

Social Tagging Systems – Shall we use the collaborative and collective approach to gather competency related information?

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Abstract. *Social Tagging as a decentralized collaborative and collective approach to describe, structure, and share digital objects with user created keywords has become increasingly popular since 2004. Once evolved from a social bookmarking application service, meanwhile it is used for several private and corporate purposes. It is also applicable for e-HRM tasks, e.g. augmenting employees' profiles and competency models with tags. In this paper we pursue to detect its applicability to support competency acquisition. In detail we firstly answer the question, which characteristics social tagging systems offer to gather competency related information in order to describe competency profiles. To answer this question we present a conceptual framework that focuses on social tagging systems from an external and internal view. Secondly, we analyze if social tagging systems are able to ensure the provisioning of reliable and valid competency related information from the classical testing theories point of view. It has been detected, that both the ambiguity of language and the absence of rules aggravate the estimation of reliability and validity. Nevertheless, other strengths social tagging systems offer have been found. They equalize the lack of information quality and make social tagging systems valuable for competency acquisition.*

Keywords: competency acquisition, conceptual framework, reliability, validity, classical testing theory

Introduction

The popularity of Social Tagging has rapidly increased since 2004 [52, 62]. Social Tagging is mostly known from private application context. Once evolved from Social Bookmarking Service (delicious)⁴, social tagging systems have become one of the best-known web-based [42] social software applications. One reason for its ongoing

⁴ <http://delicious.com>

Strohmeier, S.; Diederichsen, A. (Eds.), Evidence-Based e-HRM? On the way to rigorous and relevant research, Proceedings of the Third European Academic Workshop on electronic Human Resource Management, Bamberg, Germany, May 20-21, 2010, CEUR-WS.org, ISSN 1613-0073, Vol. 570, online: CEUR-WS.org/Vol-570/, pp. 186-205.

popularity is their simplicity and ease of use: Everybody can be a tagger, who interacts collaboratively, or collectively with other taggers in a web-based community for the purpose to administer, describe, share, structure and maintain several kinds of digital objects, e.g. pictures (Flickr⁵), videos (YouTube⁶) or WebPages (delicious) using self-created keywords called tags [42]. Taggers do not have to obey any rules or a bound to a controlled vocabulary; so, social tagging systems are anarchic decentralized social indexing systems as well.

Apart from private usage social tagging has also been applied for corporate purposes, e.g. to support and facilitate customers' navigation, e.g. product search (Amazon⁷) by means of product-related tags created by the customers themselves. Meanwhile, it is also possible to use social tagging systems to describe and augment personal profiles using tags. This special form of social tagging is also meant as people-tagging [13, 15, 16]. So far, it has been used for both private and corporate communities e.g. organizations to gather, acquire and retrieve characterizing tags [16, 46].

Moreover, social tagging systems have also become relevant for e-HRM tasks. So far there already exist few approaches which mainly focus on augmenting employees' profiles with characterizing tags [13] contributed by the employees themselves. First promising results have already shown that social tagging systems are useful to facilitate the corporate search for knowledge management, to discover employees' connections and support the expert finding, e.g. IBM Lotus connections⁸ [12, 13]. Another approach combines people-tagging and ontology maturing to support competence management mainly focused on augmenting competency models with tags [6].

However, the applicability of social tagging for competence management still seems not to be exhausted. Social Tagging systems might also be a promising method to support competency acquisition, which belongs to the main functions of competency management as well. It pursues the purpose to provide reliable and valid personal related information, gathered by means of measuring, observing and describing methods. Having both kind of information it gets possible to align required job-related target-competencies with actual competences. Alignment results are for instance needed in human resource management to schedule and control e-HRM tasks, such as strategy, planning, acquisition, requirement, deployment and development.

Although previous researches confirmed social tagging systems enable the provision of characterizing tags; there is need of further research to detect systematically appropriate variants of social tagging systems to support competency acquisition. Further it still lacks evidence if they are also able to ensure the provisioning of reliable and valid information [5]. Hence, we focus on design characteristics and quality of those systems from the classical testing theories' point of view. In short, the following questions are answered:

- ***Q1: Which possibilities do social tagging systems offer to gather competency related information?***

⁵ <http://www.flickr.com/>

⁶ <http://www.youtube.com/>

⁷ <http://www.amazon.com/gp/tagging/cloud?redirect=true>

⁸ <http://www-01.ibm.com/software/de/lotus/wdocs/connection/>

- *Q2: Do they ensure the provision of reliable and valid information?*

To answer the first question Chapter 2 regards several variants of social tagging systems from an external view and to filter appropriate ones. In a second step the internal view focuses on the dimensions social tagging systems consists of, and presents a conceptual framework to detect possible design characteristics to gather competency-related information.

