Social-QAS: Tailorable Quality Assessment Service for Social Media Content

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Abstract. More than 3 billion people use the Internet, many of whom also use social media services such as the social network Facebook with about 1.35 billion active users monthly or the microblogging platform Twitter numbering approximately 284 million active users monthly. This paper researches how a tailorable quality assessment service can assist the use of citizen-generated content from social media. In particular, we want to study how users can articulate their personal quality criteria appropriately. A presentation of related work is followed by an empirical study on the use of social media in the field of emergency management, focusing on situation assessment practices by the emergency services. Based on this, we present the tailorable quality assessment service (QAS) for social media content, which has been implemented and integrated into an existing application for both volunteers and the emergency services.

Keywords: Social media · Information quality · Tailoring · End User Development · Emergencies

1   Introduction

In times of a widespread adoption of interactive web technologies and social media, the importance of citizen-generated content is increasing constantly. According to the definition of the Organization for Economic Co-operation and Development (OECD) [20], user-generated content is "content that has been made publicly available via the internet" and reflects a "certain amount of creative effort", and which is "created outside of professional routines and practices". In recent emergencies such as the 2012 hurricane Sandy or the 2013 European floods, both the people affected and volunteers alike used social media to communicate with each other and to coordinate private relief activities [11]. Since the involvement of citizens is mostly uncoordinated and the content is therefore not necessarily created in a structured way, a vast amount of resulting data has to be analyzed. Appropriate methods of valuation are essential for the analysis, whereby a consistent evaluation of the quality of information can be complex [6]. Especially in cases where a selection has to be made from a variety of information sources and formats, it is helpful if the evaluation can be made easier by applying diverse quality criteria.

This design case study [41] aims to examine the challenges arising from the integration of citizen-generated content and especially the evaluation of information from social media. Based on a review of related work, we sommarize the results of our conducted empirical study on the use of citizen-generated content and social media by the emergency services. Based on the challenges focusing on individual and dynamic quality assessments of social media data, we have implemented a platform independent quality assessment service (QAS) for social media data. Further we have prototypically implemented and evaluated QAS into two reference applications [15, 27].

2   Related Work: Situation Assessment with Social Media

Information is essential for situation assessment during emergencies and has to be available at the right time, at the right place and in the right format [12]. Endsley [4] distinguishes between *situation awareness* as a "state of knowledge" and *situation assessment* as the "process of achieving, acquiring, or maintaining" that knowledge; and sees information gathering as a selection process leading to the construction of a mental model in accordance with individual goals. Since emergencies are not only time-critical but also unique, they generate a special demand for information that cannot be predicted. It is difficult to have all the essential information available [37]. The availability of as many sources as possible, which can be accessed without delay, would appear to be indispensable. At the same time, it is crucial to avoid a potential overload of information in such a way that the decision making is not influenced [10].

Information systems support both situation assessment [22] and decision making [40] in crisis management. It is, however, especially when dealing with such seldom used technologies within emergencies and while assessing social media that challenges still arise. Adaptations of these technologies and particularly of the information being considered are necessary and become especially important at 'use-time' [5, 21, 33]. Concepts of End-User Development (EUD) can support flexible adaptations by enabling end-users to adapt and reconfigure information systems independently [13]. EUD is understood as all "methods, techniques, and tools that allow users of software systems, who are acting as non-professional software developers, at some point to create, modify or extend a software artifact" [13]. One important concept of the discourse of EUD is tailoring, referring to the change of a "stable" aspect of an artifact [9]. However, what is 'tailoring' for the one person can be 'use' by another. Tailorability essentially has to be one important aspect of software with regard to its establishment in practice.

Mashups can enable EUD to combine services or information from various sources [1]. In addition to information that is provided automatically (meteorological data, water levels, etc.), there are two other kinds of information sources provided by people: emergency services in the field from whom information can be requested [16] and other individuals and organizations not actively participating in dealing with the emergency situation. In the case of a house coal, the number of residents can be requested from the registration office, but the estimation of the fire's size and the number of affected people can only be performed on-site. For example during a power blackout, electricity suppliers can provide the emergency services with better and

faster information about which areas are affected than this information could be gathered on-site [12]. However, a lot of pictures of the emergency itself can be found on social media platforms. Such examples show that external information can speed up the process and sometimes cannot be gathered on-site. Thereby information provided by citizens is not always objective – opposed to data measured by sensors. However, sometimes citizen generated content is very accurate – illustrated at a comparison of Wikipedia and Britannica encyclopedia articles [8]. In some cases the subjectivity of citizen-provided reports can generate some sort of vigilantism [28]. Additionally, the misinterpretation of a situation – whether deliberate or not – can lead to potential misinformation; this can result from the reporter paying too little attention to some aspects of the situation or from an incorrect representation of the facts [36]. However some information cannot be obtained from other sources [42]. There are already approaches concerning the selection and use of citizen-generated content but which do not support a complete quality assessment:

- *Twitcident* [35] is used to select tweets by keywords, the type of message or the user and displaying them on a map. At the moment, quality assessment based on meta-information such as the time of creation is not possible. Further, it does not include any information from other social media platforms.
- *SensePlace2* [29] shows another possible solution for displaying georeferenced information on a situation map gained from tweets. The problem is, however, that it collects an extensive amount of data without quality assessment so that the information overload problem is not dealt with.
- *Tweet4act* [3] enables the tracing and classification of information published on Twitter. It is realized through matching every Tweet against an emergency-specific dictionary to classify them into emergency periods. Methods of machine learning based on dictionaries and language classification are used.
- With *TwitInfo* [18], information for a specific event can be collected, classified and visualized. Aside from a graphical visualization, additional information about the quality of the actual information is presented. A personal selection of the quality requirements of the user is not implemented.
- *Ushahidi* [19] enables citizens to exchange information. Additionally, this information can be made accessible for emergency services. The direct communication and the spread of unfiltered information can cause an information overload which forces the user to evaluate the information manually according to its quality.
- *Tweak the Tweet* [32] supports the evaluation and classification of information. Even though the syntax allows variations of the quality assessments, the evaluation of information in only one specific format disables the possibility to show them on a clearly arranged situation map.

In summary, it can be stated that there are already many studies and approaches which deal with citizen-generated content; but with regard to the subjectivity of quality assessment, the current approaches are missing a tailorable tool for assessing social media information. Our research question is therefore, how the concepts of EUD can be applied to support individuals in extracting relevant social media information.

3   Pre-study: Social Media Assessment by Emergency Services

To gain a deeper understanding of the impact citizen-generated content has on social media within emergencies, we analyzed the data from a previous empirical study on the current work practices of the emergency services (focus on fire departments and police) in two different regions of Germany. The results of this pre-study have already been published [15, 26] and we aggregate the main results within this paper.

3.1   Methodology

The bases for the data analysis were the results of multiple empirical studies from 2010 to 2012 [23]. The studies were embedded in a scenario framework describing a storm with many minor and connected incidents and energy breakdowns, which had been developed together with actors from the police and fire departments, county administration and an ENO. The purpose of the scenario was to be able to create a common understanding of an occurring emergency quickly and therefore it helped to increase validity and comparability in our interviews.

First we conducted observations in order to acquire knowledge regarding the practical work in inter-organizational crisis management. The observations took place in a control center on a normal working day (observation time: 9 hours); in the crisis management group and the operations management during a crisis communication practice course (4 hours); as well as at a major cultural event with about 400,000 visitors (6 hours). In addition to observations, we conducted 5 inter-organizational group discussions (W1-W5, each 4 hours with about 10 participants) to understand the communication methods of inter-organizational crisis management. Furthermore, we conducted 22 individual interviews with actors from the participating organizations (I01-I24). Each interview lasted between 1 and 2 hours and followed a guideline, which was separated into three parts. The first part focused on the participants' role, qualification, tasks and work activities under normal conditions. The second part covered the participants' tasks during emergencies in our developed scenario framework. The third part covered applied information and communication systems and perceived problems with these tools. To study mobile collaboration practices more closely, also in regards to the creation, exchange and use of information by the response teams and the control center, an additional 5, partially structured, interviews were conducted (IM1-5; each 1 hour).

Group discussions and interviews were audio recorded and later transcribed for subsequent data analysis. The analysis of the data material was based on the inductive approach found in *grounded theory* approach [34]. We chose this systematic methodology to discover insights about the work practices through the analysis of data. To be able to use this methodology, the transcripts were coded openly and the agents' statements were divided into text modules and later into categories. The knowledge previously acquired in the literature study was used to heighten *theoretical sensitivity* [34].

