Introducing an Artifact for the Assessment of Transversal Professional Competences

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Abstract

This paper departs from a project conducted with the Trade and Craft sector of the Austrian Federal Chamber of Economics. A design science perspective scaffolds the development of an artifact, the net of competences, to support the assessment of transversal professional competences in the validation of prior formal, non-formal and informal learning. This paper contributes to theory by arguing for a structural functional equivalence between a real spider-web and the structure of the net of competences. A process perspective shows how different stakeholders interact in the net of competences. Specifically, we pose the research question "How to assess transversal professional competences?". To answer this question, we describe the design of a self-assessment by outlining item generation, generation of verb levels and the triangulation of items and verbs to create nodes in the net of competences. Abstracting from the previous, we present the algorithm on which the net of competences is based.

1. Introduction

1.1. Motivation of the paper

One of the key aims within Europe is to foster labor-market mobility and social cohesion, i.e. the "social europe" [1, 2, 3]. The validation of prior learning, the process of "assessing and recognizing a wide range of skills and competences which people develop through their lives and in different contexts, for example through education, work and leisure activities" [4, p. 216] plays an important role in these efforts. It is supported in the European Union (EU) through policies by fostering lifelong learning [5], the European Qualifications Framework (EQF) to ensure comparability between member states, the National Qualification Frameworks (NQF) [5] and the recommendation on the validation of prior learning to outline the process [6].

While member states of the EU agreed on the legislative part, it is currently important to design innovative artifacts to support the assessment of professional competences in the validation of prior learning [7]. The design of standardized and information and communication technology (ICT) based artifacts is necessary as these artifacts can "mainstream processes and increase awareness of validation" [8, p. 75]. Within standardized ICT-artifacts, different methods of assessment are supported, which currently holds as the "gold standard" in assessment procedures. This multi-method assessment is "based on the triangulation of results from different assessment methods [...] frequently used in validation" [8, p. 74]. However, even though the advantages and opportunities of standardized assessments are known, policy-makers recently concluded that "more can be done in the standardization of tools and the use of ICT" [8, p. 20] to support the assessment of professional competences in the validation of prior learning.

One reason why the development of ICT-artifacts to support the assessment of professional competences proves a challenge for research and policy making is the lack of integrated and comprehensive approaches. On the one hand, there are many approaches that describe classifications of qualifications (e.g. ISCO or ISCED [9, 10]), the content of occupational and individual requirements (e.g. the O*Net [11] or DISCO [9]) while integrative approaches are currently under development (e.g. ESCO, a recent project of the European Union [12]). On the other hand, we witness many approaches that describe levels of professional competences and competence development (e.g. [13, 14, 15, 16]. However, in order to facilitate the assessment of professional competences within an ICT-environment, we are currently lacking a comprehensive model that integrates both.

From a practical perspective, human resource development and training turns out to be a major factor in gaining and sustaining the competitive advantage of organizations [17]. However, training's in organizations are often not perceived as very useful [18] and a waste

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of time. Some even speak of the great training robbery [19] as most of the training's do not provide the return of investment organizations expected [20]. This is the second reason why the development of an ICT-artifact to assess the content *and* level of professional competences is important, as it may provide a very detailed profile of training needs in regard to a specific profession.

1.2. Research question and research method

While domain-specific competences are of great importance for each single profession, the Austrian Trade and Craft sector puts great emphasis on transversal professional competences (i.e. competences that are viable across domains such as language skills or learning to learn) [21, p. 38]. Practically speaking, if a person has acquired transversal professional competences, they can be applied in several contexts - thus increasing the person's capacity to act.

In this paper, we report a research project with the Austrian Federal Chamber of Economics. Its goal is to design an ICT-artifact to support the assessment of transversal professional competences within the Austrian Trade and Craft sector. The main purpose of the artifact is to standardize the award of trading licences, which is the legal precondition to open a business in Austria. Applicants are awarded with a trading licence if they can prove the necessary knowledge, skills and competences (KSC). The ICT-artifact should support the whole process of the validation of prior learning. Consequently, we pose the research question *"How to assess transversal professional competences?"* To answer this research question we will describe the development of the *net of competences*.