To answer the second question Chapter 3 introduces the quality criteria of the classical testing theory, on which in Chapter 4 the social tagging systems are analyzed if they are able to ensure reliable and valid data information. Difficulties and benefits social tagging systems offer are discussed. Chapter 5 summarizes the results and gives an outlook on future research.

Conceptual Framework

Social tagging systems (social classification systems [57], collaborative tagging systems [62]) is a collective term that comprises different system variants. It is at present still unclear if every social tagging system version is appropriate to support competency acquisition. Hence, we give a short overview on existing system versions detecting appropriate social tagging system variants.

1.1 Social tagging systems – System variants (External view)

Social Tagging Systems allow a categorization from different perspectives. Firstly, the stability distinct between closed and open systems. In open systems the taggers fluctuation is very high, because the taggers are not bound to the system (delicious); whereas in closed systems the same taggers stay for a longer time and the tagger group remains stable (IBM lotus connections) [10, 13]. Secondly, the taggers' transparency within the system separates transparent systems from anonymously ones. In the former taggers use their real names, whereas in the latter taggers act anonymously and hide their identity using "nicknames". Thirdly, social tagging systems, based on their entry barriers, can be split in systems with minor entry barriers [43] and systems with major entry barriers. Fourthly, their purpose separates privately used from corporate ones.

System variants		
Perspective	Characteristics	
Stability	Open	Closed
Transparency	Anonymous	Transparent
Entry Barrier	Low	High
Purpose	Private	Corporate

= Relevant for competency management

Figure 2: Social tagging systems – System variants (External View)

Open Systems are wide spread mainly in private usage. Everybody can become a member of such an open community, because taggers just have to sign in with their email address, first name and last name. It is the taggers decision to use real names or fictive ones, so transparency cannot be ensured. They are not bound to the system; hence, fluctuation level is high. Further, there also exist open social tagging systems which are used for corporate purpose, e.g. Amazon. The entry barrier is higher than the first variant, because only customers are allowed to tag, who are transparent for the company, because of their customer profile. Closed social tagging systems can be found in both private and corporate application [58]. In private application context Collabio [4] has to be mentioned a “Facebook”⁹ application which allows persons to be characterized by other persons with the help of tags in a playful way. Entry barrier is the profile owner decides who is allowed to tag e.g. friends or colleagues. Taggers are consequently transparent to the profile owner and other taggers. Those taggers are bound to the system for reasons of social reputation, consequently their fluctuation is low.

For the context of competence acquisition which takes places in a corporate environment a closed social tagging system is required. The opportunity to tag is restricted to a special tagger group, the organizational members. Taggers interact transparently within the system, and can be identified by their personal ID and real names as well. The entrance to those systems is bound to the employment contract that limit and regulate the period tagger belongs to the systems and how long they obtain a special role and job. Normally, there is low fluctuation within a closed organization. Hence, a corporate purpose is given, so we narrow the variety of all social tagging systems for this paper to closed ones that provide a high transparency of the tagger, low fluctuation and the corporate purpose as well. In the next step we focus on the elements social tagging systems consist of from an internal view.

⁹ <http://apps.facebook.com/collabio/>

1.2 Social Tagging Systems – Dimensions (Internal view)

Previous external view has narrowed the number of several social tagging systems to special closed ones with special attributes. Now, we have also to narrow the number of tagger, digital objects and tags, which are required for competency acquisition.

Social Tagging Systems consist of three related dimensions: tagger, digital objects and tags [9, 42]. Taggers are the persons who interact within the closed community. They obtain several roles at the same time, e.g. they are producer and consumer of their tags [55]. Digital objects are the resources to tag, and tags are used to describe, augment and structure several kinds of them; thereby the same tag can be added to one or many objects.

In context of competency acquisition the variety of those dimensions is restricted. Taggers get additional attributes; they are organizational members, employees, superiors, subordinates and work mates as well. Further, not every digital object is needed to be tagged. We just focus on competency profiles [6]. Finally, we regard only competency related information as special content [63] so the tags are also narrowed to those which contain and competency-related information. However, this seems not to be enough to acquire all facets competency acquisition is composed of. Further filtering views on the limited closed social tagging systems and its dimensions seems be sufficient to define them more detailed. So each single element is regarded in the following from several sub dimensions that originate from competency acquisition.

