Leveraging Web 2.0 Communities in Professional Organisations

A. Scherp,
F. Schwagereit
University of Koblenz,
Germany

N. Ireson,
V. Lanfranchi
University of Sheffield,
United Kingdom

S. Papadopoulos,
A. Kritikos,
Y. Kompatsiaris
Informatics and Telematics
Institute, Greece

P. Smrz
Brno University of Technology,
Czech Republic

ABSTRACT

Professional organisations are beginning to see the potential offered by Web 2.0 techniques and social networks to improve communication and collaboration with user communities. This leads to a need to consider how the closer interaction with communities influences the knowledge management in organisations, and how organisational interaction will affect the communities. There is high potential for deriving mutual benefits through the influence of social networks in form of Web 2.0 communities to the decision making taking place within organisations. However there are also potential hazards and challenges which arise from this new collaboration with respect to privacy, trust and reputation of individuals and organisations. In this paper, we describe the nature of professional organisations that leverage Web 2.0 communities for decision making and process execution. We present the opportunities and challenges that are involved and demonstrate them in the domain of emergency response, which entails the involvement of masses of users in the activities of the emergency response organisations.

1. INTRODUCTION

With the advent of Web 2.0, many different platforms have appeared that serve different communities for different purposes such as content sharing, collaboration on problem solving and social networking. There are a number of high-profile and successful Web 2.0 platforms like the social networking sites Facebook[1] and MySpace[2], the online photo sharing application Flickr[3] and the collaboratively created encyclopaedia Wikipedia[4]. As these platforms provide more features there are fewer distinctions between them. In particular the platforms typically provide features for social networking, although this is not in the center of their business. Thus, in this paper, the term *Web 2.0 community* is used to encompass the (online) social networks of the users of Web 2.0 platforms which also provide functionality for content sharing, collaboration and others.

Recently, many professional organisations, i.e. organisations which employ people to fulfil its aims in a professional capacity, are beginning to see the potential offered by Web 2.0 communities to improve their practices. To date, this has primarily involved marketing activities, Amazon's use of its online customers for ratings and reviews being one of the key examples. More recently there is increased interest by organisations in utilising closer interaction with user communities to improve communication and collaboration [3]. In fact, some professional organisations are aiming at exploiting Web 2.0 communities in the creation, organisation, sharing and utilisation of organisation-relevant knowledge. Such organisations will leverage information provided by the users for their decision making and business processes. For example, governmental departments, in areas such as human services, tax and revenue, health care and education, are increasing involving individuals to guide and improve their working practices [7]. Another emerging example is the information provided by Web 2.0 communities for decision making in emergency response (ER). Citizens have been traditionally involved in ER, as they can often be the first to notify of an incident by contacting the emergency services (often by using mobile phones) or to provide help as volunteers for alleviating the incident. With the emergence of Web 2.0, we have witnessed the use of social networks for the continuous documentation, information exchange and sharing of experience during and after emergency incidents (for example, on the content sharing platform Flickr). Pro-

[1] http://www.facebook.com/
[2] http://www.myspace.com/
[3] http://www.flickr.com/
[4] http://en.wikipedia.org/

Submitted for publication at
W3C Workshop on the Future of Social Networking , Barcelona, Spain, 15-16 January, 2009.

fessional ER organisations are realising that closer interaction with such communities can become crucial as part of their knowledge management, decision making and operation process.

In this paper, we discuss the opportunities and challenges that are involved when incorporating Web 2.0 communities into the decision making and process execution of the professional organisations. Web 2.0 communities are characterised by a large degree of freedom of speech and expression and they self-define their aims and interests. In contrast, professional organisations tend to be more conservative, formal and guided by very specific aims. In bringing together these two worlds, there are issues related to the privacy, trust and reputation of individuals and organisations. We demonstrate the opportunities and challenges in the domain of emergency response, where masses of people are potentially involved in the activities of the Emergency Response organisations. Involving Web 2.0 communities into the decision making and process execution of professional organisations can result in mutual benefit. The synergistic aims of the community and organisation can lead to collaboration in the creation, organisation, sharing and utilisation of knowledge. However, there are also potential hazards and challenges that arise from this new collaboration as there are different expectations on information within a community and that from a professional organisation.