In this paper, we depart from describing the ecosystem of the *net of competences* by drawing on a structural perspective to describe the components of the *net of competences* as functionally equivalent to a real spiderweb. A process perspective sheds light on activities [22, 23] that are performed in the *net of competences* by different stakeholders. A theoretical model that builds a bridge between the Occupational Information Network (O*Net) [11] and the European competence perspective [24] allows to contribute to theory by describing the development of a self-assessment procedure [25] of transversal professional competences. A content analysis [26, 27] of five qualification standards - documents to describe learning outcomes in terms of KSC connected to the Austrian NQF and thus the EQF - of different Trade and Craft professions results in 160 candidate items to describe the content dimension of transversal professional competences. To describe the level of professional competences, we refer to commonly used taxonomies to formulate learning outcomes [15, 16, 13]. Reflecting on the design process and description of the assessment procedure, we contribute back to theory by outlining the algorithm that scaffolds the *net of competences*. Practically, the algorithm may be viable for different assessment purposes as well.

Methodologically, the development of the *net of competences* rests on a design science paradigm [28, 29, 30]. Whereas natural sciences and social sciences try to understand reality, "design science attempts to create things that serve human purposes" [31, p. 55]. It may be described as the "creation and evaluation of an innovative, purposeful artifact for a specified, currently unresolved problem domain" [29, p. 82]. With utility as its ultimate goal in mind - it addresses problem-driven research question through "*building* and *evaluation* of artifacts designed to meet the identified [...] need" [29, p. 79–80]. In this paradigm, an artifact refers to "a thing that has, or can be transformed into, a material existence as an artificially made object (e.g., model, instantiation) or process (e.g., method, software)" [28]. Usually, the design science process includes six steps: "problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication" [30, p. 46]. Methodological rigor is achieved by "appropriately applying existing foundations and methodologies" [29, p. 80] in design science research. Design science has been used as an approach to assess competences via comparative judgement [32]. From a design science perspective, we report the development of the self-assessment procedure through a qualitative content analysis and practitioners panels. Furthermore, we outline the underlying algorithm of the *net of competences* in more detail.

The remainder of this paper is structured as follows. Section 2 introduces a structural and process perspective on the *net of competences*. Section 3 describes the generation of items, verb levels, and nodes. Section 4 and 5 outline the underlying algorithm and give some information about the implementation of the ICT-artifact. Section 6 discusses theoretical and practical implications, shows limitations and points at further research opportunities.

2. Theoretical background

This section outlines a structural and process perspective on the *net of competences*. The *net of competences* serves as a boundary object [33] in which four relevant stakeholder-groups [34, 35] interact. First, people applying for a trading license. Second, guides that support applicants in the assessment of professional

competences in the validation of prior learning [6]. Third, members of professional associations assessing and validating the competences of the applicants. Fourth, representatives of the government that recognize professional competences as a formal full or partial qualification.

2.1. A structural perspective on the *net of competences*

Following a functional equivalence argument [36], we draw on the structure of a real spiderweb to describe the structural components of the *net of competences*. Two objects are functionally equivalent (or analogous) if