In detail, the profile dimension focuses on appropriate profile types and several characteristics of transparency [16]. The tagger dimension focuses on taggers rights with the closed system, hierarchical level, and taggers' perspectives. Further the number of taggers, their incentive to contribute, their independence and visibility is regarded. Finally, the tag dimension has a focus on suggested tags, permitted tag-types, number of equal and different tags for single taggers, the acquisition of a temporal dimension, weighted tags, scope of tags, granularity of tags, tag structuring and font size. All dimensions, sub dimensions and combinable characteristics are composed in the figure below and presented in detail in subsequent paragraphs.

Conceptual Framework - Internal View					
Dimensions	Subdimensions	Characteristics			
Profiles	Type	Individual		Job	
	Transparency	Transparent		Non Transparent	
Tagger	Rights	Create	Use	Change	Delete
	Hierarchical level	Equal		Unequal	
	Perspective	Self		Others	
	Number	Single		Multiple	
	Incentive	Voluntary		Compulsory	
	Independence	Given		Not Given	
	Visibility	Transparent		Anonymous	
Tags	Suggestions	Given		Not Given	

	Tag Types	Unrestricted	Restricted
	Use of the same Tag	Single	Multiple
	Number of different	Unlimited	Limited
	Temporal dimension	Given	Not Given
	Weight	Given	Not Given
	Scope	Professional	Personal
	Granularity	Predefined	Not Predefined
	Structure	Given	Not Given
	Fontsize	Equal	Unequal

Figure 2: Social tagging systems – Dimensions (Internal View)

1.2.1 Profiles

Types (Individual, Job)

Actual competency profiles reflect individuals' (e.g. employees') competency stock, whereas target competency profiles point out required job related competencies [11]. A comparison of both helps to detect competency gaps [11]. Based on this information, measures of personnel requirement planning, recruiting or training can be adopted. Consequently, the alignment of actual and target competencies represents a main function of competency acquisition. Hence, social tagging systems might support both competency profiles, individuals 'and job related ones.

Transparency (Transparent, Non-Transparent)

Individuals 'competence is sensitive personal-related information; therefore, a selected group of experts has to acquire and assess individuals' competence. A transparency of individuals' competency profiles, contributed tags and tag creators for all tagger seems to be debatable against the background of data protection. Some people-tagging systems [13, 15] just allow a transparent view on individuals profiles [42], provided that the profile owner and participating tagger agree with that. However, research results show taggers tend to a non-transparent, private solution [49] when it refers to the tags attached to their profile. Thereby it is for the tagger to decide on who and how many taggers are allowed to have a look on their profile.

1.2.2 Tagger

Rights (Create, Use, Change, Delete)

Taggers obtain several rights and roles in social tagging systems [62]. Taggers are consequently entitled to create and use tags for profile description. Due to the context of competency acquisition and in particular the augmentation of individuals' profiles taggers have to obtain additional rights, e.g. changing or deleting tags, if they are inappropriate or false [13, 49]. These rights might also be helpful to eliminate obsolete tags keeping the profiles up to date.

Hierarchical level (Equal, Unequal)

A specialty of social tagging systems is that all taggers are treated equally; everybody can tag and there are no hierarchical differences [53]. However, for the purpose of competency acquisition taggers action is embedded into a closed organizational system, where taggers from several hierarchical levels interact. Every hierarchical level also reflects a special power of decision and expertise [35], e.g. not every organizational member is currently allowed to assess and ascertain competencies. Mutually tagging already exists in social tagging systems; however mutual assessing within an organization is possible but not common [39]. Hence, social tagging allows mutual tagging over several hierarchy levels where all taggers are considered unequal or without the hierarchical restriction, where all taggers are considered equal.

Perspective (Self, Other)

Self-description and assessment by others represent two well-known aptitude testing methods [6], which are often used for competency acquisition and assessment. Social Tagging also offers taggers the opportunity to describe their own profiles (both job-related and personal-related) as well as foreign ones [15]. Social Tagging seems to be particularly suitable and accepted by taggers in purpose of self-assessment and self-reference as previous research results show [14, 21, 22, 42, 46, 64]. For the reason that taggers can have both points of view social tagging systems offer both perspectives: tagging themselves or others [3].

Number (Single, Multiple)

There are several methods to acquire competencies. One of them is the single-appraisal such as a self-description or the single appraisal by the supervisor [37, 39]. A comparison of both represents a common method to gather competency-related information. Apart from those methods there are further methods that include the appraisal of multiple raters, which differ from each other by their perspectives [39]. Social Tagging Systems also allows a single tagger to describe profiles and a description of the same profile by a group of tagger from several perspectives as well [61]. So the number of tagger can vary between one (single -assessment) and many (multiple appraisal).