In the next section, we describe the opportunities and challenges of professional organisations that leverage Web 2.0 communities for decision making and process execution. Subsequently, we present a new paradigm in the domain of emergency response to show how such a community and organisation convergence can provide huge potential benefits. Finally, we sum up our main conclusions.

2. OPPORTUNITIES AND CHALLENGES

Since the advent of Web 2.0 communities, a number of organisations have been experimented with tapping the power of mass end-user participation in organisational activities for different domains such as documentation, corporate communications, resource allocation, decision making and R&D [12]. Primarily, organisations benefit from the mass participation of end-users in their activities due to the amount and diversity of ideas and perspectives brought by a large pool of individuals to tackle the problem at hand. Mass end-user participation is crucial within the organisational setting especially in cases where the problem that the organisation faces cannot be sufficiently addressed by means of its limited resources (where limited here refers to both scale and scope).

However, when discussing the interplay between professional organisations and Web 2.0 communities on a general level, one should not disregard the differences between the two as far as their structure and practices are concerned. Professional organisations have traditionally operated under a knowledge management perspective, involving formal definitions and specifications of knowledge, processes and roles. In contrast, today's Web 2.0 communities are based on spontaneity and emergent collective behaviour. Professional organisations such as enterprises and governmental agencies are formally defined and have strong and often legally enforceable rules and boundaries. The association of persons to the organisation or parts of the organisation are typically clearly defined: for instance, a person is specified to be a member of the R&D department, human resources, and so on. In addition, the roles of individuals are also specified, e.g. head of group or command centre in ER teams. Finally, the processes and goals of the organisation are usually established and stable. In contrast, Web 2.0 communities are only loosely structured and highly dynamic. The association of persons to the community can be fuzzy: e.g. a person (based on her actions and online associations to other community members) can be at the "centre" or "periphery" of the community. The roles are typically informal and not predefined, e.g. a leader of an online discussion group is the person with the highest posting activity. Last but not least, there are usually no standard processes that community members need to follow or fixed goals that they should pursue (although it is common to have communities around particular topics or missions). Thus, in order to reinforce the synergy between professional organisations and Web 2.0 communities, a series of challenges need to be addressed.

Knowledge Collection. Online community activities frequently result in masses of content and information of limited structure and of a varying degree of quality. In order for an organisation to exploit the knowledge that is hidden in such masses of information, efficient data analysis and management strategies need to be employed.

Trust Evaluation. The organisation needs to ensure that its operations are not disrupted by malicious behaviour coming from the end-user community. Therefore, the participation of community members in the organisational processes should be moderated based on the trust that the organisation has for each community member.

Privacy Maintenance. Protecting the identity and privacy of the individuals that participate in the organisational processes is prerequisite for establishing trust between the end-users and the organisation.

Alignment of Community Activities and Organisational Goals. The gap between the well-specified organisational processes and the emerging behaviour of the community may raise obstacles to the fulfilment of the organisational goals.

Having identified the challenges to be addressed when involving Web 2.0 communities in the decision making and process execution of professional organisations, we present in the following section concrete approaches to tackle these challenges, using ER as a use case.

3. WEB COMMUNITIES AND ER

There are many different types of emergencies; ones brought about by forces of nature such as avalanches, floods, droughts, earthquakes or man-made emergencies, e.g. train and plane crashes, pollution and terrorist attacks. These emergencies can vary in terms of scale both in severity and affected location. In small scale emergencies, only a few organisations may be involved, typically only local authorities such as the city council, police and fire department. During large scale emergencies several hundred organisations can be involved, as was the situation after the Tsunami in the Indian Ocean 2004, involving about 124 international and 430 local non-governmental organisations [8].

