

Our recommendation for OpenScout is to adapt and extend the IEEE-RCD model taking into account the granularity of the European Qualifications Framework and the requirements of Open Content resources, and develop it using similar methods and processes to those of the related iCOPER, PALO and the IEEE LOM competency metadata standards. The OpenScout schema should include competency data elements that are related to (a) personal characteristics and evidence of individual performance/output, (b) generic job characteristics/requirements, and (c) contextual job characteristics (context) – see (Prins et al, 2008). The schema will also need to support user tagging / folksonomies in a Web 2.0 environment, and cater for the specific needs of the management/business education communities.

## 6 Accessibility Services

### 6.1 Accessibility as a services

There is an increasing focus on people with a different set of abilities or lack of some abilities. This is a challenge since it is hard to know in advance what type of ability is missing. The goal is to provide all users with equal possibilities to participate in the society, equal possibilities to act and behave as human being. This right is equally important for all types of education.

This right is founded in many countries legislation and in the «UN convention on the Rights of Persons with Disabilities» which wants to “promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity. Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others”.<sup>2</sup>

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<sup>2</sup> See <http://www.un.org/disabilities/default.asp?navid=13&pid=150>

In «Article 9 Accessibility» the following points are addressed:

*«To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, ... including information and communications technologies and systems,... »*

In addition the following issues are addressed:

*- «(g) To promote access for persons with disabilities to new information and communications technologies and systems, including the Internet; (h) To promote the design, development, production and distribution of accessible information and communications technologies and systems at an early stage, so that these technologies and systems become accessible at minimum cost.»*

The article that is most relevant for OpenScout is

*«Article 24 - Education.*

*1. States Parties recognise the right of persons with disabilities to education. With a view to realising this right without discrimination and on the basis of equal opportunity, States Parties shall ensure an inclusive education system at all levels and lifelong learning directed to: [...]*

*(a) Persons with disabilities are not excluded from the general education system on the basis of disability, ...*

*5. States Parties shall ensure that persons with disabilities are able to access general tertiary education, vocational training, adult education and lifelong learning without discrimination and on an equal basis with others.[...]*»

All member states in EU has ratified the UN convention, and are obliged to harmonise their legislation to meet the UN convention on the rights of Persons with Disabilities»

We should work hard to meet these goals within the OpenScout project, we should work with the content developers and guide them in how to develop content that are meeting the goal of the UN convention. We should work hard to make sure that the tools and services we develop are accessible and provides equal facilitates for users with disabilities.

## 6.2 How to meet the diverse need of users?

The most known and recognised requirement to meet accessibility needs are specified in the W3C/WAI/WCAG<sup>3</sup> (Web Content Accessibility Guidelines), W3C/WAI/ATAG<sup>4</sup> (Authoring Tools Accessibility Guidelines) and W3C/WAI/ARIA<sup>5</sup> guidelines. These guidelines are providing a minimum common set of requirements that should be met by all content producers. For internet applications that are media and interactive rich using AJAX or are combining several different technologies, the W3C/WAI/ARIA (Accessible Rich Internet Guidelines) guidelines should be followed. If content are developed using proprietary tools

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<sup>3</sup> <http://www.w3.org/TR/WCAG20/>

<sup>4</sup> <http://www.w3.org/TR/ATAG20/>

<sup>5</sup> <http://www.w3.org/TR/wai-aria/>

like Flash<sup>6</sup> and Silverlight<sup>7</sup> it is important that the content developed are made as accessible as possible, and that the accessibility guidelines for these tools are followed. However we would not recommend the use of Flash or Silverlight for production of educational content and for learning resources.

Accessibility to resources are a two fold problem or challenge, we have a several layers of accessibility that we need to consider. Firstly the portal that is used to navigate, browse and search for resources has to be accessible. Secondly the search results and filtering mechanism for identifying the resources need to be accessible, and thirdly the resource itself need to be accessible.

There are several concerns that need to be addressed to have an accessible OpenScout service and portal.

Firstly we need to enhance our view on accessibility. The common view today is that following the W3C/WAI guidelines (ATAG, WCAG and ARIA) ensures accessibility, this is to some extent true. Conforming to the W3C/WAI guidelines provides help to users of Assistive Technologies. However there are some problems with the «one size fits all» approach, we need to move in the direction of «one size fits one», we should have systems that adapts to your (accessibility) preferences. When a system adapts to your preferences you as a user of the system are in control of how the system interact with you, and this would then increase the accessibility to the information. The system and the resources also need to know about your preferences, and the resource and the system must have the capability to adapt.