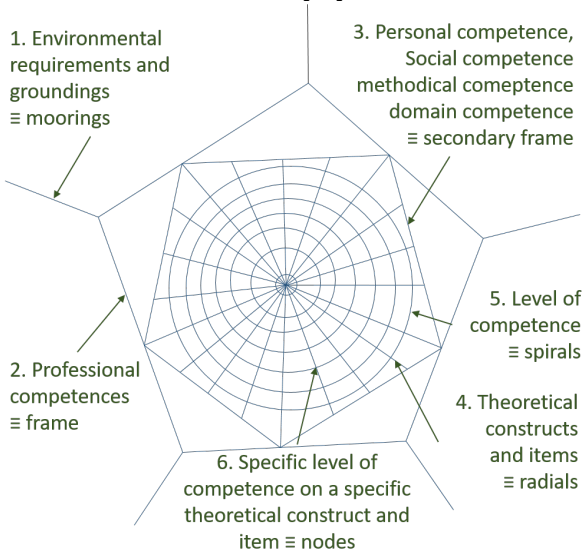
> "*they do the same (or similar) things in the same (or similar) systems in the same (or similar) environment, etc. The key is the emphasis on the word 'do'. No other features of the objects are relevant other than the fact that they do the same thing under certain conditions - which is to say that it is their behavior that is important*" [36, p. 179].

A spiderweb is "a multi-functional system" [37, p. 8] "having an outstanding structural topology" [37, p. 1] that evolved towards "extreme strength and ductility" [37, p. 1] and "provides design principles that might apply to other structural systems" [37, p. 1] as well. Functionally equivalent to a real spiderweb, the *net of competences* consists of several components, which are woven together into a viable whole that is necessary stable and flexible at the same time (Figure 1). The structural components of the *net of competences* serve as a design blueprint for the ICT-artifact.

First, moorings keep a spiderweb connected to the environment. Functionally equivalent to a spiderweb, the *net of competences* consists of environmental requirements and groundings that keep the *net of competences* connected to the environment through the following characteristics:

- Theory: it should be grounded in thorough theory. Theories of professional competences [21, 38, 39, 40], knowledge [41, 42] and skills [43] serve as its theoretical foundation [44].
- Practice: it should be implemented into practice. The validation of prior learning [4, 45, 6] structures the interaction of stakeholders [35, 34] within the *net of competences*. Furthermore, it is based on the O*Net [11].
- Institutions: it is backed up by recent European institutions [46, 47] (e.g. the EQF [5, 48] and the validation of prior learning.

Figure 1. Depiction of a spiderweb that served as a blueprint to develop the net of competences. Adapted from [37]



- Design science: it is developed using a design science methodology. This ensures viability for practice [29, 30, 28].
- Information systems: it is implemented as an ICT-artifact that serves as an boundary object [33] in which assessors and assessed can interact [32].

More details to these five characteristics can be found in [49, 24].

Second, a frame keeps the spiderweb intact and increases its stability. Functionally equivalent to a spiderweb, the frame of the *net of competences* are professional competences. The definition of professional competences is subject to ongoing discussion (e.g. [39, 21, 38, 50]); for the purpose of this paper, they can be defined as "connected pieces of knowledge, skills and attitudes that can be used to adequately solve a problem" [51, S. 115].

Third, a secondary frame further structures the spiderweb hierarchically. It increases its stability. Functionally equivalent to a spiderweb, the secondary frame of the *net of competences* is hierarchically described by four broad competence dimensions (personal competence, social competence, methodical competence and domain competence). For a detailed definition of each dimension see [21, 24]. While the secondary frame provides hierarchical structure and stability, these dimensions are not subject to the assessment themselves.

Fourth, radials pull the frame together and contribute to flexibility and stability of the web. Functionally equivalent to a spiderweb, radials are described by theoretical constructs (i.e. sub-competence dimensions) and items. The design of the theoretical model based on the O*Net is described in [24]. Currently, the *net of competences* consists of 32 sub-competences. They are subject to assessment through items. Within the *net of competences*, each theoretical construct is characterized by at least three items.

Fifth, spirals provide stability to the radials and thus create a net. Functionally equivalent to a spiderweb, spirals capture the levels of professional competence ranging from novice to expert. The *net of competences* consists of levels of professional competence [15, 16, 13]. Usually, specific verbs are used to describe professional competences on a specific level (e.g. to *describe* a thing is considered to be less complex and requiring less professional competences than to *evaluate* or to *innovate* the same thing in the same context) [14, p. 215]. Within the *net of competences*, levels of professional competence are characterized by such verbs and verb forms.

