Role of social media in the development of land use and building projects

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ABSTRACT: A new social applications era is reforming the way people communicate nowadays. These technologies generate a network effect in turning passive content consumers into active content producers. Land use planning and building projects commonly operate between public and private domains, but the urban data is currently fragmented over multiple industry systems, such as BIM and GIS based technologies. This paper draws from a literature survey and adopts new ways of collaboration into the case study context of “Finnoo-Kaitaa” in Espoo, Finland. The municipality decided to work collaboratively while engaging citizens in developing the city district vision. Through this case study we consider qualitatively social media in enabling increased citizen participation. Conclusively, implications of social relevance in every-day work life are demonstrated through a future knowledge worker scenario. The forthcoming years will reveal whether the industry is ready for a strategic change towards transparent larger audiences with new business communication landscape.

1 INTRODUCTION

A new emergent era of information technology applications, in particular social media, has transformed and is still reforming the way people communicate and share ideas in various industry sectors. The term social media has been used in 21st century for internet-based applications triggered to a social interaction. These applications are built on three progressively tied key elements: content, communities and web 2.0 technologies (Ahlqvist et al, 2008; Ahlqvist et al, 2010). The core of social media lies in a user-generated content, which may be of very different types comprising multiple media types like the text, pictures, videos and links. For this content social media provides the possibility to individuals and groups for communication, participation and feedback. This development highlights that the virtual and physical worlds will be more and more interlinked in near future (Ahlqvist et al, 2008).

Construction industry has over the past years invested heavily on the information technology. However, the urban data is currently fragmented over multiple industry standards and database solutions. On one hand, there is data related to buildings majorly constituting the use of advanced Building Information Modelling (BIM), while on the other hand, infrastructures are perceived in Geographical Information Systems (GIS). The industry is constantly struggling to unite these two approaches. One way to bring the approaches together is to develop an experimental test environment to overcome the realms of heterogeneous urban data sources by deploying various stakeholders’ needs for the data utilisation and model analyses. However, the construction project data and its decision-making processes call for the various levels of interaction between private and public domain.

Land use planning and building projects are directly impacting on many aspects of our life. The development process sets goals about the growth and determines the working life along with social, economical and environmental concerns with the end target of socio-economic and communal development. Ground rules for the planning process are described in national Land use and Building Acts. Different actors are involved in the land use planning and building projects from earliest phase throughout the many concurrent phases of project life cycle. Continually accelerating global cycles like the growing knowledge and power of end users, sustainability requirements and financial restrictions have created new challenges for this multi-disciplinary approach. The issues of urban design are often so complex and interdependent that planners, policy makers and developers need support...
for decision-making with the new, integrative ways of working together involving end-users from the early start of the process. Traditional urban planning is too often imposed on a community rather than involving members directly to the process. Communities and citizens are still excluded from the decision-making and design development processes. An argument for an enhanced citizen participation often rests on the merits of process and a belief that an engaged citizenry is better than a passive citizenry (Irvin and Stansbury, 2004). An active community involvement and the end-users in development process are needed, but still there is a huge gap between industry experts and users. Various media and tools can be actively used to overcome problems in the process implementation. As for example, social media may help to bridge the gap between the domains in the traditional development process and particularly activate citizens.

This paper addresses the global need to improvise communication gaps within the construction industry by complementing the traditional communication methods with the use of social media in urban area and building development projects in Finland. The research utilises literature survey as a starting point and adopts new ways of collaboration into a case study, as a commonly used research method in the construction industry, to consider qualitative perceptions of social media in combining the building and geographical urban data in the construction project.

2 RELATED WORK

Globally, social media applications are increasingly finding their way into organizations and its use has developed from a marginal phenomenon into a commonly accepted way of collaboration. Social media applications are usually built on Web 2.0 technologies, which advance constantly. These technologies generate a network effect that turns passive content consumers into active content producers by providing instruments to read, consider, discuss, and develop knowledge and ideas. As a matter of a fact, social media differs significantly from emails, instant messages and other databanks.

