
SOCIAL INTERACTION IN URBAN PLANNING PROJECTS

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ABSTRACT

Construction industry and the stakeholders are rapidly inclining towards the use of model-based applications such as building information modelling (BIM), also referred to as “sociotechnical system”. End user perspective and feedback are an integral part of urban planning projects. Developments of ICT and advancement in the use of social media tools have provided new dimensions to web 2.0 applications enabling utilization of 3D virtual world for larger audience. Virtual environments thus act as a scene of participation and social interaction for citizens and end users enabling new methods of participative design process.

This paper introduces participatory approach in urban planning through implementation of freely available social media tools and applications with underlying concept of “Social BIM 2.0”. The end users can monitor the built environment and verify the needs, requirements and usability of the current and future environment. The empirical part of paper consists of two case studies, which present the results of social application testing in urban planning projects. It presents approaches and results of testing social media applications, experimental visualization methods and technologies like web-based gaming environment in urban planning projects.

Keywords: Social Media, BIM, Urban Planning, Virtual Reality, Web-based game environment.

1. INTRODUCTION

Urban planning projects target liveable and functional built environment development for the end users and businesses. Urban planning developments today are tending towards participatory planning as opposed to traditional top-down approach. Planning has traditionally been recognised as a centralised, bureaucratic activity carried out by planning offices, planning authorities and other stakeholders (Krek, 2005). Urban planning processes are complex in nature and they have different discipline specific tools.

Continuous interaction between different stakeholders is one of the key aspects for successful urban planning projects. According to Murray (2010), the rise of bottom-up planning is based on the central importance of communication (written, verbal, street protests etc.) between planners and those for whom the plan is intended. In operational terms, participatory approaches in planning are promoted for reasons of efficiency and effectiveness, currency, relevance, responsiveness and their supposed low cost (McCall and Dunn, 2012). They furthermore focus on creating the sense of ownership and responsibility of the end users towards the surrounding landscape and promotes socially accepted and sustainable design solutions. One of the key issues in participatory urban planning is the missing platform for interaction between

residents, land owners and other stakeholders that can be easily used for information sharing and visualisation of the project. Social media stand as the possible platform in these types of participatory projects for easy and speedy interaction.

Planning projects are complex in nature. Data is fragmented over various layers of scale and disciplines involved. Different levels of information systems that needs to be considered in urban planning project are shown in Figure 1. For professional communication, the industry is rapidly inclining towards the increased use of model-based applications such as building information modelling (BIM), civic information systems (eg. CityGML) as well as geographic information systems (GIS). Together the larger scale collections of information may be described as a landscape information model (LIM).

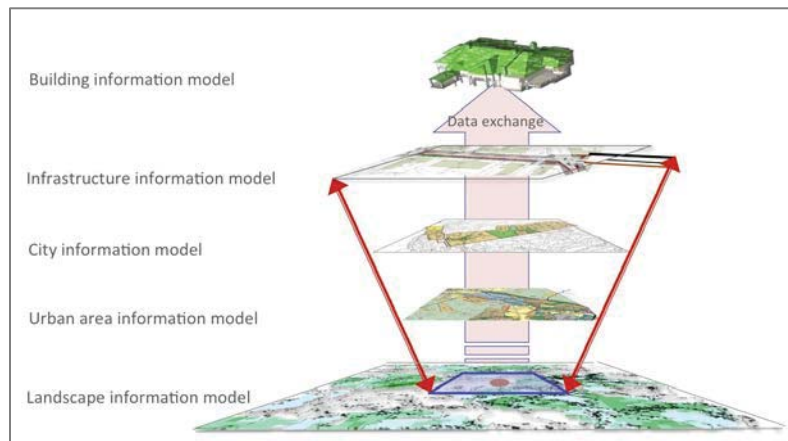


Figure 1: The fragmentation of data to various layers in urban planning.