Incentives (Voluntary, Compulsory)

Social Tagging Systems base on the principle of voluntary participation of taggers. This principle has led to a high acceptance [43]. But Social Tagging System can only then be effective when a minimum of tags and profiles is given. More important become the taggers' incentives. So, the question is if the competence acquisition should be carried out through social tagging systems on a volunteer or compulsory base. Research findings show that taggers can be split by their motivation [13, 42, 56]. So, for instance, some of them tag for their own sake or for the sake the others [13]. Some tag for reasons of self-presentation [42, 64] or just to store tags [15, 50, 51]. Further motivation has also been detected in the users need to be a part of a community. However, compulsory incentives have also been detected [6], e.g. Social pressure can also be a reason why taggers tag to get not excluded from the community [8]. So, voluntary and compulsory incentives can be distinguished. Both are relevant for competency assessment, because in closed social tagging systems with corporate purposes a contribution of tags serves predominantly corporate and non-private purposes, for which voluntary contribution or commitment cannot be ensured [33].

Independence (Given, Not Given)

Social tagging is based on the principle of collaborative object description and taggers interexchange. While the description of a profile just by one single tagger might be time consuming and incomplete, social tagging systems use taggers collaborative participation to get multiple perspectives and a broad description. However, taggers in most cases do not act independent from each other. It is more like a transparency and mutual influence between them [50]. They swap tags as ideas through a transparent visualization in order to collect multiple descriptions, synonyms or alternative descriptions.

Those can be improved if taggers are influenced by tags from others, and an internal vocabulary evolves and gets more stable over time [36]. However, there are few approaches in which taggers act independent from each other in order to filter the best describing tags for a digital object [61]. So, one can decide for dependence or independence over the taggers, but due to the requirements of data protection independence over the taggers shall be recommended.

Visibility (Transparent, Anonym)

Once a tag has been added to an object, its source cannot be traced anymore. In most cases the tag creator remains invisible. Because of its collaborative sharing character tags become common property [50] and can be reused by other taggers, which means one tag can be related with many taggers. However, to avoid inappropriate tags or tag spam [38] it might become important to identify the tagger who causes the false tag [49]. Two cases remain disputable. The first is the transparency and visibility of the related tagger for all others, the second is an anonymous solution, where the tagger remains invisible for reason of data protection and to ensure taggers freedom of opinion.

1.2.3 Tags

Suggestions (Given, Not Given)

A vexed characteristic for social tagging systems is the taggers' free choice of vocabulary without being bound to controlled vocabularies. Ambiguity of language has often been discussed as a main disadvantage of social tagging systems [26, 53]. Therefore, existing approaches tend to get social tagging more structured and recommend to support taggers vocabulary choice by suggested tags [18, 42, 63]. There are already several approaches to suggest tags, e.g. previously used tags [13], tags with similar spell, frequently used ones or the latest ones. Each kind of suggestion aims to reduce the ambiguity of language [18, 53, 59]. It is the taggers' choice to accept the suggest tags or ignore them. Hence, suggestions can be given or not.

Types (Unrestricted, Restricted)

Apart from suggestions a variety of tag-types results from the ambiguity of language [21, 22]. However, it still lacks a complete categorization. We can roughly separate single-word-tags from compounded-tags [59] as well as objective tags from subjective ones [34]. But there are also tag-types only made for the tagger himself to retrieve its own information, which are meaningless for other taggers. For the purpose of competency acquisition just tag-types that contain competency related information are required, not all tag types can be used [5]. Hence, two cases remain to decide for, a reduction of allowed tag-types [63] or tagging without constraints.

Use of the same tags (Single, Multiple)

Normally, competency acquisition methods include a scale to measure the degree each competence has got or is required. However, in social tagging systems a rating scale is missing [31, 55]. Social rating systems represent another social software category. To express the importance a tag has got for one profile, taggers sometimes use the same tag multiple times. But in some social tagging systems the multiple use of the same tag for one tagger counts once even if it is added twice or multiple times to the same object. A reuse of tags by one tagger might also be a method to express the importance the tag has got for the profile or the degree to which a competency is given or needed.

Number of different tags (Unlimited, Limited)

In social tagging systems taggers are not limited in the number of tags they add to an object [22]. It is the taggers' choice how many tags he or she wants to contribute, that's why the number of tags varies among the tagger. Using social tagging systems for competency acquisition regulations to determine the number of tags might be necessary to avoid an assessment bias within a profile and tag spam [38]. However, regulations towards a fixed number of tags might also cause spam [38] tags, when taggers just add tag because they have to. Hence one has to decide for a limited or unlimited number of different tags.