3.2   Results I: Use of Citizen-Generated Content for Situation Assessment

Generally it is not possible to base a situation assessment solely on the information gathered from one's own organization. External information can improve the information basis (W3). In addition to textual data, pictures provided by citizens are often used. These pictures enable better assessment of how the emergency was caused and what the actual situation looks like:

"If you look at information during demonstrations or other events, you can see that it is often provided faster via Twitter than we can manage on police radio or mobile phone […]. When events are taking place, they can also often be found on the internet, accompanied by pictures and videos. We will have a lot more to do with that in the future; I am pretty sure about that." (I02).

One example is the debriefing of an event: *"Our investigators like to use fire pictures because obviously our criminal investigation department is not on-site when the fire starts. Of course, they depend [on them] […] to see the fire behavior."* (I02).

But information is not always necessarily helpful: *"Information is only helpful when it affects my behavior. Any information that does not affect my behavior is a sensory overload"* (I06). An attempt is therefore made to gather only that information which is relevant: *"We try to obtain information from each and every caller"* (I15). Even in emergency situations, people on-site are becoming involved in supporting the emergency services: *"There are many special cases where you need basic skills or previous knowledge but there are also cases in which you can fall back on knowledge and skills provided by citizens"* (I11). Regardless of the large amount of information, the time factor exerts considerable pressure on the emergency services. Due to this, it is always important that each operation is executed promptly. There is *"no time to deal with strangers additionally"* (I02). The fact still remains that citizen-generated content may be defective and therefore requires information assessment.

3.3   Results II: Selection and Quality Assessment of Social Media Content

The question: *"Who is going to evaluate this now […] and is it really going to help us to assess the situation?"* (I03) often appears in emergency situations. The sheer amount of citizen-generated content makes its use especially difficult: *"Above all, 290 [messages] of 300 are trash. You can only get something from ten reports"* (I02). The mass of information quickly raises the problem of how to handle it: *"You have to read them all. Of course it would be helpful if there was a preselection"* (I02).

For this reason, automatic selection is recommendable: *"It would be nice if there were a selection that separates the important from the unimportant"* (I03). Nevertheless, information has to appear in a certain quantity to render it trustworthy for the emergency services: *"It's a problem if I only have one source. It is certainly more reliable to have five sources than just one"* (I15). External sources are especially susceptible to providing misinformation (I14, I15) and have to be verified (I15) because of this: You *"have to be careful with the content because it does not always reflect reality"* (I14) – *"In such cases it becomes obvious that someone is trying to lead us up the garden path […] and we have to evaluate the information for*

ourselves" (I02). In these cases, misinformation is not always intended; potentially it can result from the subjective perception of the situation which can appear very different to a neutral observer. In conclusion, the use of citizen-generated content from social media fails because of the need for assessment by the emergency services: *"There is simply a bottleneck which we cannot overcome"* (I02).

Overall it is noticeable that *"the more precise information, the more relevant it is"* (I02). This kind of precision can be achieved by assessment. There has to be some form of guarantee that the selected information is useful for the emergency services (I02, I03). Global selection also proves to be difficult because *"it does not seem possible to me that we can select in advance what is important for the section leader. He might need the same information as the chief of operations – or not"* (IM01). This therefore necessitates the possibility of flexible assessment criteria (I19). Due to the time-critical aspect of emergency situations, it is imperative that the personal selection of information be supported since every member of the emergency team has to decide *"relatively quickly between the important and the unimportant"* (I19).

The first impression has to include some amount of significance and has to be helpful for the situation assessment: *"If someone he takes a photo of a window, I know that he was really there. But where is that window exactly?"* (I16). This shows that pictures need additional meta-information just as normal textual information does. Pictures can be especially helpful for assessing crowds of people at huge events: "*If someone had noticed that a relevant number of people were congregating in certain areas, you could have closed the entrance immediately with the help of the security*" (I06). Even though this entails gathering a lot of information,*"most people […] do not [know] what counts and what kind of information we need"* (I02). There is therefore a risk that the information has no additional value and cannot be used in the emergency situation: *"I do not believe that who is not connected in some way to the police or the fire service is capable of providing useful information in these stress situations"* (I02). It is unusual for an untrained citizen to have knowledge of this sort. *"You have to be very careful with this kind of information"* (I14).