Participatory design approach is an emerging process where user feedback is considered and their opinions have an influence on the planning. Ever since the renewal of the Land Use and Building Act in 1999, participation has been widely encouraged and actively discussed in Finland (Olsson et. al., 2012). However, one of the major challenges in exchanging information with the public is the variance in information needed in different stages of planning. Typically, the free exchange of ideas in the beginning quickly gives way to emerging conflicts of interest during the process, which eventually mould into legal statements, decisions and agreements as the fiscal consequences of planning are settled (Olsson et. al., 2012). Participative urban planning projects emphasize an open and communicative approach, with a focus on openness especially in the early stages of planning where the contextual knowledge of different stakeholders, especially citizens and local actors is most appreciated.

Social media has potential for redefining the traditional ways of citizen participation by enabling more direct, real-time and networked ways to collaborate (Näkki et. al., 2011). Social media is a group of internet based applications build on the ideological and technological foundations of web 2.0, allowing the creation and exchange of user generated content (Kaplan and Haenlein, 2010). Social media employ mobile and web-based technologies to create highly interactive platforms (Kietzmann, et. al., 2011). The second generation of social media offers a new dimension to these web 2.0 applications towards the utilization of three-dimensional (3D) virtual worlds like Second Life, and web-based environments utilising gaming technologies (Porkka et. al., 2012). Different types of social networking sites and tools are increasingly being used for social interaction within the private as well as public circles. These new interaction opportunities provide the construction industry with a new business communication landscape that can be utilised for an enhanced interaction between stakeholders with a reasonable workload. Together with virtual environments and models distributed through web, end users are able to visualise projects from various angles by smooth navigation. These new technologies furthermore stand as a promising channel for collecting feedback during the planning and at later life cycle phases. The adoption of such technologies has been slow in urban planning and construction industry, but some very promising path openings have been introduced.

2. SOCIAL INTERACTION IN URBAN PLANNING PROJECTS

Since the launch of World Wide Web in 1989, development of web-based technologies continues to make a significant impact on peoples' social and professional lives. Rapid growth and development of information and communication technologies (ICT), in particularly, the growth in prominence of social media and web 2.0 technologies within the last decade have had a dramatic impact globally on how people communicate (Thomas and Thomas, 2012). Construction industry is an extremely information-intensive and knowledge-based industry, and therefore AEC organisations need to fully embrace ICTs if they are to remain competitive (BERR, 2008). The use of ICT in construction enables integration, collaboration and knowledge management, new ways of procurement and site management, and process improvement (Sarshar and Isikdag 2004). For the modern construction enterprise, it continues to be an important driver of process efficiency and an indispensable tool (Underwood and Khosrowshahi, 2012).

In order to achieve continuous interaction between stakeholders, participatory design approach in urban planning today demands easy-to-use social media tools with informal characteristics. They require high quality virtual environments so that a user is able to clearly perceive the design proposal. These types of tools generate a network effect that turns passive content consumers into active content producers to visualise, read, consider, discuss, and develop knowledge and ideas (Porkka et. al., 2012). However, various problems still exists like data exchange between various applications, web-based virtual environments with high level of detail that every user can use without the need of educating how to use it, user motivation, and many more. Social media applications and tools, usually built on web 2.0 technologies, have developed from a marginal phenomenon into a commonly accepted way of collaboration. These possibilities have provided the construction industry with a web-based landscape that can be easily and quickly used for interaction between different stakeholders.

At one hand, social media tools and applications boost interaction possibilities not only within private sphere but also towards the larger scope of public sphere. Whereas, on the other hand, rational ignorance of end users' stands as an integral part of the participatory urban planning processes (Krek, 2005). According to the rational ignorance condition, citizens decide to be rational, ignoring for example, an urban participatory process as participation would require a high investment of time and effort (Poplin, 2012). There is therefore a need for easy-to-use public social media tools integrated within the ones what they are already using in their everyday life. These would help to motivate the users so that the tendency towards rational ignorance is minimized. The strength of social applications is in their many distinctive features including openness, free basic use, collaboration within a network or community, and an iterative production model (Ropponen et. al., 2010). According to Kaplan and Haenlein (2010), social media can be categorized into six types as shown in table 1.