How to express personal preferences are defined in the ISO/IEC 24751:2008 series of standards «Individualized adaptability and accessibility in e-learning, education and training» (ISO/IEC 2008a-c). This standard provides a mechanism for how personal needs and preferences should be mapped and the personal preferences should be met by the digital resource description. For each personal needs and preference, there is a description of the resources. E.g. one of your preferences could be that you prefer the information presented with «high contrast», then the system or resource will have a description stating that it could present itself in «high contrast». Another personal preference could be that all videos should have captioning. Then the system will provide a video with captioning in your preferred language. Your personal preferences could be used in two ways, one to have the user interface of the portal to adapt to your presentation style (colours, sizes, contrast etc.) and then other personal preferences would be used when searching, browsing and filtering for resources i.e. if you have a preference that videos should be captioned, the system should only provide videos with captioning. This would add an automatic layer of filtering when browsing/searching for resources.

The challenge is then how do we convey this information to the OpenScout services.

We need to add an accessibility service to the OpenScout system. This accessibility service should have a «loose coupling» to the user management system. So that when you as a user accesses the OpenScout portal and log-in, the OpenScout portal is also receiving your

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<sup>6</sup> FLASH accessibility guidelines <http://www.adobe.com/accessibility/products/flash/>

<sup>7</sup> SILVERLIGHT accessibility guidelines <http://www.silverlight.net/>

personal needs and preferences. The portal then could adapt to your presentation style and enabling that searches and filtering of results are based on the your personal preferences. We should add relevant user preferences to all searches for resources, and also add the preferences when browsing and filtering resources. It is also important that the user could turn off this added filtering and search parameters.

In addition all resources within OpenScout need to have some relevant resource descriptions so to matching personal preferences would be possible. Access to information on an equal basis is a fundamental right for all man. Unfortunately, the use of ICT is prohibiting the equal access to many users, and the focus on accessibility is therefore necessary to avoid use of technologies and techniques that introduces unnecessary barriers to ICT.

All users have their preferences, and they know how they would like to receive and interact with systems most conveniently.

### 6.3 Loose coupling accessibility service:

If we envisage that we have a SSO service that provides access to all content and services within the OpenScout community, we could also provide a Personal needs and Preferences Accessibility Services that works closely with the SSO services. The PnP Accessibility service is providing the other systems with information about a given persons preferences. We would then have the following workflow (see figure 9).

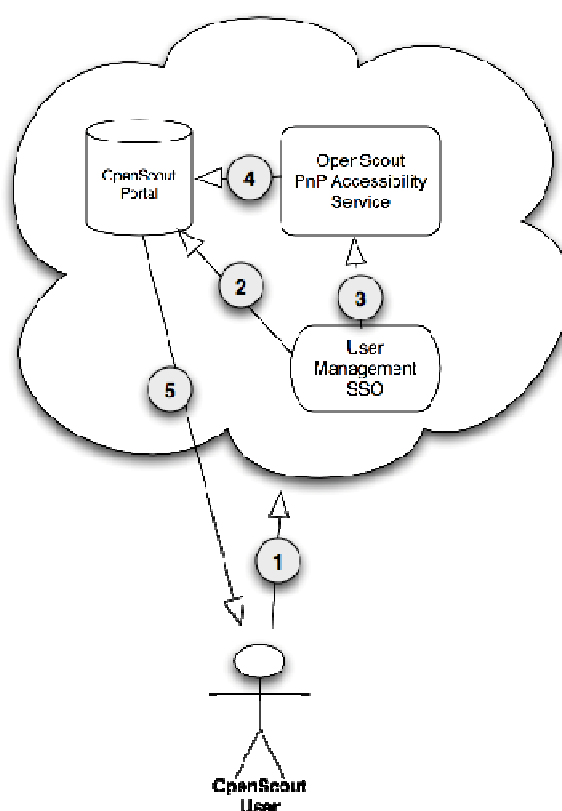


Figure 9: Accessibility service as part of the Open Scout portal

- A user logs on to the OpenScout portal
- The logon (SSO) system then checks that the user has access to the system and to the actions performed.
- The logon system is at the same time querying the PnP Accessibility Service for the user's preferences.
- If the user has some preferences, these are transferred to the actual service used.
- The OpenScout portal adapts to the user's preferences and provides content that is accessible.

The disadvantages of this model is that the user needs to provide a set of PnP's to all portals that have an accessibility service, and that all accessibility features of a resource have to be a part of the OpenScout repository.

#### **6.4 Accessibility proxy service**

Another approach to an accessibility service is to set up an accessibility proxy service.

In this model we put the accessibility part outside of the OpenScout portal and services. All requests to the portal are going through the accessibility proxy. This proxy knows about your personal needs and preferences, and is using this information to adapt the information on-the-fly to your preferences. The responsibility of finding an accessible resource based on your preferences are then moved to the Accessibility proxy. E.g. if your preference is that a video should have captioning, the accessibility proxy would search for the same resource with captioning. To make such searches happen, we need to apply the proper set of metadata to the resources. Such an approach also provides for applying tools that could do on-the-fly captioning, or on-the-fly translations from text to speech (see figure 10).