3.4   Results III: Responsibility and Decision Making

Ultimately, it is a member of the emergency team who has to take responsibility for actions taken and who also has to decide if the information is used or not (I15). Misinterpretation is possible both by humans as well as through computer support. It does not matter how good the assessment mechanism is: there *"remains a risk and the person in charge has to bear it, it is as simple as that"* (I15). That is the reason why the emergency services are so careful when using external information. In conclusion it can be stated that *"assessing information, assessing it correctly and dealing with it […] is a challenging task"* (I15). Every single piece of information is an input to evaluate the whole situation: *"You add more and more flesh to the skeleton you start off with, so that in the end, you have a picture; not just a silhouette but a whole figure and any actions executed by the police are mostly based on that figure"* (I16).

*S*ituation assessment influences the actions which in return influence the situation. However, it does not always make sense just to increase the amount of information. Because as the American political scientist Simon has early stated in 1971, the higher the amount of information, the higher the consumption of information, which in turn creates a "poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it" [30].

4   Concept: Tailorable Quality Assessment Service for Social Media Content

It is not only our literature review and the empirical study which have shown the quality assessment of mass information and extractions of relevant information to be a major challenge. It seems comprehensible that different circumstances require different assessment methods. The option to combine these methods could therefore contribute to the improvement of the quality assessment practice [15]. Several assessment methods have already been shown in section 2. In section 3 it has been shown that different assessment methods can support the subjective quality assessment in different situations. Our concept enables the assessment of (social media) content with 15 assessment methods (Table 1) which can be divided into four categories according to their technical execution:

1. The **rating of metadata** contains five assessment methods (author frequency, temporal proximity, local proximity, number of followers/likes, amount of metadata), in which either the deviation from the entered research criteria or the absolute appearance is determined by assessing the difference.

2. The **rating based on the content** provides two assessment methods (frequency of search keyword, stop words), that ascertain the appearance of certain words (or their synonyms) from a list.

3. The **rating based on the classification of the message** uses six assessment methods (sentiment analysis, fear factor, happiness factor, named entity recognition, emoticon, slang), which determine the appearance of words using word lists. In this way, information is graded in different categories.

4. The **rating based on scientific methods** applies two assessment methods (Shannon Information Theory (Entropy), term frequency, inverse document frequency).

   If the (non-specified) end-user of an application based on QAS has the possibility to choose several assessment methods, a subjective quality of information can be determined. Furthermore, this choice and the different categories allow further application of the quality assessment service within several scenarios.

Table 1. Implemented Quality Assessment Methods

#	Method / Criterion	Description
A	**Assessment of metadata**	
1	Author Frequency (Reputation)	Number of messages from the same author in the message set. The more messages an author writes, the more knowledge about the situation is assumed.
2	Temporal Proximity (Currency)	Temporal proximity of the messages to the center of the search period. The closer the message is to the search moment, the more certain it is that the information is relevant
3	Local Proximity	Distance between the place the message was created and the incident's place. The shorter the distance, the higher the probability that the message is about the current disaster.
4	Followers / Likes (Credibility)	An increasing degree of credibility is assumed in proportion to the growing number of likes / followers conferred on a particular message / author.
5	Metadata (Pictures/Links)	Using an image or other media material in addition to textual information can be useful. This assessment criterion measures the amount of metadata.
B	**Assessment based on content**	
6	Frequency of search keyword (Interpretability)	It is ensured that the keyword is not contained randomly in the message but actually addresses the issue. The message is also searched for synonyms.
7	Stop words	The number of stop words (e.g. "so") does not increase the validity of the message as these words do not provide information. Therefor the message utility increases as use of stop words decreases.
C	**Assessment based on classification of the message**	
8	Sentiment Analysis (Impartiality)	The message is evaluated regarding its emotional property. Emotional messages can distort the meaning, especially if they are motivated by fear.
9	Negative Sentiment (Fear Factor)	The Fear Factor measures the degree of expression of fear in the message by the frequency of words that are related to the subject of fear.
10	Positive Sentiment (Happiness Factor)	The Happiness Factor, measures the degree of expression of joy in the message by the frequency of words that are related to the subject joy.
11	Named Entity Recognition (NER)	Number of entities in the message. An entity indicates the connection of the information's content to another information source. Thus the information quality increases by the number of entities in a message.
12	Emoticon Conversion	Provides the ability to convert emoticons into language expressions supporting the readability for different audiences.
13	Slang Conversion	Provides the ability to convert slang words into standard language supporting the readability for different audiences.
D	**Assessment based on scientific methods**	
14	tf-Idf (term frequency – Inverse document frequency)	The appearance of individual search keywords (term frequency) with the frequency of appearance in all messages (inverse document frequency). Useful if more than one single keyword is used because the appearance of a fragment of the whole term which only occurs frequently in few documents is weighted higher than the appearance of a fragment which occurs in many documents but less frequently. $tf(t,d) = \frac{f(t,d)}{\max\{f(w,d) : w \in d\}}$
15	Shannon Information Theory (Entropy)	Shannon theory of information. The average amount of information contained in each message received. $I(p_x) = \log_a\left(\frac{1}{p_x}\right) = -\log_a(p_x)$