Kaplan and Haenlein (2010) have grouped the social media typology depending upon two key elements: media research (social presence, media richness) and social processes (self-presentation, self-disclosure). The idea of social presence and concept of media richness are closely related and interwoven with each other. Some social media are more effective than others depending upon the degree of information transmission they allow. The first classification is made based on the richness of the medium and the degree of social presence it allows. The concept of self-presentation in conjunction to the social dimension states that in any type of social interaction, people have the desire to control the impressions other people form of them, in other words self-disclosure of oneself with various objectives.

Self-disclosure is not considered as the key indicator for the pilot projects as the primary focus is to activate end user participation with easy to use and user friendly social media tools/applications. Virtual

Table 1: Types of social media depending upon social presence (Kaplan and Haenlein, 2010)

		Social presence/Media richness		
		Low	Medium	High
Self-presentation/	High	Blogs	Social networking sites (eg., Facebook)	Virtual social worlds (e.g., Second Life)
Self-disclosure	Low	Collaborative projects (eg., Wikipedia)	Content communities (eg., YouTube)	Virtual game worlds (eg., World of Warcraft)

environments of social and game worlds are in the highest level with reference to media richness as they try to replicate all the dimensions of face-to-face interactions (Kaplan and Haenlein, 2012). Each type of social media has its own personality and way(s) to reach out to the potential audiences. It is therefore important to choose the optimal social media channel(s) depending upon the goals for communication. For participative urban planning projects, visualization and the readability of the intentions of other stakeholders and planners is a primary need. Virtual social and game worlds are the current need of implementation at the early stage as it provides a virtual built environment platform where users are able to navigate high quality BIM data. It moreover provides end users with easy to use tools for navigating and visualising the proposed project so that the impact of the design proposal is better understood.

3. UTILIZING SOCIAL MEDIA IN PLANNING PROCESS

Social BIM 2.0 has the core concept of linking BIM technology and social media. Social media is everywhere. User growth and popularity of social media with its irreversible impact in our daily life today has made it as an easy platform for interaction and sharing information between large numbers of audience. Integrating BIM technology with social media applications has been outlined in this paper as core concept in defining “Social BIM 2.0”. For example a simple concept of social BIM 2.0 is integrating social media sharing capabilities straight from BIM applications. This is further enhanced by making BIM applications be able to collect the feedback and users view about the shared content within the application’s environment. In a simple understanding, BIM applications should integrate with social media tools so that users can sign in with one’s credentials and be able to follow up the shared content of the BIM applications. It will not only make BIM application vendors to introduce new and easy user integration but also provide the customers with platform to continuously discuss and obtain feedback of their design content in a more approachable way.

Specific to urban planning and construction processes, social BIM 2.0 act as a platform that provides web-based virtual environments along with novel participatory forms to capture the user feedback. Participative design approach and integration of social media creates easy communication channel. Information and idea overflow with larger audience input will result in an unorganised data management if not monitored properly. Large numbers of users are active in social media with medium degree of richness where formal and informal discussions as well as information flow and sharing occur all the time. Construction industry data fragmented over multiple platforms face a major problem of Knowledge Management (KM) and activation of end users can make it even more complicated. Case study of Dave and Koskela (2009) for implementation of social media application to solve organizational knowledge sharing problem was considered successful as the solution provided an effective and simple way to create knowledge by taking employees’ ideas through an iterative cycle of discussion. It furthermore provided a searchable knowledge repository capturing both tacit and explicit knowledge that was possible today through web 2.0 technologies. Thus, social processes applied in construction projects serve as an effective lever for the capture, sharing, and dissemination of valuable experience and knowledge (Kazi and Koivuniemi, 2006).

4. CASE STUDIES

The approach in this paper is presented through two case studies: an urban planning project for a retail development in Inkilänportti and a typical road and railway plan in Nissola, both located in greater Helsinki area in southern Finland. These case studies have been selected to highlight the use and added value of new working methods enabled by the social media. The first case study utilizes virtual models in order to change the planning towards a more collaborative workflow, while the second case study has a bold target for increasing the use of participative design methods in urban plan development. Both of these pilots show that the creative use of social media offers better opportunities for various stakeholders, especially non-professionals, to contribute to developing the plan.