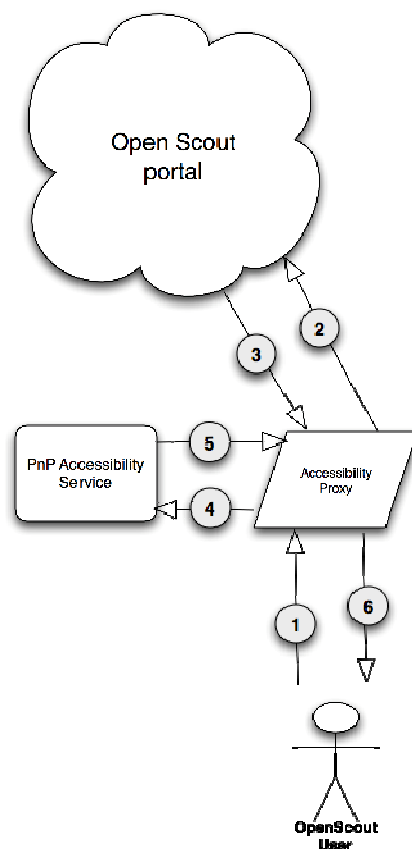


Figure 10: Accessibility service as a proxy

This model would have the following workflow:

- A user accesses the OpenScout portal, through the accessibility proxy.
- The proxy accesses the OpenScout portal
- The requested content is transferred from the OpenScout portal to the accessibility proxy
- The accessibility proxy sends information about the user to the PnP Accessibility service
- The PnP Accessibility service returns with the users preferences.
- Based on the preferences, the Accessibility proxy transforms the information, replaces relevant resources based on the users preferences, and then return the adapted accessible information to the user.

When the accessibility-proxy are doing much of the work on identifying and locating alternative versions of a resource, we are also providing for the «just in time accessibility» paradigm. The just in time accessibility paradigm is when one person is working together or collaborating with another person with some disabilities. One case could be that this user have a preference that all illustrations should have a textual description. If no such description exists, one could be generated on the fly and this new resource is then registered by the



accessibility proxy and immediately made available for that user and for all other users with the same preference.

To facilitate searches and browsing based on the preferences, we need to investigate a mechanism on transferring the PnP's to the OpenScout service.

Regardless of solution we also need to develop an accessible system for registering a users personal needs and preferences.

## 7 Summary and conclusion

In this deliverable we have summarized the discussion about competences and competence based education. The flaws and terminological confusions about competency, competence and skills have been discussed and a working definition for the use of these terms in the project has been proposed. Based on a analysis of selected literature the topic of competence based education in business and management education has been summarized and several models have been discussed. A number of competence related services from other (European) project and commercial systems have been summarized. Related specifications and standards have been introduced and discussed. The need for accessibility services for stakeholders with special needs has been formulated and two exemplary services have been proposed.

Based on the findings from the deliverable we draw the following preliminary conclusions for the further work:

- The concept of competence based education offers appealing advantages despite the fuzziness around the concept of competences.
- For the communication within the consortium and also to the stakeholders we propose the following working definition for the terms competence and competency:
  - *Competence*: Effective performance in a domain at different levels of proficiency.  
  
Competences can be classified into: (1) cognitive competence (knowledge), (2) functional competence (skills or competencies), (3) personal competence (e.g., intelligence, flexibility), (4) ethical competence (attitudes), and (5) trans-/metacompetences (e.g. communication skills)
  - *Competency*: Any form of skill that can be described in a context of learning, education or training.
- The topic of competences has a long tradition in the domain of business and management education and several competence models have been proposed. These models will be further discussed and reviewed together with the stakeholder partners of the consortium.
- We need to offer flexible ways to formulate competences in the domain of business and management education. This flexibility includes the support of different ways for (top down) competence descriptions as well as alternative ways to describe competence related information by users (e.g. purpose tagging) and alternative

representations of competence related information (e.g. via lists of formulated problems).

- This requirement lead to the decision to use the competence services of the MACE project as the basis for competence services of the OpenScout project.
- Due to the shortcomings of existing competence standards the project has to develop its own specification. Our recommendation for OpenScout is to adapt and extend the IEEE-RCD model taking into account the granularity of the European Qualifications Framework and the requirements of Open Content resources and stakeholders.

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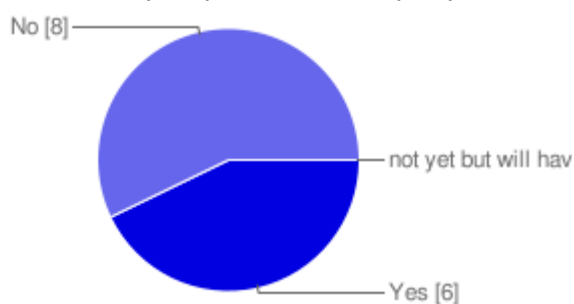


## 9 Appendix

### Results of questionnaire

#### Questions related to competences and competence-based education (all partners)

Does your university/department/company have a list of defined competences?