During an incident, the ER team may receive information from multifarious sources (like the emergency services, other local authority bodies, government bodies, broadcast services, affected individuals, and others). The seriousness of an incident is likely to increase as its scale and complexity increases; however, in such situations it is more likely that the amount of information received will become over-

whelming. The ER team's decision making process can, literally, mean the difference between life and death. Primarily this means the allocation and coordination of resources, but also involves effective communication between the agencies involved, the decision/command chain and the affected individuals. The management of the mass of information is crucial in aiding this decision-making, ensuring, as far as possible, that the responders have full *situational awareness* to make informed decisions.

Situational awareness can be defined as awareness of what is happening around you and the ability to retrieve, understand and reuse the available information to enhance your response to the situation. It is of particular relevance when dealing with large amount of information and when the consequences of actions may be dramatic. In ER, situational awareness can be related to the possibility of having accurate, complete and real-time information about an incident, to use this information to take decisions and guide actions and to share situational awareness with all the other actors involved. Situational awareness is increasingly challenging and important as emergencies increase in scale and geographic distribution.

In recent years Information Technology (IT) solutions have been employed to aid in the Knowledge Management process in ER. Examples of IT incident management systems are ATLAS[5] and the Vector Command Support System[6]. These systems deal specifically with interactions within the ER organisations. However, there are also some initiatives exploring novel ways to communicating with citizens, other than the traditional broadcast media. These initiatives include broadcasting over different media such as CommunitySafe[7] a web-based information source for the London community relating to ER issues and also providing information to social networks and web applications. Life360[8] is a multichannel messaging system and neighbourhood-centric social network to keep the user up-to-date and in contact with family and local community, using customised emergency alerts. The US Federal Emergency Management Agency has teamed up with MySpace to distribute a tool which provides information on how to get help, locate victims, facilitate donations, register volunteers and track the approach of a hurricane. A Facebook group for "emergency awareness" was set up in July 2008 at the University of Maryland. The group has been used to publish any emergency message that the university issues on its other alert systems. Again developed at the University of Maryland, project 911.gov[9] aims at developing a Web 2.0 platform supporting the collaboration of organisational entities for emergency response and citizens. A recent Open Source system, Sahana[10], provides a Web 2.0 platform for connecting ER organisations with volunteers. This platform is aimed at the setup of an online community by an organisation for a specific (large scale) incident.

In practice, during an emergency incident, individuals involved in the incident use the communities they are already engaged in as a means to express their concerns and provide or request information. This effect is also seen in online communities during the floods on 25th June 2007 in UK. In the Sheffield area a local social network[11] experienced more than double the average (approx. 2000) daily posts, with almost 1500 posts about the flooding on the day of the incident. The BBC also reported [5] that they experienced a huge increase in user visits to their website during the incident, with the number of hits exceeding the viewing figures on the more traditional information output of local radio. In addition, a questionnaire distributed to Sheffield citizens about the Sheffield Floods as part of the user requirements gathering phase of the EU project WeKnowIt [16] showed that 31% of respondents used social networks and public forums as a mean of communication during the flooding, when asked to only consider communication with people outside their family this figure rises to 40%. This indicates that Web 2.0 platforms and social networks are becoming a common resource for citizens during an emergency and thus that a significant proportion of the population are likely to use social sites to both provide and receive information.

The following sections examine three key factors which must be considered if the closer interplay between Web 2.0 communities and ER organisations is to be effective: the utilisation of user (rather than professionally) generated content, the need for organisations to (re-)define their structure and to (re-)examine their process models.