4.1 Inkilänportti retail area plan development

The future Inkilänportti retail area is located in Kirkkonummi municipality 25 kilometres west from the centre of Helsinki city. The planning area covers 50 hectares of land which at present is predominantly forest with sparse settlement. The planning area is located at a strategic point, where the main road artery (Highway 51) westwards from Helsinki city meets the end point of the outer ring-road (Ring Road III). This gives a lucrative position to commercial development. The area will be connected to the surrounding future housing areas as well as a nearby railway station with a network of bicycle and pedestrian ways. A direct bus connection towards Helsinki city as well as outwards towards the urban centre of Kirkkonummi will open the development area to public transport.

FCG Finnish Consulting Group has been commissioned by the land owners to prepare a detailed city plan (asemakaava) as well as road and infrastructure plans to the area. FCG also acts as a coordinating planning consultant for preliminary planning for the buildings and public areas. Planning is based on the Greater Helsinki regional plan (maakuntakaava) (2006) and general plan (yleiskaava) for Kirkkonummi municipality (2006). The general plan is being revised by the municipality in a separate simultaneous process, which will end in a detailed general plan (osayleiskaava) for the surrounding Inkilä area. The detailed city plan (asemakaava) will be subjected to political decision making in the end of 2012.

In an early stage of planning it became apparent that the complexity of the planning object and the on-going simultaneous processes pose an exceptional challenge for project management. An innovative use of BIM in project management as well as in collaboration and communication within the planning team and between different stakeholders (planners, land owners, citizens, municipality and regional authorities) has been seen as an effective tool for the project. The experience gained in using BIM and social media serves as a base for future infrastructure design development projects. Alongside with the practical planning questions at hand, one of the major challenges for this project is the incorporation of participatory design approach itself as a whole for larger audience. The participatory methods are at this stage piloted within the planning group and in conversation with the client, and larger audience will be served at a more advanced stage of the planning process. A major challenge is also design data collaboration between different design disciplines. The industry still lacks standard data exchange format between InfraBIM and BIM of the proposed facilities.

Traditional design meetings have been carried out in a regular basis. Social interaction and the use of social media is one of the key objectives in this pilot project. Social media tools with high level of media richness have been selected as an early step of social media integration. This has been done by testing the use of virtual reality model for collaboration where the owners were also present (see Figure 2, left).

The virtual model generated was produced by Vianova Systems Finland, and the BIM environment has been viewed in the virtual laboratory of VTT Technical Research Centre of Finland. This multi-user virtual environment consists of three adjacent large wall displays adjusted at an angle of 45 degrees where navigation is performed with multi-touch gestures on a large table-top interface. The environment provides a platform where different stakeholders and designers have come together to understand the complex design parameters and clashes between different disciplines.



Figure 2: Image from Inkilänportti project meeting organised in virtual environment at VTT (left, image courtesy of Janne Porkka) and screenshot from virtual model (right, image courtesy Skanska CDF Oy / Vianova Ltd / FCG Finnish Consulting Group).

End users / citizen participation for the specific project is currently being planned to be implemented with use of workshops, web-based virtual environments and social media channels to activate end users and gather their feedback. Questionnaire survey with the degree of 1 to 7 among the participants was carried out during a working meeting (where 1 is completely disagree, 4 neutral, and 7 completely agree). The questions/views related to the social media use and technological acceptance were included. These views contained the core concepts like if design contents were better understood; if similar technology will be used in future projects; and if similar web based virtual environment (VE) applications will be beneficial as an end user tool. Key findings from the survey are as follows:

- 46% of the users completely agreed and 46% of the users partially agreed that the virtual environment has helped them to better understand the project.
- 92% of the participants completely agreed that they would use similar technology in future projects.
- 81% agreed that it would be beneficial to have a web based VE application that can be used by the users with own minimal resources available