In general: At first, the individual messages are evaluated absolutely concerning the particular method. Afterwards, the relative score of each message is determined by searching for the highest and the lowest absolute score. The message with the highest absolute score is graded "1.0" (100%), the one with the lowest absolute score "0.0" (0%). Subsequently, single scores are weighted and an overall score is obtained. Additionally, in order to address both the requirements of querying multiple sources and enabling the subjectivity of quality assessment, the individual user must be given the opportunity to select the desired social media sources.

5   Implementation and Integration

5.1   Implementation of Social-QAS

The actual quality assessment service is realized as a service following the paradigm of a web-based, service-oriented architecture (SOA). Using such an architecture, it is possible to perform the rating centrally and thus enable its integration into different applications by providing assessment results along with the original data in JSON format (JavaScript Object Notation). The interface is called "via HTTP-GET" and query parameters are added at the end of the URL (separated by "&"). The server-sided information rating is expected to reduce the client's processing load. The APIs of the particular social network providers are used to extract data from the social networks [27]. Within the scope of this paper, Twitter and Facebook are considered especially as necessary APIs exist for them: these APIs provide a variety of opportunities to both export and import data regarding the related social network.

To gather semantic meanings of the content of the message, a Named Entity Recognizer (NER) (No. 11) is used. The Stanford NER[1] is available as Java library for free. The corpus "deWac generalized classifier" was deployed for the NER because it is especially suitable for German messages from social networks. The library Classifier4J[2] was used for the creation of a Bayes Classifier (No. 8), that allows the categorization of information into different classes because it can be skilled with lists of words. The list of synonyms (No. 6) was been generated using the Open Thesaurus web services[3]. A geographical reference is needed to visualize the information. As the majority of information does not contain any geographical metadata, it has to be geocoded. The Gisgraphy Geocoder[4] is usable by web services and geocodes location information for any map material. For reasons of speed, a list is applied for each location that has already been geolocated, whereof the coordinates can be determined without geolocation. GSON[5] provides an automatic generation of a JSON object by means of a java object model and is therefore used for conversion.

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[1] http://nlp.stanford.edu/software/CRF-NER.shtml

[2] http://classifier4j.sourceforge.net/

[3] http://www.openthesaurus.de/

[4] http://www.gisgraphy.com/

[5] https://code.google.com/p/google-gson/

5.2   Available Data

While working with QAS based on the available type of social media different data attributes are accessible (Table 2). Furthermore some technical and business oriented limitations become apparent [27]. Therefore it is not possible to apply all quality assessment methods in the same way.

Table 2. Source-based data attributes

Attributes	Facebook	Google+	Instagram	Twitter	YouTube
Date, Time	Given	Given	Given	Given	Given
Sender	Given	Given	Given	Given	Given
Title	N/A	Given	Caption	N/A	Given
Tags, Keywords	N/A	N/A	Given	N/A	Given
Comments, Replies, Answers	Comments	Replies	Comments	N/A	Via Google+
Content	Given	Given	Caption	Given	Description
Number of views	N/A	N/A	N/A	N/A	Given
Number of likes	Likes	Plusoners	Likes	N/A	Likes
Number of dislikes	N/A	N/A	N/A	N/A	Dislikes
Number of retweets	N/A	N/A	N/A	Given	N/A
Number of shares	Given	Resharers	N/A	N/A	N/A
Person: Age	N/A	Age Range	N/A	N/A	Age Range
Person: Location	Given	Given	N/A	Given	Given
Person: Number of uploads	N/A	N/A	Given	N/A	N/A
Person: Number of watches	N/A	N/A	N/A	N/A	N/A
Person: Number of total posts	N/A	N/A	N/A	Given	N/A
Person: Real name	Given	Given	Given	Given	Given

5.3   Integration of QAS into a Web Application and a Facebook-App

To test the implemented service, we have integrated QAS into a web-based application specified for emergency services as well as a Facebook-app "XHELP" to support volunteer moderators during disasters. In the following we will outline prototypically the implementation into XHELP, which allows information to be both acquired and distributed cross-media and cross-channel [25].