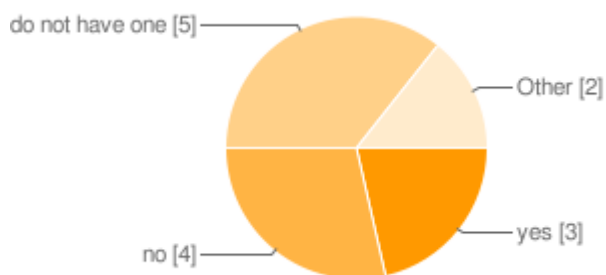
Yes 6 43%

No 8 57%

not yet but will have 0 0%

People may select more than one checkbox, so percentages may add up to more than 100%.

The defined competence list is making use of competence standards as the European Qualification Framework (EQF).



yes 3 21%

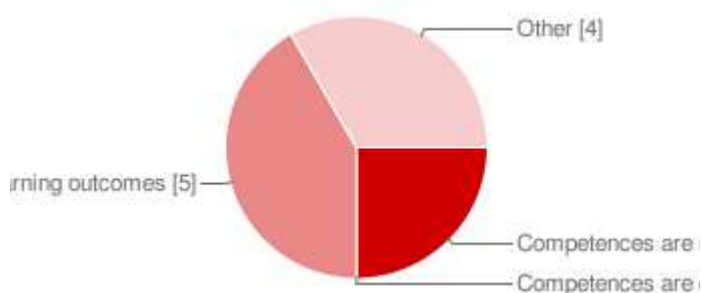
no 4 29%

we do not have one 5 36%

Other 2 14%

People may select more than one checkbox, so percentages may add up to more than 100%.

Can you describe the main role of competences in your organisation



Competences are used as references for constructing and using learning content 3 25%

Competences are defined but are not related to learning content 0 0%

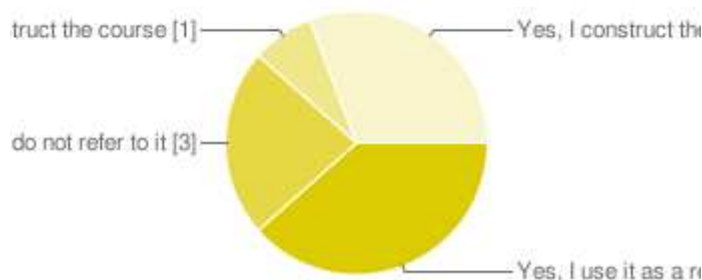
Competences are mainly used as criteria for assessment of learning outcomes 5 42%

learning outcomes

Other 4 33%

People may select more than one checkbox, so percentages may add up to more than 100%.

Do you use defined competences when creating a new training offering (course/seminar)?



Yes, I use it as a reference for necessary learning objectives 5 38%

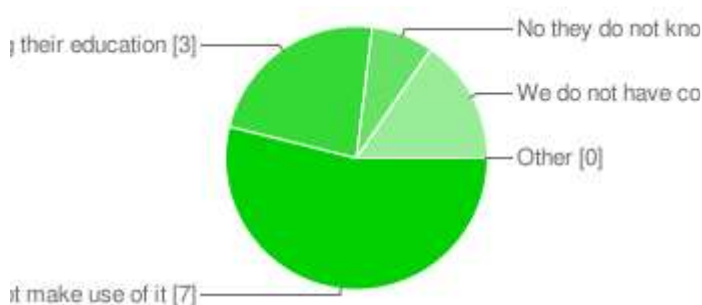
No, I do not refer to it 3 23%

Yes, I select one or two competences which are the main focus and then construct the course 1 8%

Yes, I construct the course and then define the competences that can be gained from the study 4 31%

People may select more than one checkbox, so percentages may add up to more than 100%.

Do learners know about the competences that are taught in a course/seminar?



Yes, they are aware, but do not make use of it 7 54%

Yes, they are aware and use it for structuring their education 3 23%

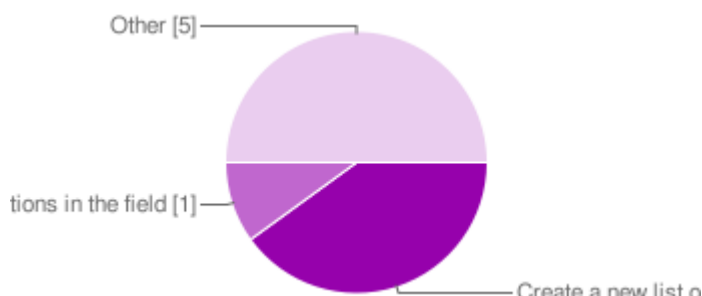
No they do not know that competences are behind a course taught 1 8%

We do not have competences connected to courses 2 15%

Other 0 0%

People may select more than one checkbox, so percentages may add up to more than 100%.

Does your University/Department have plans to define/refer to a list of competences?