3.1 User-Generated Content within ER

The recent exponential growth in User-Generated Content (UGC) sites [2, 1] is providing text, images and videos which potentially offer useful information for ER organisations. The information from these sites could help provide notifications, practical information or confirmations which could improve situational awareness and thus decision making. Rather than relying on the limited resources of professional organisations to gather information, social network sites provide access to a mass of individuals who are directly involved in the incident. With the advent of mobile interfaces to social networks, users can upload information directly from the site of the incident, thus providing real-time critical information about the event, and the possibility of having a clearer geographic visualisation of the extent of the emergency. In fact, for a number of recent earthquakes it has been claimed that Twitter[12], a micro-blogging service, provided the first notification and pictures related to seismic events before the national broadcast services or even professional ER organisations[13].

In the UK, the BBC[14] provides the main source of information for the public and whilst they are not an ER organisation per se, they do interact with both the organisation and the public during emergencies. The realisation of the importance of UGC has led the BBC to investigate in The Aberdeen Project [5] how to present professional and user-generated news are combined. The idea is to provide a map-based interface with icons and layers to indicate different information types (stories, images and videos) and sources (the public and news services). Whilst the BBC website will provide a central repository of information for the public to access, the intention is that this information will also be

[5] http://www.atlasops.com/
[6] http://www.emergencycommandsystem.com
[7] http://www.communitysafe.gov.uk/
[8] http://www.life360.com/
[9] http://www.cs.umd.edu/hcil/911gov/
[10] http://www.sahana.lk/
[11] http://www.sheffieldforum.co.uk/
[12] http://twitter.com/
[13] http://www.bbc.co.uk/blogs/technology/2008/05/twitter_and_the_china_earthqua.html
[14] http://www.bbc.com

broadcasted via RSS and posted on the BBC blog/forum. Such an initiative shows that during an emergency a professional organisation can both gather UGC from social networks sites to improve their own content and broadcast information (including the UGC).

The use of social networks and Web 2.0 platforms will radically affect the way the ER information is distributed: from a one-way communication paradigm (where an organisation gathers information from internal or trusted sources and communicates this to the citizens) towards two-way communication in which the citizens become active members of the ER team with respect to online information gathering and communication. Thus the professional ER organisations no longer have full control over the information. Thus, the concept of control needs to be revised into "managing and cooperation" the gathering and communication of information. However, the loss of control over the UGC poses issues regarding the quality and the trustworthiness of information and eventually the reputation of the organisation.

Whilst ER organisations engage in knowledge management processes which aim to generate and distribute accurate information, UGC may not adhere to the same criteria. Users may post information which is speculative rather than definitive, or simply incorrect or misleading. Where incorrect information is transferred from a social network setting and used or reproduced by an organisation the effect of any misinformation may be more serious, for example in terms of inappropriate resource allocation or of the reputation of the organisation. In addition to the issue of incorrect information, the nature of information is subjective, therefore individuals and ER organisations will have different perspectives and place different degrees of importance upon a given incident.

If organisations are going to exploit UGC from social networks, they need means to assess the quality of that information. To an extent, pictorial information can be seen to be more objective and reliable, allowing ER personnel to assess the degree of damage or danger. However, care is still required as shown from the case of Sky News which published user submitted pictures of the recent UK storms that included ones from the New Orleans floods and stills from the film "The Day After Tomorrow"[15]. One of the key ways of assessment of information is independent validation, this might come from other users or external sources. As given users provide quality information, the trust in those users grows, and this trust can be propagated to their associates. For organisations, which may have multiple people or even automatic systems interacting with the social network, this network of trust will have to be explicitly represented.

Finally, organisations must consider the ownership of information and privacy of individuals. In effect the organisations must ensure they maintain the trust of the community in their use of UGC.

3.2 Networked Definition of Virtual Organisations in ER

In ER, both professional organisations like an ER team and Web 2.0 communities consisting of citizens, neighbourhood groups or organised volunteers participate. They work together in a virtual organisation to cope with the emergency. Thus, a virtual organisation consists of several organisations that temporarily work together to pursue a common goal.