Inside this application, it is possible to search for information using different quality parameters and to perform a quality assessment (Figure 1). For this, the user decides which assessment criteria to choose using a slider. Integrating the user in this way meets the requirements for a flexible and manageable quality assessment, as identified in the pre-study.

Fig. 1. Quality Assessment Service integrated into an application

Fig. 2. Search results (left), degree of completion (lower left) and map presentation (right)

The results of a search are illustrated both as a table and visually, on a situation map. A wealth of meta information - such as the degree of completion of particular methods - is displayed as tool tips in the table. At the same time, the situation map enables the direct determination of the proximity of the information to the search location (Figure 2). This way, the user is able to choose from various procedures the mode in which s/he wishes to view the results, thus increasing the flexibility of the application. This user interface is only one of a range of ways in which QAS can be used.

5.4   Key Advantages

In summary, QAS unifies the following functionalities:

- The quality of information generated by citizens can be assessed on the basis of several methods.
- Assessment does not only take place on the basis of metadata, but additional on the basis of the content.
- The user decides how to weight each method. The subjective quality of a message emerges when all the assessments of every method have been combined.
- QAS is very flexible because it provides the opportunity to extend the sources and assessment methods very easily.
- The integration and usage in other applications is possible because the implementation is SOA-based.

6   Conclusion

This article illustrates how a tailorable quality assessment of citizen-generated information from social media can support the situation assessment practices of crisis management actors – both emergency services [15] as well as informal volunteers [25]. As a starting point, we analyzed the results of an already conducted empirical study involving emergency services regarding the use of citizen-generated content and social media within their current work practices [15]. Based on literature and empirical findings, we derived different quality criteria and applied them on information from social media. We implemented QAS, which not only incorporated all the quality criteria but also offered the user the chance to adjust them according to the requirements of the current situation. We contribute three results that extend the current state of the art:

1. An analysis of dealing with citizen-generated content in emergency situations through an empirical study which highlights the selection and quality assessment of citizen-generated content in emergencies.
2. A concept for a tailorable quality assessment service for social media as well as a running SOA-oriented and tailorable implementation that can be integrated into different applications (section 4 and 5.1)
3. A reference implementation of QAS inside an existing web-based application fpr emergency services [15] and an existing web-app for volunteers [25] (section 5.2).

In summary, the flexibility in form of tailoring options for source platform selection and quality assessment criteria is helpful due to the fact that situation assessment has been shown to be very subjective. Thus information needs depend on personal feelings, experience and the situation itself. Compared to the current state of the art, Social-QAS, developed within this work, has a number of advantages: in contrast to Vivacqua et al. [39], it is not just the emergency services who receive information; additionally, the work of unbound volunteers can be supported through flexible assessment and free accessibility. A very wide base of information is realized using several social networks as information sources [35]. Compared to Starbird et al. [31], who limit the amount of information by using a fixed syntax, in QAS all the information from various sources is considered. Verma et al. [38] place restrictions by only allowing the usage of a number of assessment criteria that can be combined with each other.

Our results could prove interesting for other application fields as well. Wherever information is gathered and analyzed and information systems are implemented to support the task, one question still poses a challenge: How can information systems be implemented in such a way as to allow the automatic selection of relevant data and, at the same time, afford end-users the possibility to adapt this automation, thus enabling tailorable quality assessment according to their needs [2]. This is especially of importance if situations and the context of work differ and if practices evolve over time. Concepts like Social-QAS will help to allow end-users to articulate their needs in a more appropriate way.

Our work still has some limitations. Not all the criteria that are relevant for quality assessment are included within QAS. Furthermore, according to the context, the amount of criteria might overburden the cognitive skills of end-users. It is, therefore, important to define standards and to allow end-users to adapt them, whereby different tailoring power might then require different skills, according to MacLean et al. [17]; thus local developers may be needed [7]. Another limitation is that Social-QAS needs a good data base to encompass all its rating mechanisms. But as table 2 has shown, currently not all social media services provide such a sophisticated data base. To get more details about what quality criteria method is appropriated within which scenario, we need to enhance our data base. In future work, we will therefore try to enhance the raw data base from social media to further improve quality assessment for social media content. Our endeavor will be to expand dynamic quality assessment not solely for cross-platform social media content [25] but also for other types of information sources, such as on-site volunteers [14].

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