Social media has many different forms and the strength of these applications include variety. The first generation of social media includes tools such as blogging, podcasting, video sharing, wikis, RSS feeds, micro-blogging, social networking, social bookmarking, and social aggregation (Hopkins, 2009). Most popular social media applications and their characteristics are introduced in Table 1.

Table 1. Most popular social media applications (adopted from Hopkins, 2009).

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
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<tbody>
<tr>
<td>Blogging</td>
<td>Web site that allows a serial publishing schedule written as a series of new items that have personal editorial voice and allows readers to comment.</td>
</tr>
<tr>
<td>Podcasting</td>
<td>Type of audio and video recording automatically published through service to its subscriber: ‘radio with a rewind button’.</td>
</tr>
<tr>
<td>Video sharing</td>
<td>Peer-to-peer video conversation sites like YouTube. There are also services like Skype providing internet calls and video conferencing.</td>
</tr>
<tr>
<td>Wikis</td>
<td>Content management system (CMS) open to alteration, addition and an amendment by more than one person.</td>
</tr>
<tr>
<td>RSS feeds</td>
<td>Tiny piece of computer code that enables incredible knowledge sharing content providers can syndicate or re-publish new content properly to subscribers of the service.</td>
</tr>
<tr>
<td>Micro-blogging</td>
<td>Text message service that uses RSS feeds to share short messages.</td>
</tr>
<tr>
<td>Twitter</td>
<td>Service for short messages, shares up to 140 letter messages.</td>
</tr>
<tr>
<td>Social networking</td>
<td>Service where subscribers create profiles to connect with friends and their friends to share information through many mediums such as wall postings, info, photos, videos, events, and links. Recent big hits Facebook and LinkedIn.</td>
</tr>
<tr>
<td>Social bookmarking</td>
<td>Enables users to tag, save, manage and share web pages from centralized source, like through Delicious.com.</td>
</tr>
<tr>
<td>Social aggregation</td>
<td>Integrative applications allow users to get connected to many leading social networks through one application. Interestingly tools like Digsby enable also emails and instant messaging.</td>
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Currently, most important driver for social media is the wide availability of free and easy to use applications and basic human need for creating and maintaining contacts with other people (Ahlvist et al., 2008). The second generation is building a new dimension to these web 2.0 applications towards the utilisation of three-dimensional (3D) virtual worlds like Second Life, which does provide a potential linkage to the construction industry.

Data in land use and building projects is structured and visualised objects have many detailed design parameters in an addition to geometry and material information, usually shown in typical visualizations. To promote an innovation in public works through the use of information and communication technology, an environment should be provided for 3D information presentation on structures efficiently and smoothly throughout the lifecycle of projects (Kubota, 2011). Currently urban and building data are fragmented over different disciplines and various databases and software such as 3D clash detection tools are used to identify and
resolve conflicts. Urban planning projects handle a large amount of data and participants. Since the real actuators of urban design are end-users (Arida, 2002), there is a need for a perspective to activate also end-users and other stakeholders through social media applications.

Business processes nowadays are more complex, interconnected, interdependent, and interrelated than earlier (Ollus et al., 2009). When freeform social software is used within companies, a term Enterprise 2.0 is referred (McAfee, 2006). A Table 2 explains how a project business landscape is changing to enable project stakeholders to communicate more flexibly in a collaborative environment.

Table 2. Comparison of traditional and next generation business projects (Ollus et al., 2009).

<table>
<thead>
<tr>
<th>Enterprise 1.0</th>
<th>Enterprise 2.0</th>
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<tbody>
<tr>
<td>Centralization of control</td>
<td>Decentralization of control</td>
</tr>
<tr>
<td>Top-down planning</td>
<td>Bottom-up planning</td>
</tr>
<tr>
<td>Strictly controlled environment</td>
<td>Collaborative environment</td>
</tr>
<tr>
<td>Pre-defined structure and tasks</td>
<td>Emergent structures, tasking</td>
</tr>
<tr>
<td>Restricted access to the plan</td>
<td>Organized access to the plan</td>
</tr>
<tr>
<td>Local, strict information access</td>
<td>Universal information access</td>
</tr>
<tr>
<td>Limited team communication</td>
<td>Enhanced team communication</td>
</tr>
<tr>
<td>Separate projects</td>
<td>Holistic approach, resource pools</td>
</tr>
<tr>
<td>Separate tools</td>
<td>Shared tools</td>
</tr>
<tr>
<td>Often complex tools</td>
<td>Easy to use tools</td>
</tr>
<tr>
<td>Rigidity of tools</td>
<td>Flexibility of tools</td>
</tr>
</tbody>
</table>