Temporal dimension (Given, Not Given)

Some social tagging systems consist of more than three elements; some also include a temporal dimension to acquire the date a tag occurs for the first time or every time it has been changed. With the additional temporal dimension changes over the time could be measured. The additional temporal dimension might also be useful for competency acquisition to depict changes in the profiles over time [13].

Weight (Equal, Unequal)

Another specialty of social tagging systems is the equality in weight every tag has within the system. This is related with the equal treatment of each tagger. However, a weighted tag might be a method to underline the tags' importance [63], e.g. the superiors' tags might be more important for individuals profiles than the subordinates' one. Otherwise latest added tags might be more important than those which were added a year ago. So, one can decide for unequally or equally weighted tags.

Scope (Professional Competence, Personal Competence)

Current people tagging approaches allow taggers to describe profiles in an unstructured manner [13, 28]. Focusing on competency acquisition there are several dimensions respectively facets competence consists of [24, 37, 60]. According to the DQR competence can be subdivided in two sections: professional and personal competence [19]. Hence, social tagging might cover the whole scope or just one of both sections [60].

Granularity (Predefined, Not Predefined)

Apart from the dimensions competence consists of there are also differences considering the granularity a competence is ascertained. The more granular a competency is acquired the easier it is to align actual and target competencies. However, ambiguity of language and the absence of rules in social tagging systems allow every hierarchical level [63] within the tags [10]. To gather more accurate

information we suggest predefining granular levels. Alternatively to this suggestion a non predefined characteristic is also possible.

Structure (Given, Not Given)

Unlike taxonomies, where terms are clearly kept in strict mono- hierarchical parent-child relations in social tagging systems each tagger can create his or her own structure [43, 55]. In most cases those structures are individual and cannot be matched with others. Tags can also be aggregated, e.g. compounded as tag bundles [42, 53, 59].

Further there exist approaches, which recommend a predefined structure, e.g. by means of given metadata, to get tags more accurate [1]. Another research recommends predefined facets or dimensions, where tags can be sub ordered [48]. In order to get a more aggregated view on competencies a given structure through predefined facets or metadata might be helpful. However it depends on number and quality of facets or metadata whether this is effective [1]. So, one can decide for an integrated structure or a structure less characteristic.

Font size (Equal, Unequal)

Finally, tag visualization as one of the main social tagging characteristics remains to discuss. There are various ways to visualize tags. Tags can be ordered as tag-clouds or they can be listed both horizontally and vertically. It's further on possible to order them either alphabetically, or semantically, or visualize them as unordered [27]. Each visualization aims at supporting social navigation [38, 50, 52]. Apart from structure the font sized can vary. In most cases a big font size represents a high frequency [30], up-to-datedness or occurrence. But it is also possible to visualize all tags in an equal font size.

2 Theoretical Foundation - Quality Criteria

Competency acquisition deals with measuring, elicitation and collection of competency related information; thereby, it gets usually supported by electronically diagnostic instruments for aptitude testing. Creating a scientific fundament each instrument used for competency acquisition requires a theoretical foundation that in most cases is based on a measuring theory. Each theory or model has several assumptions and is founded to quality criteria which have to be observed. Competence is a construct of aptitude testing [60]. Normally, methods to measure competencies for competency acquisition are evaluated by quality criteria, particularly reliability and validity that result from classical testing theory [25]. So, classical testing theory seems to be an appropriate theory to evaluate social tagging systems. In the following assumptions of classical testing theory are presented in short.

2.1 Assumptions

Classical testing bases on three main assumptions (axioms) and additional assumptions as well. All of them concern the measuring process and in particular the measured values [44]. Firstly, the existence axiom declares that the real value exists as the expected value of a measurement. Secondly, the connectivity axiom implies that each measured value consists of both a true and an error value. It implies each measurement is defected with errors. Thirdly, the independence axiom precludes that there is dependence between error values and true values among several persons. It is additionally assumed that error values within a person are not related. Further independence over participating raters is assumed [25]. Classical testing theory mainly

considers the quality of a measurement or elicitation from the measurement errors point of view; therefore it is also called “measurement error theory”. Measurement errors or error values can be subdivided in coincidental errors and systematical errors [23]. The former results from internal and external influences a person is affected with. They appear infrequently and are non predictable. The latter appears in pattern and results from errors within the theoretical or empirical measuring model. According to the classical testing theory error values result from the lack of quality. Thereby the degree of quality can be estimated with quality criteria, in particular, reliability and validity which will be subsequently introduced.

2.1.1 Reliability

Reliability is „ (...) the degree of accuracy a procedure has with regard to the characteristic to be measured.“ [35, p. 250][29]. It is also a degree for the stability a measuring instrument has got. [44]. Reliability requires two temporal distanced measurements which have to congruent in their measured values. So, reliability is a measure how prone a measuring method is for coincidental error values. Getting reliable results or measured values rules, regulations, norms and structures are necessary required.

