Using WebGIS and Videoconferencing to Support Distributed Concurrent Urban Planning Workshops

A case supporting a collaborative community "Treasure Map Creation” workshop

Leleito EMANUEL, Akira OHGAI, Motoya KOGA, Yoshimizu GOHNAI
Toyohashi University of Technology
1-1 Hibarigaoka, Tempaku-cho, Toyohashi City, Aichi Pref., Japan
Tel: +81-532-44-1320,
Fax: +81-532-44-1320,
Email: emanuel@urban.tutrp.tut.ac.jp

Key words: Citizen Participatory Planning, WebGIS, Videoconferencing, Distributed Workshops

Abstract: This study focuses on an experimental method that employs the internet, WebGIS and videoconference systems to enable gathering and sharing of information from concurrently hosted multiple distributed participatory planning workshops. The method is expected to contribute to time, effort and economic savings while enabling greater grassroots participation as well as promoting the whole participatory planning process through more efficient information collection, sharing and updating. The authors present as a case study a distributed WS supported by videoconferencing and WebGIS systems reporting on the challenges and the implications for use in supporting participatory planning from the community scale to the larger scale regional planning levels are discussed.

1. INTRODUCTION

Democratic bottom-up planning processes undoubtedly plays a significant role in planning, be it as a law requirement, decision improvement, legitimization of plans or various other reasons. Citizen participation in planning is summarily described as a process through which people who will be affected by or are interested in a decision, those with a stake in the outcome, get a chance to influence its content before it is made, and in the process producing “better decisions and better citizens” Grabow, S. H., et al. (2004). From the decision maker’s view, it enables them to gain diverse information more attuned to the needs of different groups for better decision making, foster democratic ideals as well as to “recruit support, obtain legitimacy, and avoid opposition” (Leatherman, J. and M. Howell, 2000). From the citizens’ side, participation is an opportunity to express their preferences and learn more on issues of interest and, more importantly a chance to determine the nature of the solutions to these issues for their best benefit.

At present, public involvement usually occurs in many forms such as the mass media, websites, public education meetings, public hearings, surveys, visioning or search workshops, neighbourhood planning councils, referenda et cetera. However, tools methodologies for supporting higher levels of citizen participation in planning are not yet established and true public involvement continue to become an elusive goal. Here, “Higher Level” of citizen participation refers both to the higher rungs in the Ladder of Citizen Participation as typified by Arnstein, S. R. (1969) as well as to a greater number in citizen participation. Real success in such a process requires a well informed and engaged citizenry as well as an enhanced connection between the local residents and their local government. Development in information communication technology (ICT) has availed new options that hold the potential of “turning citizen participation into a pervasive, enriching and habitual part of public decision-making” (Samuel, A., 2005).

Innes J.E. (2000) argues that the traditional methods of public involvement in government decision making simply do not work while some of the emerging alternatives “lack the hands-on reality of engaging members of the public directly with decision makers, even in the limited way that is possible through traditional participation”. She however gives examples of search conferences, community workshops and visioning efforts as newly evolving cooperative methods that hold great promise which she believes will become “the dominant way of involving the public in planning decisions”.

In Japan, the popularity of citizen participation in planning has been boosted by the City Planning Act (ordinance 18.2 enacted in 1992) which requires that all municipal governments prepare urban master plans through engagement with local residents in a citizen participatory process. Currently faced with complex social issues and a public growing more sceptical and demanding a greater stake in decision making, local governments have taken citizen participatory planning workshops (WS) as the flagship of higher level of citizen involvement in planning. WS is a kind of face to face deliberative forum that tries to involve multiple stakeholders especially local citizens in the planning process as intimately as possible.

However, local governments are still struggling with challenges both in providing and receiving information from citizens. In this paper, multiple distributed WSs supported by videoconferencing and WebGIS systems is proposed as a viable solution for a more effective support of the WS. This WS support method is expected to contribute considerably to time, effort and economic savings while enabling greater grassroots participation as well as promoting the whole participatory planning process through information collection, sharing of information, information updating, and promotion of transparency and acceptance of the final decisions made. The authors present a case study WS supported by WebGIS and videoconferencing systems reporting on the challenges met and the implications for use in supporting participatory planning from the community scale to the larger scale regional planning levels are discussed.

2. THE “WORKSHOP” MODEL OF CITIZEN PARTICIPATION IN JAPAN

2.1 Overview of the WS model

The WS model of participation prioritizes hands-on experience of planning issues and face to face engagement of participants. Figure 1 shows the steps in a conventional WS which usually incorporates “Town walks”.