Social networking is widely accepted in large companies for the content creation, idea sharing and updating social networks. Business intelligence, however, is not in the data itself but how people are using it. Social applications rely on the users; traditional business cultures require new methodologies and processes in order to achieve an agility and increased productivity. On the contrary, business networks often reject the traditional organizational structures to communicate more flexibly in a collaborative environment (Kaplan & Haenlein, 2010).

The second generation of social media is a very potential distribution channel for model-based information in architecture, engineering and construction industry. The correct and active use of social media applications and tools not only offers a new communication channel and collaboration technique for the industry, it also serves as the platform for social interaction between the private and public domains in the development projects. Yet the applications are targeting end-users and when the social media applications are implemented to organizational workflows, their business use may increase progressively. Moreover, these environments are becoming multi-cultural and contributors need new capabilities (Kalliala & Toikkanen, 2009).

3 CASE STUDY FOR THE DEVELOPMENT OF LAND USE AND BUILDING PROJECTS

The second largest city in Finland, Espoo, is located next to the capital Helsinki. Nearly 250000 citizens are living in five urban centres and two local centres, which differs from a conventional Finnish city structure formed around a single centre. City of Espoo has decided to publish information about the city structure development and meaningful urban planning and building projects in the region of Espoo are presented on their website. The portal includes a section for past, on-going, and future activities, which may be open for public participation. Besides, these development forums also enable citizen participation to local and localized information collection and feedback. One of such examples is presented in the Figure 1 for local residents at Espoon keskus sub-centre (Espoon keskus, 2012a).

![Figure 1. A map-based softGIS application to enable commenting in Espoon keskus area (Courtesy of city of Espoo).](image)

In Espoon keskus, the city of Espoo decided to deploy participative geographical information by use of SoftGIS application (softGIS, 2012). SoftGIS is used to collect the localized information generated through the interaction between environment, individual and community. The application operates on a web environment, where citizens are able to pose comments on a neighbourhood planning in relation to various topics. For example, citizens may express their positive and negative opinions, and leave a development proposal in relation to the ongoing planning activities. These comments are visualised in a map, which is publically available.
Later, all received comments are combined to a GIS application for further utilisation in the planning and decision making process. The approach has also been deployed in other Finnish cities, such as Helsinki and Turku.

Social applications have been used globally in order to enable easier citizen participation to urban planning. Web services are used for gathering local knowledge and information produced by different actors in an area or a city district development. These forums may be continuously open for citizens, or facilitate one land use development plan. Chicago Metropolitan Agency for Planning has launched a comprehensive regional plan to help the seven counties and 284 communities plan together (CMAP, 2012). Social media applications have been used in the development project to lower the threshold for communication in Chicago metropolitan area. However, Salkin (2011) explains that although there are benefits, such as greater public participation, common interest networking, cost-effectiveness and real-time record, in using social networking for land use planning and zoning initiatives, these applications should be cautiously used due to contractual issues.

3.1 Finnoo-Kaitaa area development project

Finnoo-Kaitaa area is situated on the coastline about fifteen kilometers from the Helsinki city centre. The city district of forty-seven hectares is as yet largely unconstructed. The City of Espoo started its land use planning in 2009, when they decided to relocate the Suomenoja water treatment plant. When ready, the area is projected to house nearly 20 000 inhabitants and several thousand jobs (WSP Finland, 2012). A first design proposal version is ready and project participants are currently discussing and improvising the content. The development plan is built around a new underground metro station called Finnoo, which is the focal point of the area development (see Fig. 2).