Sixth, nodes are created where radials and spirals cross. Functionally equivalent to a spiderweb, nodes are the "smallest building block" of the *net of competences*. A node describes a specific level of professional competence on a specific theoretical construct. Each node is characterized by at least three items (an item is a statement about the content of a specific area of professional competence) and a verb (a descriptor that describes a specific complexity of the items content). In sum, these structural components assure that the *net of competences* is moored within the environment and necessary flexible and stable at the same time (Figure 1).

2.2. A process perspective on the *net of competences*

This section outlines how the structural components of the *net of competences* play together in four phases of the validation of prior learning: the *identification*, *documentation*, *assessment* and *recognition* of professional competences.

The **identification** of professional competences aims at making explicit [41, 42] often tacit [52] competences from learning that took place in a setting of formal, non-formal and informal learning [4, 45, 53, 54]. This phase should be guided [6] and facilitated by coaching techniques [55] and social interaction [56, 57].

The **documentation** of professional competences aims at combining [41, 42] explicit evidence of achieved learning outcomes [4, 45]. The *net of competences* relies primarily on creating a portfolio, an "organized collection of (written) materials (either on paper and/or digital) that presents and verifies learning outcomes acquired through experience" [58, S. 600]. It can include résumés, documentation of formal learning (e.g. school or university degrees), non-formal learning (e.g. certifications of community colleges or massive open online courses) and informal learning (e.g. letters of reference from former workplaces, testimonials from the workplace/voluntary work). Also photographs of work samples, presentations, or videos showing behavior in social interaction may be appropriate. While assembling a portfolio is described as tedious and time-consuming [59], it strengthens the overall validity of the assessment [58].

The **assessment** of professional competences aims at comparing *identified* and *documented* learning outcomes against a standard or point of reference [58]. A mixed-method approach is advocated as the "gold standard" [60]. Taking into account different definitions of professional competence [21, 39, 38], several assessment methods may be relevant to accurately assess professional competences. Usually, assessment of competences departs from a self-assessment, where applicants estimate their level of competence against a standard [6]. Subsequently, further evidence through standardized psychological testing can be gathered. However, as professional competences are closely related to action [61] and activity [22], behavioral simulations may be required as some competences cannot be assessed through a paper-pencil test. Here, issues of standardization and validity come into play [62].

The **recognition** of professional competences aims at awarding a partial or full qualification for *identified*, *documented* and *assessed* learning outcomes and is usually done by a competent authority, such as governmental representatives [4, 45]. While the validation of prior learning usually happens step wise, the *net of competences* is designed in a way that an applicant can work iteratively and jump back and forth in the *identification* and *documentation* of learning outcomes before he/she uploads the documentation for assessment. An example how the structural and process perspective are linked can be found in section 5.

3. Generation of items, verb levels and nodes

In [24] we described in detail the development of the theoretical model of the *net of competences* which can be seen as a bridge between the Occupational Information Network (O*Net) and the European competence perspective. This bridge contains 32 theoretical constructs which stand for the relevant

competence dimensions on a very detailed level. These 32 competence dimensions can be aggregated to the four main competence dimensions (personal, social, methodological and domain competence). Based on this theoretical model of the *net of competences* we will now continue to describe item generation, the development of verb levels and their triangulation within the *net of competences* in this section. An overview of the research process is given in Table 3.

3.1. Item generation

The *net of competences* consists of 32 theoretical constructs [24] that are described by at least three items per construct. We generated items to assess the theoretical constructs based on five qualification standards of different Austrian professions. A qualification standard is a document, that comprehensively lists learning outcomes of a profession on a specific NQF level. Learning outcomes are "statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence" [63]. Each of these five qualification standard lists roughly 50 learning outcomes which have to be reached to receive a trading license. To develop candidate items for the assessment of professional competences in the validation of prior learning, we followed a common procedure of instrument development in Information Systems [25, p. 73]. While each profession requires distinct professional competences, here we describe the development of transversal professional competences - which are competences that are not specific to a certain profession.