The estimation of reliability embraces stability over time (re-test reliability), internal stability and at last the agreement over several raters in their interpretation of measured values. In detail re-test reliability can be estimated if there are two measurements at different times in which the same group uses the same method to measure or ascertain the same thing. A special kind of re-test reliability is the intra-rater reliability, a measure for the stability of measured values within one rater over time [2]. Estimating internal consistency it requires a measuring method to be divisible into many equal small measurements, which count as a measurement for their own [29]. If all measurements deliver the same measured values, internal consistency is given. Thirdly, inter-rater-reliability can be estimated if a fixed group of rater is ensured, who interpret the same measured value independent from each other in the same way. It implies a measuring method to be clear and accurate so that coincident interpretation errors can be minimized.

2.2 Validity

Validity is a measure how trustworthy, complete and valid a measuring method is. It is given if a measuring method exactly measures what it is supposed to do and nothing else. Validity can be assumed as given if theoretical argument and empirical results underline this. Validity represents further a measure, how prone a measuring method is from both systematical and coincidental error values [2].

There are several ways to estimate validity. Firstly, content validity is a measure if the applied measuring method actually measures the whole content respectively every facet of the regarded construct. It implies that a construct is measurable and a fixed definition exists which contains every facets the construct exits of it [60]. To estimate or test the content validity normally experts are interviewed, respectively, consulted. This is what we call face validity, which is given if the majority of experts agree with the definition. Secondly, criterion validity is a measure to what extent measured values match with present or future external criterion. Simultaneously or present comparison is regarded by concurrent validity, whereas predictive validity focuses on delayed comparisons. Thirdly, construct validity is given if actually the contrast is measured and nothing else. To put that in our perspective construct validity is given if all measured values refer to

competence and not to intelligence. Convergence validity is given if several measuring methods get the same measured values. Discriminate validity is given if measuring different constructs provide different measured values.

3 Discussion

Based on conceptual and theoretical assumptions we answer the question if social tagging systems, as limited before, are able to ensure the provision of reliable and valid competency related information. In the following at the first step we examine to what extent social tagging systems ensure the measuring of both quality criteria. At the second step we show up the sources of coincidental and systematical errors and give recommendations to minimize them referring to our conceptual framework.

3.1 Reliability

Estimating intra- rater reliability or re-test reliability a temporal dimension is required to compare tags within one tagger over time. Further, it has to be ensured that a tagger remains for a fixed period within a social tagging system. It is necessary that at least two measurements at different times can be done to compare changes within the tags. This is only to ensure in closed systems, because in open ones there is nothing that bounds a tagger to a system, whereas in closed systems the employment contract regulates the length of a period a tagger is bound to the organization. It still lacks research if competency related tags within one tagger are stable over time. Tags represent the taggers vocabulary, which develops over time as well as the tagger's personality and competence. Although previous findings show that some patterns of stability in the taggers vocabulary choice and spelling exist [50], it remains unclear if their understanding of the tag content remains also the same.

However, just the fact that the taggers belong to the organization does not guarantee their contribution yet. Previous findings show taggers can be distinguished in power user respectively normal taggers who tag frequently and lurkers who tag infrequently or just profit of existing information [50, 51]. This aggravates the validation of re-rest reliability and intra-rater-reliability for all taggers.

Currently, there is just a voluntary incentive; taggers are free to contribute tags driven by their own motivation. A compulsory incentive for now does not exist. However, if taggers are not expected to contribute, re-test reliability respectively intra-rater-reliability might be hardly to estimate. But a compulsory incentive might also increase the spam tag [63] because taggers just tag because they have to.

Estimating internal consistency implies that the measurement method, e.g. social tagging systems can be divided into many smaller measurements which measure the construct competence in an equal manner. Social tagging systems consist of multiple taggers, profiles and tags and it is possible to form smaller social tagging systems within one system. However, there are differences between each single tagger, profile and tags, so equality of each dimension is hardly to attest. For instance, there are several tag types which vary in their accurateness, objectivity and content. Not all of them are appropriate to ascertain competencies [5]. Further, spam tags exist [38, 54] that does not contain any relevant content. So consistency within the measurement method is hardly to attest.