Since the early stages of development, it has been clear that engaging local stakeholders would crucially influence on the success of area planning. Collaborative planning started in practice when city of Espoo board decided that a particularly open and engaging approach was needed and the officials consequently started to work on Finnoo-Kaitaa vision together with a multidisciplinary consultant WSP Finland Ltd.

The vision (WSP Finland, 2012) is being carried out in a fruitful and intensive cooperation with local residents and associations. The process was kicked off with an evening of ideas with open seminar on the challenges of urban development and the several values in the locality. Both informal networks and local media were used to invite participants to attend five thematic groups, each of which held three evening workshops. The featured themes include a city structure, energy, nature & recreation, architecture & housing, and finally livelihood & services. A synthesis was drawn out after the workshops and later on groups assembled for the final evaluation. The interaction during the vision process is aimed at freely presenting and developing ideas, instead of pushing decisions.

Figure 2. A thematic map of Finnoo-Kaitaa city district, which points out features of envisioned urban functions and activities (Courtesy of WSP Finland).

Finnoo becomes the city’s vibrant, urban maritime district in the vision through a unique built shoreline and canals. Some participants coined it the “Venice of Espoo”. On the other hand, the area aims at being recognized for a wide range of ecological buildings and built environments including a water research centre, carbon neutral housing, business and leisure. Architecture in blocks near the metro station is of high quality and social places, such as market places and vivid local services, are easily available for residents. The area provides a variety of pedestrian routes and public spaces spiced with exciting artworks, light installations and greeneries. Preliminary plan of a metro station and its surrounding building blocks, illustrated in the Figure 3, was continued by Helsinki-Zurich architects.

3.2 Possibilities to utilise social media applications for interaction

Major urban development projects often extend over a prolonged period of time, even up to 25 years in the case of major regeneration projects. These
projects usually involve a large number of stakeholders, similarly making the decisions more complicated. Many key-decisions are made early in the process, when the concept for development is being considered. Therefore, it is essential to access the critical information and key stakeholder perspectives at an early stage, otherwise decisions are likely to be flawed and may result in compromises leading to an potentially unsustainable development (Isaacs et al., 2011).

As described above, the Finnoo-Kaitaa area has been developed, since the early phases, through workshops and proactive methods activating both residents, non-governmental organisations, professionals of many fields and city representatives to jointly develop the city district. After the vision, stakeholders were engage in expert workshops on the Finnoo metro centre concept, developed by WSP Finland Ltd., and draft larger area plans from Helsinki Zurich architects. In the near future, the process will open further for architectural competitions.

In the preliminary phases of planning process, traditional urban planning tools have been implemented. However, urban data is currently fragmented and buildings and urban plan are made with model-based planning tools, utilising both BIM in buildings and GIS based software for infrastructural planning. Additionally, an experimental multi-user virtual reality environment from VTT has been used in one of the workshops to fertilise expert collaboration (see Fig 4).

The virtual environment consists of three adjacent large wall displays adjusted at an angle of 45 degrees with each other. Navigation in the model is performed with multi-touch gestures on a large tabletop interface. Based on our experiences, virtual reality application helps to bridge the social interaction gap between industry professionals. The city district plan is large and complicated, and therefore, visualisation helped in understanding the dimensions and created related atmosphere. However, the computer-assisted communication in Finnoo project has largely focused on the professional collaboration.

For the discussion further to citizens and wider audiences, social media applications are useful. In general, many citizens are already using various social media applications in their personal life. But in the professional environment of planning and construction, the use of social media has not yet fulfilled its potential as expressed in a Figure 5.

Virtual active participation of users through possible uses of various public social media tools has been one of the priorities to test later in this project. The municipal officials want to see active citizen participation, to create a channel for discussion with the future Finnoo community. The area development forum gives a possibility to collect and comment ideas, to connect Facebook and Twitter, to register as a follower, and to develop the service further as per the activities and needs. Since experiences from
the participatory geographical information in Espoon keskus have been positive, city considers a feedback and commenting procedure, such as by use of softGIS, in Finnoo-Kaitaa area.