First, we conducted a content analysis, a qualitative research method that allows to capture and structure the content of large bodies of text [26, 27] - of five qualification standards of different Austrian professions (Plumbers, Butchers, Hair-cutters, Orthopedic shoemakers and Motor vehicle technicians). The content analysis revealed that roughly 2/3 of all learning outcomes of arguably very different professions are similar enough to be grouped together - and thus qualify as transversal professional competences [21]. Second, based on the content analysis of five qualification standards, we generated 160 candidate items [25, p. 73] within the research group. While one member of the group conducted the content analysis and generated candidate items, other members assessed these items and provided feedback on them (i.e. accounting for an expert panel) [25, p. 73]. During several iterations, all 160 items were reformulated (shortened and improved in clarity). Where necessary, we relocated the item to a better fitting theoretical construct (i.e. sub-competence). A second expert panel, consisting of members of the Austrian Federal Chamber of Economics reviewed all 160 candidate items again and adapted them where deemed necessary.

3.2. Development of verb levels

To describe the level of professional competences from novice to the expert - independent of the specific profession - we relied on relevant scientific literature [13, 15, 64]. There are several taxonomies available, which are widely used around the world that describe six levels of professional competences (e.g. [13, 15]). In line with the most widely used taxonomies describing levels of professional competences, the research team decided to develop the *net of competences* distinguishing these six levels. To distinguish these six levels of professional competences, practitioner/policy-making literature offers guidelines containing lists of verbs (e.g. for the European context [8, pp. 34,51-52] or for Austria [65, pp. 25-27]). These guidelines offer - almost endless - lists of verbs to describe learning outcomes and professional competences on specific levels. Table 2 gives an example list of verbs for each of the six levels.

Table 1. Overview of research process

Section	Input	Activity	Output
3.1	Five qualification standards of different Austrian professions	Generation of candidate items through a qualitative content analysis and several feedback loops	160 candidate items to describe and assess the 32 theoretical constructs
3.2	Taxonomies to describe levels of competence; literature to develop learning outcomes	Collection of verbs to describe the level of professional competence through a literature review	Exhaustive list with potential verbs to describe the level of professional competence
3.3	Stakeholder analysis	Adapting candidate items and determining fitting verbs through 15 practitioners panels with representatives of five stakeholder groups	160 qualitatively validated items with fitting verbs for each level

Table 2. Example list of verbs used in the net of competences to describe the levels of competence [15, 13, 14]

Level: Name	German translation	English verbs
Level 1: Remember	(zu) nennen, (zu) benennen	to name, to recognize
Level 2: Understand	(zu) erklären, (zu) beschreiben	to describe, to explain
Level 3: Apply	an(zu)wenden, durch(zu)führen	to apply, to perform
Level 4: Analyze	(zu) prüfen, (zu) analysieren	to test, to analyze
Level 5: Evaluate	(zu) beurteilen, (zu) begründen	to assess, to justify
Level 6: Create	weiter(zu)entwickeln, (zu) optimieren	to develop, to refine

3.3. Nodes: triangulation of items and verb levels

In order to determine whether a verb from the relevant literature described above fits to a specific item, there are certain requirements the verb has to fulfill (e.g. [8, pp. 46-48]):

- it must linguistically fit to the item
- it must be comprehensive for the target audience
- it must describe a specific level of professional competence in regard to the item

To determine which verbs fit for a specific verb level and is viable in combination with the item, we conducted 15 practitioner panels in six Austrian cities with 73 participants in total. Each practitioner panel lasted about three hours and was usually moderated by the first author. In each panel, we went through 10 candidate items and proposed up to four verbs per level that indicate the level of competence for each candidate item. We aimed to find 12 fitting verbs (two on each level) for each of the 160 candidate items.