Estimating inter-rater-reliability implies that at least two taggers tag the same profile. In social tagging systems multiple taggers describe the same digital object in a collaborative manner. However, the number of tagger varies depending on the digital object, respectively, profile. It is possible that just one or all taggers describe a profile,

because there are no rules that restrict a minimum of taggers. Referring to the conceptual approach there are several possibilities to estimate inter-rater-reliability exist, e.g. estimating inter-rater-reliability over several perspectives (self-assessment and foreign appraisal) [15], several hierarchical level or within one hierarchical level can be done.

Secondly, inter-rater-reliability requires congruence over taggers' interpretation of the same measured value. In social tagging systems there are neither rules nor regulations concerning the vocabulary choice. This causes the ambiguity of language social tagging systems are known for, in particular tags are imprecise [26]. Synonyms, homonyms, abbreviations and so on are not excluded because taggers are free in their vocabulary choice. However, taggers differ from each other in their linguistic power of expression, cognitive talents and domain knowledge [17]. Hence, ambiguity can be avoided neither in the spelling, nor in the understanding or sense a tag has [31, 53, 54]. For example, although an individual's profile is tagged multiple times by different taggers with „leadership ability“, inter-rater-reliability cannot be attested at all because each tagger might have its own understanding, what “leadership ability” is [16, 45]. Tags are consequently not accurate to interpret, in particular single-word tags offer polysemy [3,57]. But can be used as a start tag which can be augmented with more specific tags.

Further there tags with multiple or additional hidden meanings that are just understandable for a special group, called socio-semantic tags [34, 57]. Apart from objective tags there subject related ones [32], which can just be understood or interpreted by the tagger himself [6, 13, 32, 51, 53]. So, we recommend limiting the tag-types to those tag types which are clear for all taggers. Problems to interpret tags in an accurate manner might further result from different granularities within the tags. Fine-granular tags might be more accurate than large-grained ones, e.g. the tag „C++“ is more defining than “computerlanguage”. We recommend a predefined granularity level; however, it needs further research to detect which granularity-level is the best.

Independence from the participating taggers for each tagger has to be observed for competency acquisition and assessment procedures [35] according to the German requirements for proficiency assessment procedures and classical testing theory as well. In detail, it concerns the processes of acquisition, interpretation and evaluation of competency related information respectively tags. It is especially relevant for personal related information and individual's competency profile description due to the fact that competencies are sensitive personal-related data. However, social tagging systems follow the principle of collaborative tag sharing and a mutual transparency of all contributed tags [13, 15, 16]. So it requires a special characteristic as we presented in the conceptual framework.

Assuming each tagger tags independent from others the same profile, multiple single descriptions of one profile are given to estimate their inter-rater reliability. In this combination multiple tagger are involved in a collective way. To ensure independence the transparency we recommend to keep profiles and the foreign related tags non-transparent for the tagger that he or she just see own contributed tags [61]. Thus coincidental errors that result from external influences might be minimized.

Nevertheless, coincidental errors result from both influence sources externals and internals as well. This has been scarcely confirmed in [30, 50], which show taggers are influenced by their own subjective point of view and other taggers' influence as well. Internal coincidental errors result from the taggers' current temper and personality. So, every tagger is influenced by its own idiosyncratic subjective point of view [20].

Socially desired tags cannot be avoided at all [6]. Otherwise, tags can consciously be avoided [16], e.g. to strip other taggers a special competence which tagger do not have themselves or just to save another tagger to be not connected with an expertise they want not to related with [14]. Underestimation or overestimation of their own or foreign competencies might occur as well [23].

However, classical testing theory assumes the true values are the expected values, so the mean of multiple measure values might compensate error values. Social tagging systems already use the wisdom of multiple taggers to describe the same object. The congruence over several taggers in his or her profile description helps to detect relevant tags. Research results from social indexing show, taggers agree on core terms [60], which are mostly defining for a digital object. Nevertheless, even if tags just appear once, they can be valuable [4]. Therefore, social tagging seems to be an appropriate method to minimize internal coincidental error values. The more taggers are involved, the more objective a profile description might become [36], it might also be helpful to improve inter indexer inconsistency [21, 22, 30]. Further subjective coincidental errors in competency acquisition could be reduced [23].

However non-transparent solutions act against the collaborative character social tagging systems has. Hence, we recommend a transparent solution, in which a tagger is influenced by external criteria (foreign tags) but all taggers interact invisibly with each just other over their tags. Thereby, all tags are in an equal font size to avoid halo effects [23, 27]. So, every tagger gets more objective information, foreign tags work as suggestions and it is the taggers decision to use the same tags or create new ones. So, taggers might be inspired by other tags to find additional rich deep information. It requires further research whether this approach observes the requirements for proficiency assessment and data protection.