In a current practice, residents and stakeholders are often invited to participate in a face-to-face event such as workshops where they can give some contribution to the acute planning issues. However, if they are provided with a powerful interactive tool, their contribution can expand dramatically. Therefore, different social media tools should be used and developed for all interested parties’ use, as they provide a very efficient channel for collaboration and can convey many more forms of tacit and unstructured knowledge. Therefore, in urban planning and building projects, social networking may extend the traditional BIM and GIS data with a rich data that is itself geographically mapped. Naturally, many challenges still remain for developing better methods for analysing this knowledge from social applications (Ollus et al. 2009).

Among other advantages, the strengthened social perspective may enhance the sustainability of built environment by linking planning to the rest of building and infrastructure life cycle. An interactive geographic information system for feedback can be very efficient in collecting input from a large number of citizens in an extended area. While the environmental impact assessment for a rapid railway line between Espoo-Salo locations was being prepared back in 2009 (see Fig. 6), over 500 comments were received from the citizens by “WSP Finland”.

Since the map based interaction with citizens has proved to be effective, an additional approach to combine 3D visualisation techniques in the future to social media applications may enhance the capability of citizens to understand even better the content of design. Such methods are needed for active public participation, because these fun, easy-to-use and free-of-charge applications may help to overcome the current communication barriers. User participation and customer orientation are current concepts in marketing and satisfied customers assure the quality of the product. Soft indicators have found their way gradually in construction (Kärnä et al. 2009) and the industry is changing the processes to support the customer orientation (Vainio et al. 1998). Presently there are some on-going examples of a public private partnership in land use zoning to reach also inhabitant needs for the development of neighbourhood. The Figure 7 illustrates the area of Jousenpuisto in Espoo, where 800 apartments are built in the future.

Figure 6. An interactive geographic information feedback system utilised in a rapid railway line development between Espoo-Salo locations (Courtesy of WSP Finland Ltd.).

The forthcoming years will reveal how the industry can benefit from social media as a new business communication landscape by providing the industry with a strategic change for a larger audience towards a transparent citizen-engaging communication.

4 SCENARIO FOR FUTURE URBAN AND BUILDING PLAN DEVELOPMENT

Currently construction industry experts are utilizing model-based planning tools for urban planning and building projects. Project manager makes the decisions based on formal documents from a project databank, such as drawings etc., but some important factors may be neglected preventing a project to meet its objectives. Social applications emphasize on human voice and involve less bureaucracy, when you do not have all the answers but you are always willing to learn from someone else and build new ideas together (Hopkins, 2009). Unfortunately the capability of personnel to learn how to use these tools often varies. Ahlqvist et al. (2008) sees the lack of trust and the stickiness of old practices as a counter to social media applications.

The two features of social media, which complement the traditional communication channels and team working, are activity history and the life-stream of actions. The first feature means that a
social application save automatically the life-stream of all actions in the project and enables the management and citizens to notice the pattern of event history. The second feature is a very powerful mechanism to keep track on an on-going communication between numerous participants. Social media may be an important parameter to consider, because it engages the inhabitants, develops trust and increases the satisfaction of future residents (Päivänen, 2005). In urban planning projects, we often lack the traceability of decisions, where as through social media all opinions and comments are archived and distributed through a multiple medium like photos, comments, discussion and wall-postings.

The conclusion of this chapter is summarised by a future knowledge worker description. We describe a scenario for social media uptake in an urban and building project in the construction industry. This, a rather provocative, story challenges and motivates a reader to consider the possibilities of social media in an every-day work life. The scenario is based on a motivating opening from Klinke et. al (2009), which is then complemented with our innovative ideas and case study experiences.

Table 3. A future knowledge worker scenario in the construction industry for early urban planning and building project.

An early urban plan and building development project work will get even more mobile in the future. The work is performed in a stronger team, where each design field has an important role, coordinated and supported by the project manager. Each designer works on a model based planning application. However, the models produced are extensive and distribution to other stakeholders is crucial to ensure successful teamwork. Therefore, all data is stored at cloud computing services, allowing only the modified content to be transferred seamlessly also to a portable smart device.