During the practitioner panels, we asked the following questions for each candidate item: First, *Do you understand the candidate item?*. If at least two practitioners did not understand the item or deemed it was too complicated, the group reformulated the item till a sufficient wording was found while keeping its meaning as similar as possible. Second, we proposed the panels a set of up to four verbs for each of the six levels and each candidate item. We asked for each verb: *Does the respective verb fit to the candidate item?* and *Does the verb reflect the respective level of competence?*. When the group agreed that a verb fitted to the item, it was included, when the group disagreed that a verb fitted to the item, it was excluded. While the moderator guided the discussion and wrote in the database, the panel determined the formulation of items and whether a verb fitted to the item. Depending on the item, it was possible that a verb occurs on two different levels.

4. Outline of the algorithm in the *net of competences*

Although the whole *net of competences* is rather complex, the underlying algorithm itself is relatively simple and straightforward. The algorithm builds up on the three main components of the *net of competences* – competence dimensions, items and verbs. The goal of the algorithm is to assign a value to each sub-competence dimension. The so calculated values represent the levels of each sub-competence within the *net of competences*. The whole action space of the algorithm is spanned by the 160 items, the 32 sub-competence dimensions within the four broad competence dimensions and the 2 alternatives of verbs for each of the 6 competence levels (6 x 2 verbs).

1. Each of the verbs is assigned to exactly one competence level and is therefore coded with the number of the level. Now to each of the 160 items a value between 1 and 6 is assigned depending on the verb the user has chosen.
2. Each of the 32 sub-competence dimensions is characterized by between three and nine items. For each sub-competence dimension, the values of the characterizing items are summed up and are divided by the number of items.
3. The value for each of the four broad competence dimensions is calculated by summing up the values of the sub-competence dimensions which are assigned to the respective competence dimension.
4. The assessor analyses the portfolio documents uploaded by the user (see section 2.2). Each document is assigned to at least one competence dimension. If the analysis shows that the document not only proves a competence, but also documents that this competence has been performed over a longer period of time, then the value of the corresponding competence is increased.
5. On the other hand, if documents do not prove the competence, the value of the corresponding competence is decreased or - in extreme cases - the value is set to zero.

6. In a last step, the values calculated in this way are compared with the defined reference values of the profession in which the user is interested and for which the user has applied for a trading license. This comparison is made either at the level of the four broad competence dimensions or even at the level of the 32 sub-competence dimensions.

7. The result of the comparison is a relative complement in which for each competence dimension respectively each sub-competence dimension the competence value of the user is subtracted from the reference value. A value of zero or greater than zero indicates that the user in this competence dimension already fits well, while a negative value indicates that the user has to improve this special competences in order to gain the trading licence.

5. Implementation and application

To implement the *net of competences*, we have developed a data model to map the four broad competence dimensions (personal, social, methodological and domain competence) and the 32 sub-competences in an ICT-artifact. The 160 formulated items describing 32 sub-competence areas are stored together with the answer options (verbs) and reference values. As the ICT-artifact is currently running on a server, all changes made in the database are logged automatically and are stored comprehensively related to change protocols (i.e. a version history is fully implemented). Further items and verbs can be stored in the system for the future goal of simplifying the acquisition of a trade license. To integrate the domain-specific professional competences of each single profession, an online module to moderate practitioner panels with professional associations has been developed and tested in 15 panels. In this frontend, all items and the connected pool of verbs can be edited and changed easily. The ICT-artifact is currently available in a fully functional version for a limited group of users.