Create a new list of competences based on our curricula 4 40%

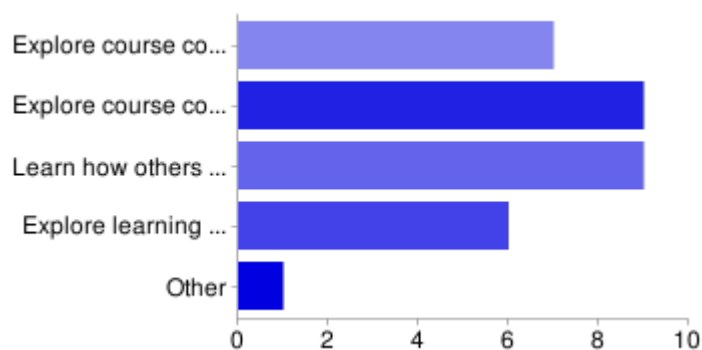
Select competences from existing definitions in the field 1 10%

Other 5 50%

People may select more than one

checkbox, so percentages may add up to more than 100%.

What would be most helpful for learners when looking for learning content and courses in the field of business and management education? (multiple selections possible)



Explore course content by competences that they teach 7 47%

Explore course content by competences that are required to work on 9 60%

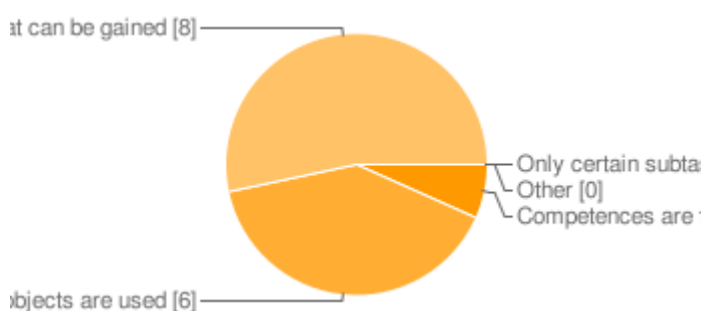
Learn how others have achieved certain competences 9 60%

Explore learning content and see what competences are related to learning content 6 40%

Other 1 7%

People may select more than one checkbox, so percentages may add up to more than 100%.

How can the relation of OpenScout learning objects and competences be described best?



Competences are the outcome of exploring and viewing OpenScout learning objects 1 7%

Competences are the outcome of learning activities in which OpenScout learning objects are used 6 40%

Management education problems are directly related to certain competences that can be gained 8 53%

Only certain subtasks in the field of management education are related to certain competences 0 0%

Other 0 0%

People may select more than one checkbox, so percentages may add up to more than 100%.

Are you aware of any competence models, competence maps or competence taxonomies for the field of business and management education? Please provide them in the box below.

Not really. Based on our past experience, Faculty of organisational sciences, University of Maribor has their own list of general and subject specific competencies that are relevant

for business and management education. Unfortunately, the list is not publicly available. No, but will enquire with business school colleague & come back to you on this! Unfortunately not. Lots of competences taxonomy co-exist : a good and workable example can be found under the following link:  
<http://www.ashridge.org.uk/Website/opsaq.nsf/web/self+assessment+questionnaire> None specifically for Business and Mngmt e...

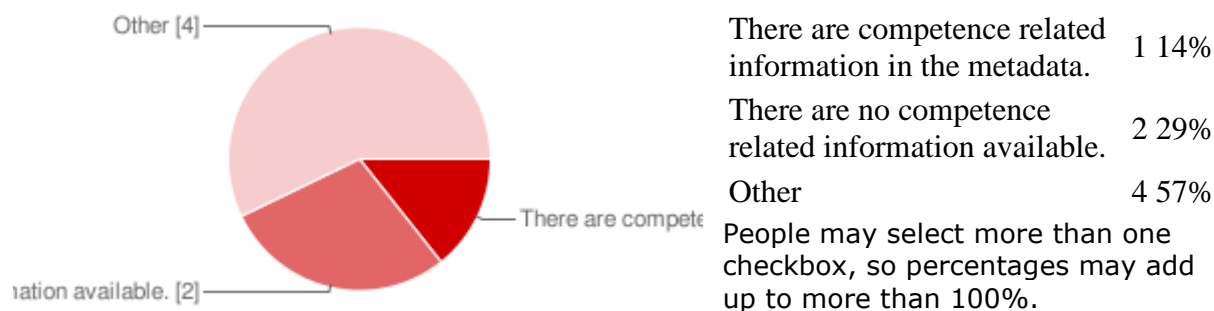
Finally: Please give your interpretation and the importance of competences in your work

Also as members of the ICOPER project ([www.icoper.org](http://www.icoper.org)) that analyses learning standards and aims at preparing a reference model for competency-driven learning, our feeling is that the main activities should be learning outcome or competency driven, in particular when analyzing learning needs, specifying metadata for units of learning (like courses; the definition is "a contextualized, complete, self-contained unit of education or training that consists of a teaching method and associated content") that can be found in OpenScout educational network, searching for units of learning that best c...