In order to support the work of this virtual organisation with IT, e.g. by providing mobile access to a list of people who need help for evacuation, the organisational structures of this heterogeneous virtual organisation needs to be represented and maintained in the used IT systems. These structures include in particular information about membership of persons in involved (sub-) organisations like the different ER entities and organised volunteers.

Organisational structures are exploited when resources like pictures of a flood or evacuation plans are shared among members of the virtual organisation. Usually access rights are defined based on organisational membership to restrict access to a subset of people.

Several challenges arise in our setting. Users such as the regular citizen or organised volunteer do not limit themselves to one Web 2.0 platform as no single platform can provide all requested functionality. Instead a competition between various platforms can be observed. Therefore different platforms will exist that hold different resources (e.g. photos in Flickr and videos in YouTube[16]). Community membership needs to be stated independently from specific platforms used. This requirement is even more crucial when virtual organisations are formed consisting of both professional organisations and communities, because it can be assumed that they will not use only one platform.

If we require a mechanism for definition of virtual organisations to be platform independent, this mechanism needs to allow these definitions in a networked way, i.e. initiated and conducted over different entities and in hierarchical structures. Professional organisations typically have one central entity, which has the authority to define the organisation top down and therefore centralised (cf. [4] for an overview on such systems). However, this assumption does not hold for Web 2.0 communities, which might have no or very little structure and therefore no single entity for definition.

Current solutions like the RT framework [10] allow for expressing hierarchical structures, but lack in expressing organisational structures without a strictly defined head, which we typically do not find in Web 2.0 communities. Methods to express Web 2.0 community relationships could be D-FOAF [9], which provides an infrastructure for expressing and managing communities based on FOAF [6], but it also does not meet our requirements because it needs a central host for managing community structures. Consequently, we are developing a formal mechanism, which is able to capture both types the professional organisation as well as the Web 2.0 community to define the virtual organisations. This means hierarchical organisations as well as non-hierarchical structures can be expressed by this mechanism. Since no central repositories exist, we assume that all persons defining such organisations can make their personal definition available independently. Thus the organisational structure is derived by combining all relevant information stated by each person and/or organisation separately. In dynamic settings such as ER, where virtual organisations are formed in an unpredictable ad hoc way and must continual react to external-driven events, access to potentially private or restricted resources cannot be only granted according organisational membership or between mutual acquaintances, but

[15] http://socialmediatrader.com/when-user-generated-content-attacks/

[16] http://www.youtube.com/

must be based on the current needs of both the organisations and communities.

3.3 Modelling of Ad-hoc, Dynamic Processes in ER

As discussed above, most of the challenges appearing within the interplay between organisations and Web 2.0 communities have their root to the difference between the formal nature of traditional organisations and the informal and dynamic one found in online social networks. Information specification and quality, process type (usually static for professional organisation and ad-hoc for social networks), and user roles are the most prominent traits delineating the aforementioned difference.

Workflow or business process modelling is the organisational practice commonly employed for specifying the procedures that should be carried out by a set of participants according to a defined set of rules in order to achieve a specific goal [11]. Every workflow entails an internal dataflow which must support: (a) managing the input and output data that the various activities of the workflow model use, (b) making the data available to whichever activity of the workflow model needs them and (c) ensuring the consistency of the dataflow between model's activities.

Although workflow modelling has been extensively examined and several management tools exist, this research field is still considered evolving [13]. This fact along with the need for a new process framework that will take under consideration the novelties of Web 2.0 knowledge creation and sharing paradigm, render existing approaches insufficient.

The discussion above implies that serious consideration should be put on using data flows as a means of deriving ad hoc workflow models. By applying process mining theory on the logs of a system it is possible to discover workflow models [15] which can, then, be modelled by means of some formal representation (e.g. Petri Nets) [14]. In this way it will be possible to bridge the gap between professional organisation and online social networks. Moreover the above procedure could be combined with dataflow check and verification techniques [11].