With advances in teamwork in BIM and GIS software, the managers company is utilising a new platform to allow geographically distributed offices to collaborate and even organise an online design review meeting. The meeting is held on a virtual reality application, which automatically converts the designs into a near photo realistic rendering. After the review, all findings and results are shared through a platform to stakeholders, and even to not present participants via online webinars.

He has a mobile job profile, but at the same time should be aware of instant project changes. Therefore, when unable to use the laptop, he continues working on the tablet that is also synchronised with the cloud computing service, enabling access to emails, documents, contacts, calendar, plans etc. He follows topics shared by others and views the 3D walkthrough of latest plan changes initiated by a designer in the team. Since the design software is integrated with a social media application, it is possible to discuss the content directly in social media networks. These networks help him to keep track on suggestions and comments from the other team members. If required, he leaves a comment and requests a change to the alternative. The particular designer leaves a counter posting, where the rationale is explained transparently. The tablet is also connected to web based office programs if they need to write and edit the document together.

Social media supports the traditional data exchange and helps the team to follow project progress. The latest activities are posted to an internal project blog, which includes the history sharing for interested stakeholders. As an editor of the project blog he can open some of the wall postings to public, while the rest remains in an authorized access. Additionally, he has multiple profiles in social applications for networking. These profiles allow him to keep a track on his colleagues and to advertise accomplished milestones.

In public projects, he usually opens a new thread to get in touch with local people. Citizens have given an important feedback and shared experiences of the locations under the planning phase. He selects the suitable social media application from the mainstream citizens applications for actively engaging them. The selection is based on the medium supporting the target. Sometimes he exports the urban plan to a map or 3D based feedback collection service. The service provides inhabitants with a possibility to write opinions. The interface is available for smart touch screen devices, requiring no special knowhow to navigate a virtual plan. He answers to on-going discussions in development forum at particular hours.

They have agreed within the team to share new proposals through social media. On the other hand, they also feel that inhabitants in the area should be able to give regional input to the plan. When the dialog with citizens has continued for a couple of iterative rounds, usually later at the design phase, the team prepares for applying a building permit. City recently opened an electronic building permit procedure, where a model based plan is uploaded on a cloud service. At this point, the city “spell checks” the model against their regional building and area compliance codes. They also use a complementing software in their internal quality check. The city officials mark the needed changes, when required, as proposals to the model and share corrective actions as marking location tags to an attached social application.

Family is also important to the future knowledge worker. At certain times he stay disconnected. He is able to do so, because applications help the team to operate and to back up individuals. He knows that the project work continues as earlier, without interruptions, even when he is on a vacation in Bahamas.

5 CONCLUSIONS

Land use development and urban construction projects are challenging playground for a communication. The development process often includes collaboration between the various design fields through multiple phases, and thus, the coordination of planning, for example in relation to land use, infrastructures, buildings, energy, and environment, needs to be thoroughly coordinated. At the moment, business oriented people use social media resources to find relevant information. However, it was noted by Klinke et al (2009) that employees sometimes use instant messaging services and communication tools, which are not always supported by corporate IT units. Currently these social media applications are not efficiently utilised within the construction industry context. Social applications are an efficient channel to support formal business process collaboration with the import of tacit and unstructured knowledge, which may considerably improve the outcome of planning.
process. Data in urban planning and construction projects is usually exchanged with formal and specialized applications, like BIM or GIS based tools. Many industry examples in this paper have already demonstrated that social networking extends use of the traditional data with citizen participation feedback.

The implementation of social media applications into a project has to be planned in advance. While considering the use of applications in a project environment, it is necessary to select wisely which one of the potential applications should be utilised. Especially targets, goals and the way their use is measured must be defined. Good indicators for successful use are: implementation, usage, impact, profitability, volume, usability and education (Otala & Pöysti, 2008). Strengthened social perspective may enhance the sustainability of built environment from the planning towards the life cycle of buildings and infrastructures. When developers find a way to filter meaningful knowledge from an extensive set of user opinions, urban planning has an efficient feedback procedure to involve citizens.

The forthcoming years will reveal whether the industry is ready for a strategic change towards transparent larger audiences with a new business communication landscape. Social applications may potentially drive companies to a competitive advantage, enable new business models, and change the processes entirely.

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