4.2 Nissola street and railway plan

The second case study addresses a street and railway plan at Nissola region of Nummela city that belongs to Vihti municipality. The project is located at 45 kilometers from Helsinki in northwest direction. Existing non-electrified single track, Hanko-Hyvinkää railway used for goods transportation passes through the proposed area. Primary goal is to remove existing four numbers of level-crossings and develop a proposal of new street connection with single underpass crossing for user safety and well managed traffic flow (Sito, 2011). Three different versions of roadway design were proposed for local discussions with the municipal officials and the selected option was developed further. The selected option was presented to the different target groups like municipal officials, end users/residents, as well as interested groups of people. The proposals were displayed through the local channels in printed format at municipal service points (Vihti, 2012). Introduction of web-based game environment as a social media tool was carried out in public hearing (23.5.2012) so that end users could easily understand the proposal in virtual environment (see Figure 3, left). Users can browse the proposal through internet until 1st June 2012 to collect the feedback. This has been first urban project where web-based game environment is being used with the possibility for the users to provide feedback (see Figure 3, right). Interestingly, the project has a bold target in utilising social media as participative method too in urban plan development in order to enhance various stakeholder possibilities to contribute plan development.

Urban planning calls for social media applications that have high degree of media richness as discussed earlier. The industry still lacks virtual environment applications of web-based higher quality that replicates the built environments where users can perceive the new developments accurately and easily. Primary function of these web-based virtual worlds is to provide the possibility of easy navigation space for visualising urban environments. The project work is led by Sito Ltd., a design consult, who has gained very positive feedback from using such methods in their earlier projects. This is also very first project in Finland that uses virtual game worlds as social media tools with the possibility to provide

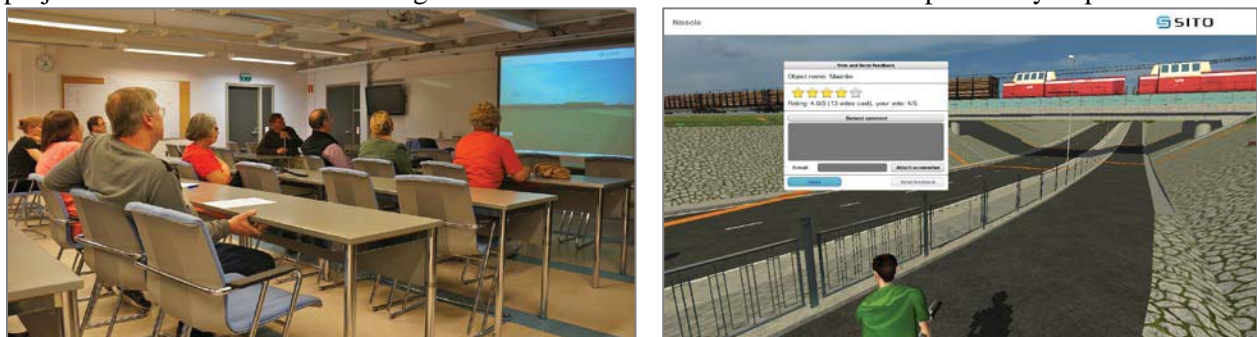


Figure 3: The public hearing of Nissola road and railway plan on 23rd of May 2012 in Vihti (Image courtesy of Janne Porkka) and screenshot from Nissola web model with commenting feature (Image courtesy of Sito).

feedback straight through the environment. High quality visualization and possibility of providing feedback is a key to easier communication with the end users. Multi-user environment with possibilities of interaction within the environment has been made possible and will be tested in near future.

Questionnaire survey similar to the one in Inkilänportti was used to perceive users' view and technological acceptance. Key findings of the survey results are outlined as follows:

- 64% of the users completely agreed and 9 % of the users partially agreed that the virtual environment has helped them to better understand the project.
- 45% of the participants completely agreed, 18% of users partially agree and 9% remained neutral that they would use similar technology in future projects.
- 36% of the users completely agree, 27% of the users partially agree, 18% remain neutral and 18% completely disagree for the question about future use of similar web-based VE application from ones computer.