## Questions for Content Providers in the Consortium

First of all we would like to know about existing metadata that have a relation to competences. To better understand how content providers relate to accessibility, and requirements from users with special needs, we ask some additional questions about this aspect.

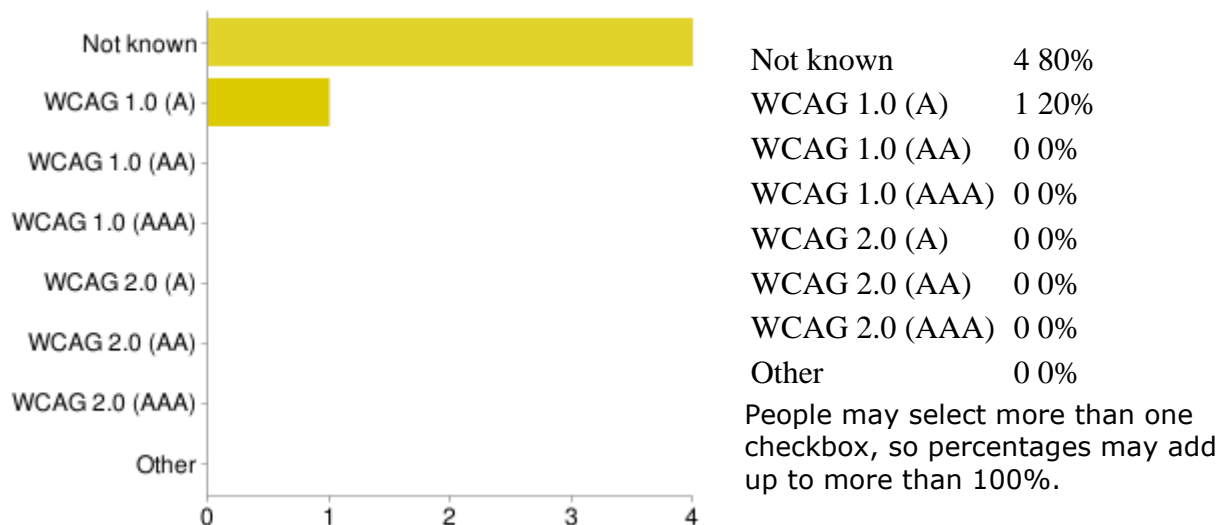
If you are also a content provider in the OpenScout project please tell us if there are already any competence related information available for your content.



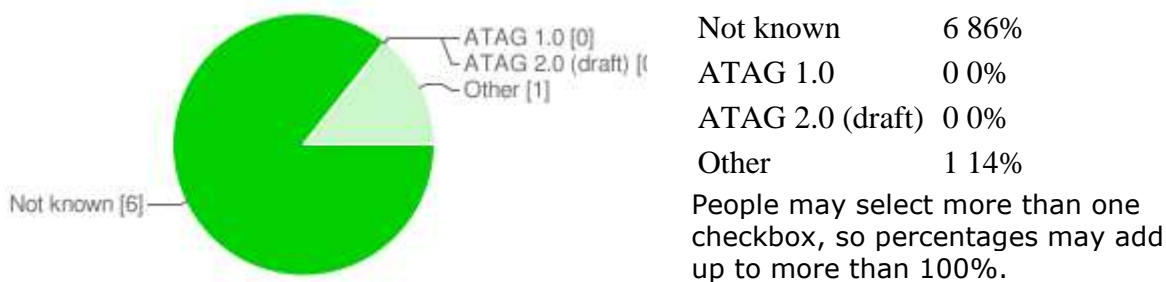
## Accessibility Standards

One of the most used accessibility standards today are the W3C/WAI series of recommendations, we would like to know to which extent you support these requirements. And at what level of you support these recommendations.

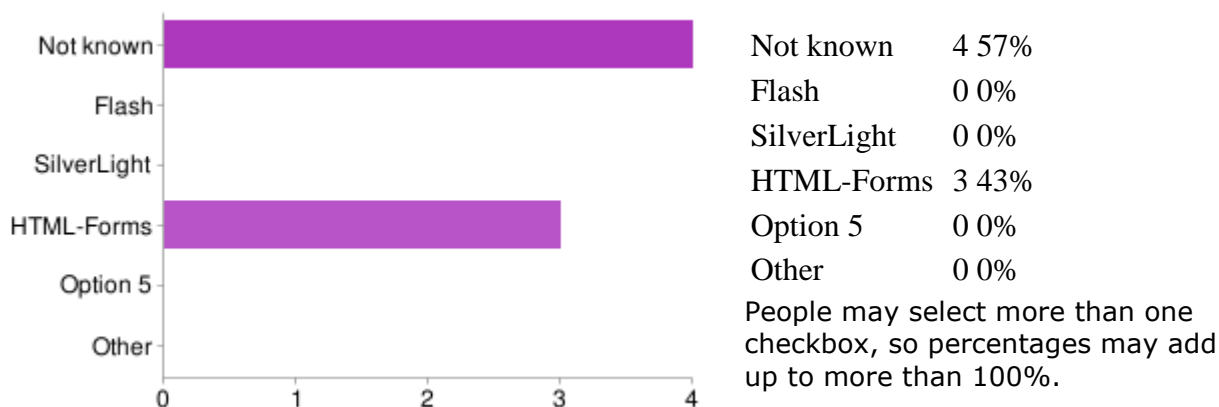
At what level conforms your content to the WCAG recommendations, this is information provided in the HTML produced by your production system, and are consumed by web-browsers of the learner:



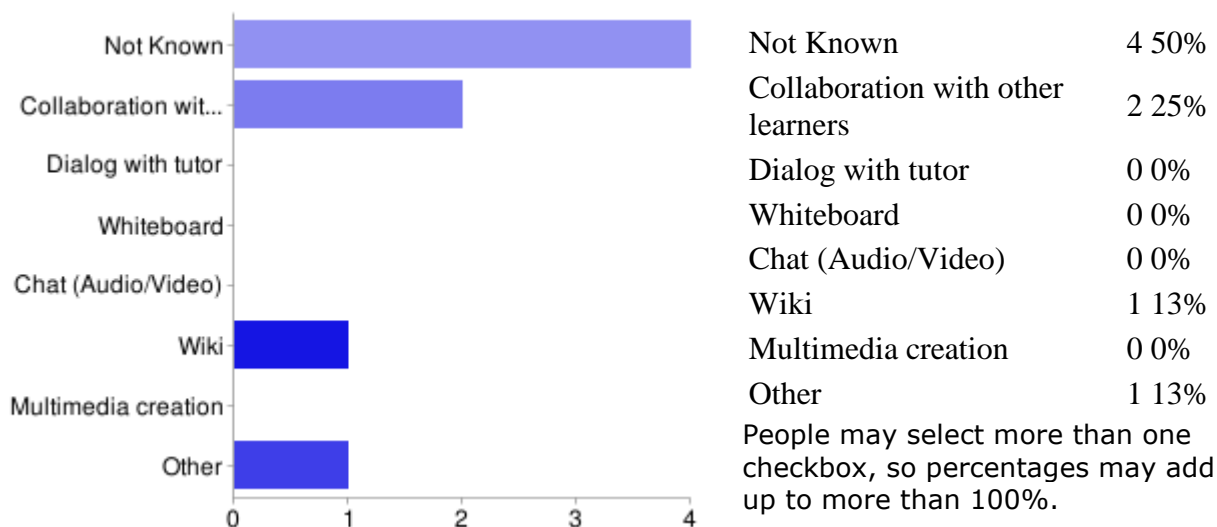
There is a shift in many of today's e-learning environments, where learners are not only consuming information, but also producing content and information. When learners are producing content, which standards are used to accommodate the learner?



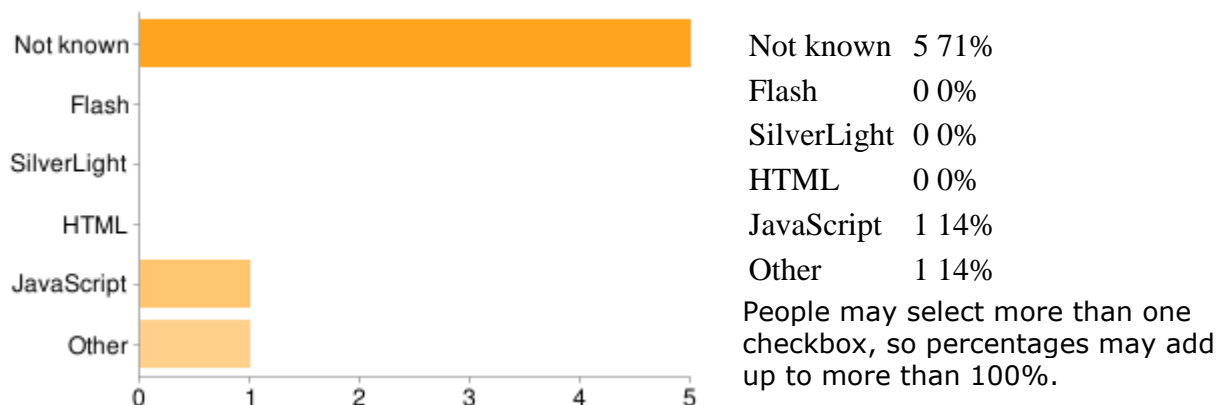
What type of input are used when learners are producing content:



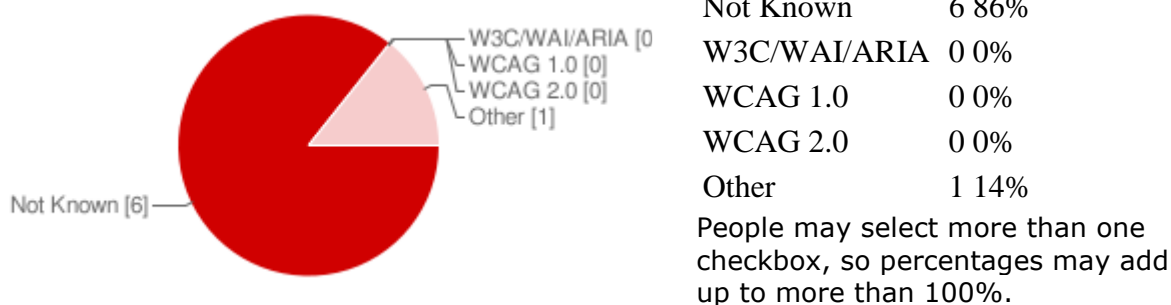
When learners are producing content, what type of interaction are supported between the learners?