4. CONCLUSIONS

In this paper, we argued for the opportunities and challenges of future social networks that emerge from the combination of Web 2.0 communities and professional organisations. If such a community and organisational interaction is going to result in mutual benefit then the interface between the two must consider their differences. Communities can offer a mass of information, understanding and ideas which could be potentially useful to the organisation. However they are unlikely to have the same aims as the organisation, also there is little consequence of misinformation in communities which is often not the case for organisations. If organisations can utilise the Web 2.0 communities and provide improved services as a result, then it becomes in the communities' interest to improve the collaboration. The WeKnowIt project aims to address the issues laid out in the paper by examining techniques to facilitate the transfer of information and content between individuals, communities and organisations. The techniques will be employed in the domain of emergence response, where successful collaboration between Web 2.0 communities and organisations could produce concrete and even life saving benefits.

Acknowledgments

This work has been supported by the European project WeKnowIt—Emerging, Collective Intelligence for personal, organisational and social use (ICT-215453).

5. REFERENCES

[1] Leading User-Generated Content Sites See Exponential Growth in UK, 2006. http://www.comscore.com/press/release.asp?press=993.

[2] User-Generated Content Drives Half of U.S. Top 10 Fastest Growing Web Brands, 2006. http://www.nielsen-online.com/pr/PR_060810.PDF.

[3] Enterprise social media: Trends and best practices in adopting web 2.0 in 2008, 2008. http://www.awarenessnetworks.com/resources/resources-whitepapers.asp.

[4] P. C. Chapin, C. Skalka, and X. S. Wang. Authorization in trust management: Features and foundations. *ACM Comput. Surv.*, 40(3):1–48, 2008.

[5] D. Dodd. Connecting in a crisis maps, news and emergencies. In *Managing Emergencies With Information Technology*, 2008. http://www.coastms.co.uk/documents/IT08/Emergencies%20and%20IT%20Sept%202008%20Dodd.pdf.

[6] L. Dodds. An Introduction to FOAF, February 2004. http://www.xml.com/pub/a/2004/02/04/foaf.html.

[7] Gartner. Citizen social networks will complement, and may replace, some government functions, 2008. http://www.gartner.com/it/page.jsp?id=784212.

[8] R. K. Huber, S. Richter, and J. R. und Ulrike Lechner. Assessment of C2 Maturity against the Background of Complexity of Disaster Relief Operations. In *Command and Control Research and Technology Symposium*, 2008.

[9] S. Kruk, S. Grzonkowski, A. Gzella, T. Woroniecki, and H. Choi. D-FOAF: Distributed Identity Management with Access Rights Delegation. In *Asian Semantic Web Conference, Beijing, China*. Springer, 2006.

[10] N. Li, J. Mitchell, and W. Winsborough. Design of a role-based trust-management framework. In *IEEE Symposium on Security and Privacy, 2002*, 2002.

[11] S. Sadiq, M. E. Orlowska, W. Sadiq, and C. Foulger. Data flow and validation in workflow modelling. In *Australasian Database Conference*, 2007.

[12] D. Tapscott and A. D. Williams. *Wikinomics: How Mass Collaboration Changes Everything*. Atlantic Books, London, UK, 2007.

[13] W. van der Aalst. Verification of workflow nets. In *Application and Theory of Petri Nets*. Springer, 1997.

[14] W. van der Aalst. Discovering coordination patterns using process mining. In *Workshop on Petri Nets and Coordination, Bologna, Italy*, 2004.

[15] T. Weijters and W. van der Aalst. Process mining: Discovering workflow models from eventbased data. In *Belgium-Netherlands Conf. on Artificial Intelligence*, 2001.

[16] WeKnowIt. D7.1 consumer and emergency response use case initial requirements, 2008. http://www.weknowit.eu/system/files/D7.1.pdf.