One of the projects that is currently running undertaken by Sito where gaming environment has been used is for Perhelä apartment block in the city of Järvenpää (Järvenpää, 2012), situated near the Helsinki metropolitan area in Finland. The Perhelä district targets in becoming an attractive landmark in commerce and housing, and that will simultaneously reinforce Järvenpää as an administrative center for the region. New construction of the Perhelä block, with parking facility for 600 cars results in daily traffic volumes of approximately 6400 – 6600 vehicles in the area (Sito, 2012). The project has started in 2010–2011 with evaluation of impact the project would have on traffic as well as the infrastructure construction sites related to the project. The project is continuing with Perhelä district detailed plan and modernised central street called Helsingintie to be completed by autumn 2012. The project is a fascinating example in using two participative methods towards residents and other stakeholders. Järvenpää collects feedback through web with use of SoftGIS application (SoftGIS Perhelä, 2012) about successful plan sections and development needs. The interface is a map where users are able to post comments (see Figure 4). The results are not yet available, but opinions are exchanged actively at the discussion forum of Keski-Uusimaa newspaper.

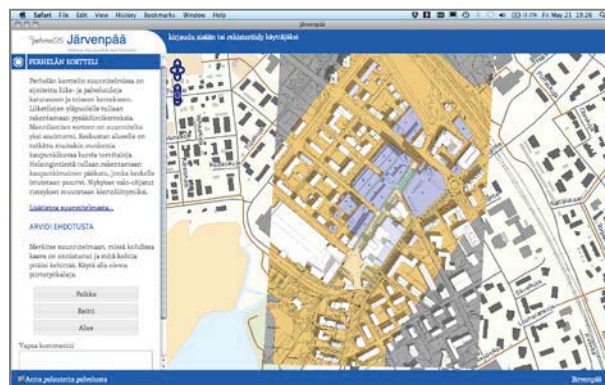


Figure 4: Screenshot from SoftGIS in Perhelä district at Järvenpää (Image courtesy of Järvenpää city).

The city of Järvenpää organised a public hearing event, where web model from Sito Ltd. utilising gaming technology for Perhelä was introduced to residents and media (Sito, 2012). The model includes two scenarios - realistic plan and vision for the future - switchable from menu. Furthermore, a realistic model also offered daytime and night views to landscape (see Figure 5). Viewers of the web model shared an opinion that the virtual plans help in gaining better understanding on the content of plan. Furthermore, the government officials of Järvenpää also had positive experiences from the model. The Perhelä visualization for example helped in traffic discussions of central street called Helsingintie, which will be modernised. Three traffic light intersections at the central street are being converted into roundabouts, new median strip will be added and new intersection is built for shopping center. The evaluated traffic solution in the new scenario provided the results of a well-functioning traffic system.

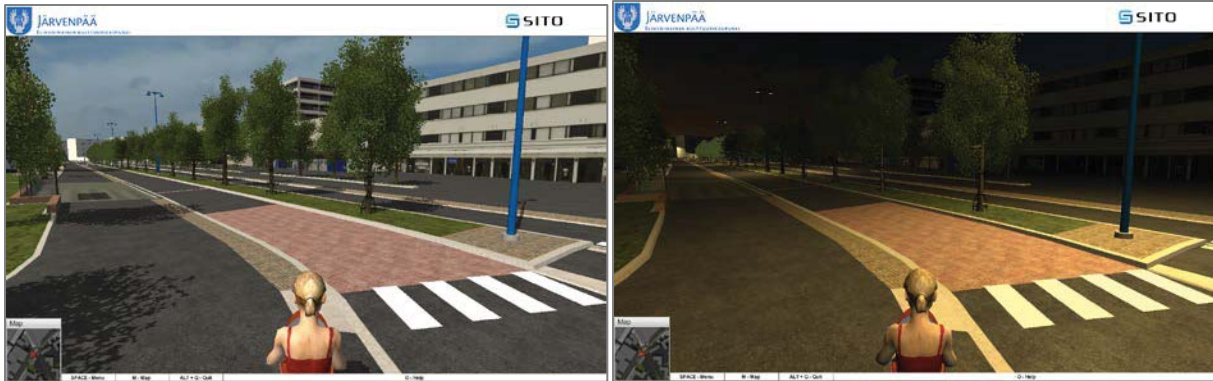


Figure 5: Screenshots from web model in Perhelä district in Järvenpää, daytime view left and night view right (Image courtesy of Sito).