From a **user perspective**, the self assessment then works like this: an user is presented with one item after another in the self-assessment. Each item is connected to a specific pool of twelve verbs (two verbs per level of professional competence). For each item, six out of 12 verbs are randomly drawn from the pool of possible and associated answer verbs. Now, each item can be answered by choosing one out of six verbs that are presented to the applicant. The applicant is encouraged to choose the verb that best mirrors his or her estimated level of professional competence in regard to the item. We give an example:

"I am able to ..... the efficiency of processes in my business"

1. level: to recognize, to identify
2. level: to explain, to describe
3. level: to interpret, to demonstrate
4. level: to analyze, to test
5. level: to argue and justify, to evaluate
6. level: to develop, to refine

6. Discussion and Conclusion

In this section, we describe implications for theory and practice; subsequently we point at limitations and opportunities for further research.

6.1. Implications for theory and practice

Departing from a project with the Austrian Federal Chamber of Economics, we draw on a design science research paradigm to ground previous theoretical work (an hierarchical and comprehensive theoretical model that merges the European competence perspective and the American O*Net [24]) in the larger body of research. Reflecting on the development process, we theoretically ground the *net of competences* as functionally equivalent to a spiderweb [37]. While the comprehensive theoretical model consisted of 32 sub-competence dimensions, we now add two components. First, we describe the development of 160 items for the assessment of professional competences. Secondly, we outline the level of professional competence by describing a set of 12 verbs attached to each item. Abstracting from the fieldwork, we introduce an algorithm that connects each component and shows how qualitative documentation of professional competences can be transformed into a quantitative judgment. In so doing, we contribute to the integration of approaches describing the content of KSC (e.g. [66, 11] with approaches describing the level of proficiency and development of KSC (e.g. [13, 15, 14, 16]).

Practically, the outcome of this research endeavour targets the scarcity of ICT-based assessment methods within the validation of prior learning in the European context. Especially the algorithm introduced in section 4 can be directly applied by professional associations to assess the documentation of professional competences and transform qualitative portfolios into a quantitative judgment. Through its fine granularity, it is possible to determine learning needs [17] (i.e. opportunities and potentialities for learning) and thus fosters the design

of effective learning intervention in regard to a specific profession. As the *net of competences* is currently fully embedded in an ICT-artifact, it may support professional associations in standardizing their assessment procedures and thus increase their legitimacy [46].

6.2. Limitations and further research

Besides limitations that are inherent to the research design itself [30, 28, 29], there are some specific to the *net of competences* as presented above. As the *net of competences* is linguistically close to qualification standards, a good command of German is currently required for applicants and assessors. Thus, it is not an entry instrument to integrate applicants into the labour market [67, 56, 57]. Furthermore, some applicants might tend to overestimate their performance [68], others underestimate themselves and their performance [69]. Others may find it difficult to choose only one verb as two would fit their level of professional competence better. Also, the visibility of validation procedures remains a challenge in general [60], as people are not aware of their prior learning and do not count informal learning outcomes as a part of professional competences.

Further research may explore how comparative judgment [32] could be implemented in the assessment procedures within the *net of competences* to increase the overall validity of the assessment. Comparative judgment turns out to be a valid approach to implement rank ordering of documentation of several applicants, which is strongly facilitated by ICT. In regard to the design of the *net of competences*, further research should aim at validating candidate items and verb levels [25] by the relevant stakeholder groups [35]. To strengthen viability in the field, further research may assess the perceived usefulness and perceived ease of use [70] and conduct usability tests [71] of the ICT-artifact. As outlined in section 4, it is important to determine criteria that increase or decrease the weight of a single documentation. Thus, it is important to find answers to the question, which criteria influence the trust and trustworthiness of documentation in mediated social interaction. For example, how reputation scores [72, 73] influence trust in online interaction has been subject to extensive scientific research [74]. From a technical perspective, natural language processing (NLP) and text analytics methods may be incorporated in future research. For instance, the *net of competences* could integrate methods to analyze synonyms (e.g. through ontologies), word meanings and word types (e.g. through part-of-speech tagging).

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