Finally, due to the accuracy and trustworthiness [35] to estimate inter-rater-reliability it requires equal expertise or domain knowledge for all taggers. In social tagging systems an expertise is not required [17, 43, 52], each tagger is allowed to participate [51] However, it requires empirical research to test if non-experts tags are less defining than experts [31, 51]. Taggers differ in their expertise and knowledge, especially if we assume that they are from several hierarchical levels. But every single tagger has got special domain knowledge and might contribute hidden but important competency related information [5, 31]. For example, a tagger who has no special expertise in competency acquisition might know in detail which competencies his job requires. On the other hand, work mates might also know each other from another perspective than superiors or subordinates do, similarly to the multiple-rater-assessments. So, we recommend reaching equality in the taggers expertise as required to weight tags corresponding with the hierarchical level or by the distance a tagger has to the profile owner or job.

In sum, it remains debatable if social tagging systems provide hard, reliable and accurate competency-related information. But using the recommended characteristics coincidental error sources might be minimized, which required further research. However, rich, deep competency-related information from many different perspectives can be gained [4, 7]. Social tagging systems seem to be appropriate to detect hidden information [5], which is hardly to collect over all facets with current methods in such a simple manner. Especially for self-description they seem to be an appropriate method [16, 46,50] because taggers can describe their own competencies in their own words as detailed as required.

3.2 Validity

Estimating content validity it requires a fix measuring model that defines all facets dimensions competence consists of, in a special granularity [2]. However, social tagging systems do not provide any guidelines or definitions. They rather aim at the collection of all possible descriptions a digital object or construct might have. Social Tagging systems are foreign from controlled vocabularies, in which a single group of experts defines what competence is, the facets it consist of and how granular it is to ascertain. Instead of consulting experts to evaluate the face validity, social tagging systems use the collective knowledge of taggers to get a broad, rich and extensive definition. So content validity in social tagging systems is not based on a fixed definition but it is rather a continuous evolutionary defining process. This procedure is already used in combination with ontologies to augment competency models supported by employee's commitment [6, 33]. So, content validity is difficult to estimate. Estimating criterion validity needs external criteria, e.g. empirically measured values to which tags can be compared with. This could be difficult to prove because competence is hardly to measure directly [6]. Hence, the estimation of concurrent and predictive validity requires further research. Estimating construct validity implies that, firstly, the construct is measurable and it, secondly, can be clearly distinguished from other constructs [2]. This seems to be difficult for multifaceted constructs such as competence [24], because there are several definitions and in part overlapping understandings what competence is [37,41]. Competence is a latent construct that consist depending on the situation of more or less facets [2, 41]. The harder it is to ascertain all facets with one measurement method [2]. But competencies are everywhere to detect, so each tag might be able to ascertain a small facet of competence [6]. To estimate convergent validity we recommend comparing tags with existing definitions and measured values gained by other conventional methods. If they are congruent concurrent validity is given. Estimating discriminate validity requires additional social tagging systems that ascertain other construct profiles with the same tagger. Both require further research.

4 Conclusion

Firstly, we answered the question which possibilities social tagging systems offer to gather competency related information. In order to do this we systematically examined social tagging systems from external and internal points of view and presented a conceptual framework that consists of several design characteristics ordered by social tagging dimensions and selected sub dimensions.

Secondly, we aimed at finding out if social tagging systems are able to ensure the allocation of reliable and valid competency related information. To examine this we regarded social tagging systems from the point of view of classical testing theory. In particular, we focused on their reliability and validity. It has been detected that the absence of rules, independence from the taggers and missing expertise as well as the ambiguity of language aggravate the estimation of reliability and validity. The main disadvantages result from the shortness of tags that allows different understandings and interpretability. So, from classical testing theory's point of view social tagging systems do not fulfill the requirements to gather hard-reliable and consequently valid competency-related information. This was previously assumed in [17], who consider the flexibility and ambiguity of social tagging systems as a negatively influence on the quality of tags [51]. Social tagging procedure is similar to qualitative research methods that use the language of the society and acquire or gather data from the participant's point of view, who describe constructs through their own eyes [7].

Nevertheless, using social tagging for competency acquisition is valuable for e-HRM. Because of their decentralized collaborative character, it is a free choice of vocabulary and missing structure social tagging systems are accepted by many people. Their commitment could be helpful to ascertain more hidden, deep and rich information by several multiple perspective which otherwise would not have been ascertained [4]. Using the collective or collaborative gathering approach social tagging systems consist of multiple perspectives from several points of views can also make competency-related information more accurate [30]. Further benefits, social tagging systems additionally provide, are hardly to detect with chosen quality criteria. So we propose another evaluation by substitute quality criteria e.g. efficiency, effectiveness [30], relevance and usefulness.

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