Case studies and a referenced project above includes the main concept of end user activation through use of social media. Gaming environment has primarily been used for creating the web-based virtual environment that is used online where installing additional software is not required. Very little explanation is needed for a user to explain how the navigation is used depending upon the familiarity of user with such kind of virtual world. These types of web-based environments has been seen as a positive and promising platform for participatory urban planning projects. Users have seen the technology as an easy and approachable medium for better understanding and visualising the project contents. The virtual game environment being a web-based application where users can access them at their own ease and time provides a possibility of wider use and acceptance. In the future, these web-based applications will provide various kinds of interaction possibilities like multi-user navigation, immersive virtual interaction within the environment, etc., that will enhance its usability among the users.

5. DISCUSSION AND CONCLUSIONS

Participatory design approach needs to be incorporated to promote a socially sustainable environment with a high grade of public acceptance.. Incorporating social media in participatory urban planning supports and enables increased interaction. The vision of using social media in urban planning projects is to provide a landscape for both designers and end users with a common platform to share knowledge and provide them interaction tools to act on the common built environment issues about what end users want and need from the projects. Easy to use and web-based virtual game environments minimize or tend to minimize rational ignorance issue in urban planning projects by simple click and browse method navigation as well as by regular and constant interaction with the users. This two-way communication approach provides a platform to engage and motivate end users for active participation.

Using social media as a tool for participatory planning gives the planners, stakeholders and end users easy and efficient platform for communication and interaction. Importance of social media tools and degree of user motivation needs as stands as selecting the appropriate tools for its implementation in participatory planning. The social media classification of Kaplan and Haenlein (2010) subjected to their importance and need of user motivation is visualised as shown in Table 2 below (for easier selection, social media classifications, are grouped into three groups depending upon their social presence/media richness).

Social media like blogs and collaborative projects (group 1) have low importance in participatory planning as high level of user motivation is needed and have lower level of interaction possibilities. Social networking sites/content communities (group 2) and virtual social worlds/virtual game worlds (group 3) both have high importance in participatory planning whereas motivation level needed to activate end users is seen as low and medium/low respectively. Group 2 social media are widely accepted and used by most of the people. These type of media is active used as the channel for information sharing

Table 2: Importance of social media in participatory planning

		Group 1 (Blogs/ collaborative projects)	Group 2 (Social networking sites/content communities)	Group 3 (virtual social worlds/virtual game worlds)
	Importance for interaction	Low	High	High
Participatory planning	User motivation needed	High	Low	Medium/Low

and communication in today's digital work. So they need low level user motivation. Group 3 social media also stand as has high level of importance as these type of platforms provides the possibilities of 3D virtual world navigation and visualisation and should be used along with group 2 social media tools. They are categorised as both medium and low level in need for motivating users. Medium level representation has been done because of the complexity of their use like the need to download, install and follow rules. However, lower level of motivation will be required when web based user friendly environments will be on its full potential.

Social media use in participatory urban planning uplifts the possibilities of easier communication and interaction with end users. The variance of social media tools used together and in parallel to each other definitely has a promising future for participatory urban planning projects where users are more active. Social BIM 2.0 outlined earlier also deals with technical part of easy content generation of BIM data for use in these types of web-based environment that can be applied for using in social media. These projects as are still in the process of implementation. Further steps include creating project specific social networking sites and content communities so that end users are actively participating and discussing about the proposed built environment. 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 (Ojala & Pöysti, 2008). The feedback thus generated will be actively monitored and incorporated in the design changes that will come in the future days. However, more concrete results, both positive and negative impacts of using social media in participatory urban planning will be clearer in coming days.

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