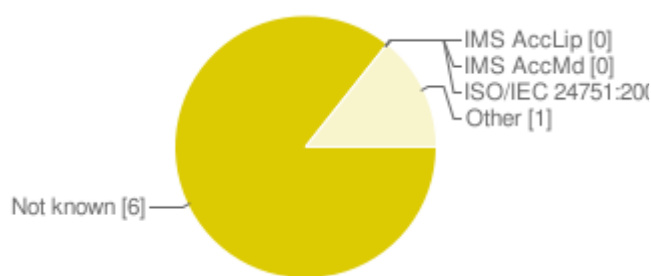
Many learning resources are a combination of different media, such as text, audio, images, movies, tables, illustrations and figures. How is the media composed together to become a resource:



What type of accessibility standards are supported by the rich content?



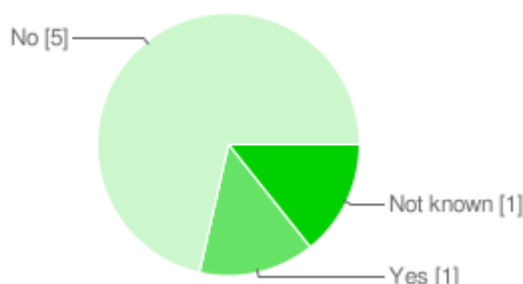
Many users have different requirements to make the learning resources accessible, where the resources are adopted to the different users requirements. If the content is adoptable, what standards are used:



|                    |       |
|--------------------|-------|
| Not known          | 6 86% |
| IMS AccLip         | 0 0%  |
| IMS AccMd          | 0 0%  |
| ISO/IEC 24751:2008 | 0 0%  |
| Other              | 1 14% |

People may select more than one checkbox, so percentages may add up to more than 100%.

One type of adoption is language, are you providing the same learning resource in different languages?



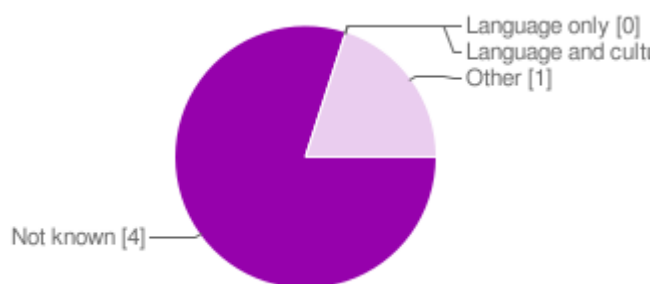
|           |       |
|-----------|-------|
| Not known | 1 14% |
| Yes       | 1 14% |
| No        | 5 71% |

People may select more than one checkbox, so percentages may add up to more than 100%.

If you have answered Yes in the question above please list the languages you support here.

OL units are available in English, Catalan, Portuguese, Welsh, Chinese (Mandarin I think)

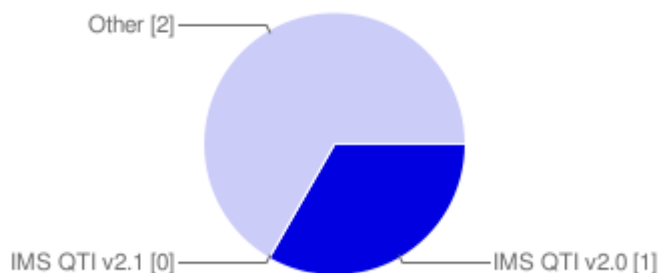
If you are providing the learning resource in different languages, are you also adopting cultural aspects of the resource?



|                                |       |
|--------------------------------|-------|
| Not known                      | 4 80% |
| Language only                  | 0 0%  |
| Language and cultural adoption | 0 0%  |
| Other                          | 1 20% |

People may select more than one checkbox, so percentages may add up to more than 100%.

In many e-learning environments assessing the learner are of importance, related to the learning resources you are providing, are you also providing mechanisms for assessing the learner? If so what standards are you following when developing the assessments?



|              |       |
|--------------|-------|
| IMS QTI v2.0 | 1 33% |
| IMS QTI v2.1 | 0 0%  |
| Other        | 2 67% |

People may select more than one checkbox, so percentages may add up to more than 100%.