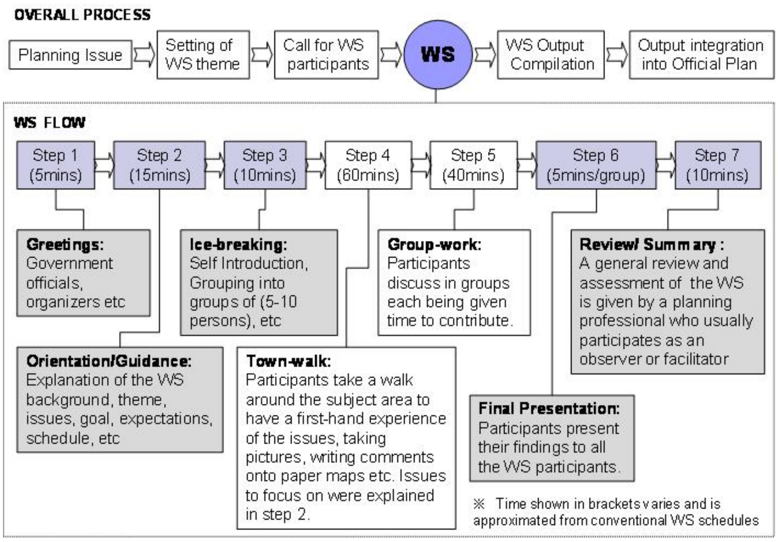

Figure 1: The overall process and activity flow in a WS

WSs are seen as an effective way for meaningful interaction between the public and the decision makers. The WS process is designed and managed in such a way that each participant is given a chance to express themselves in an environment that discourages direct opposition to their views. This enables gathering of widely varied ideas from the WS while encouraging consensus building. The WS are usually small to medium scale in size, with participant number ranging from about 5 to 50 people. Core activities during the WS take place within groups of 5 to 10 people which are formed to allow for greater participation and richer discussion. It is usually towards the end of the WS that these groups present their findings to all the WS participants, otherwise even though in the same venue, there is no real interaction between the groups. After the WS, these findings are edited and all compiled together into reports for planning reference, and in some cases, a simplified compiled summary of the WS output is prepared and distributed to the WS participants and other local area residents.

2.2 Issues in conventional WS model

WSs are usually held either once or many times over a period of time. In conventional WSs, while the venue location might change, all participants usually assemble in one venue each time. Problems that have been observed in such WSs, include time and venue limitations, issues of information sharing during and after the WSs, information updating, and compilation of the WS output, etc (Figure 2.). Some of these issues are gradually being solved especially through use of ICT which offers more transparency, accessibility and work efficiency. In the WS model however, time limitation issues come to the forefront due the limited time available during WSs and the limited distance a person can walk in the given time. Also, people might be unwilling to spend extra time from their busy daily activities in travel to attend WSs in distant venues. In addition, the fact that group-work is at the core of the WS causes limitation on the number of participants. Presence of many groups a packed venue results in a non-conducive atmosphere for

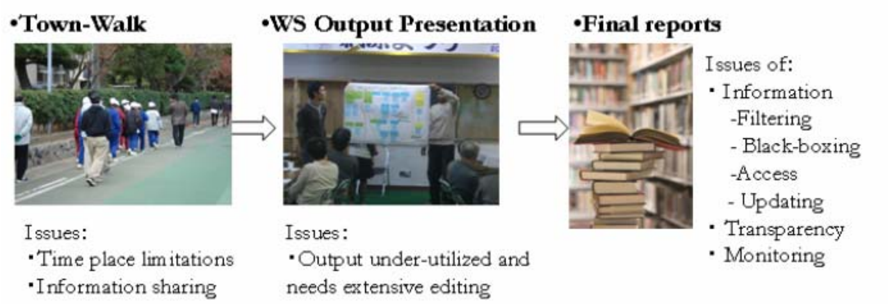

Figure 2: Issues in conventional participatory planning workshops

group-work discussion due to noise levels. It is not unusual to hear someone wishing there were a partitioning or even a room for each group.

These problems, most with effects that increase in proportion to the size of the plan subject area have often resulted in poor participation and inadequate utilization of the WS outputs both in promoting awareness among residents as well as in use in the final plan drafts, and in some cases have lead to loss of confidence on the effectiveness or usefulness of this kind of citizen participatory planning process. They are a significant obstacle to effective democratic planning.

2.3 Emerging ICT tools for WS Support

Basing on experience in same-time/same-place conventional WSs, the focus of distributed WS support can be distilled to support for Steps 1,2,3,6, and 7 in the WS process shown in grey on Figure 1. This is because even in conventional WSs, the only time that communication occurs between or is intended for all the participants is during the greetings, orientation/guidance, ice-breaking, final presentation and review steps during the WS. However, most of the emerging WS support tools currently in use in Japan whether analog or digital are mostly used to support same venue WSs. Many incorporate digital tools such as 2D and 3D maps, CG, virtual reality (Takafumi, A., 2006), WebGISs or Participatory Planning GIS (PPGISs) (Ohgai A., 2007), etc, in tandem with or replacing part or all of the traditional analog tools used in the WS. To a limited extent, some research efforts have made attempts to support remote participation in WSs using a combination of WebGIS and web chat(Takeyuki O., 2006) while VRML and online tools such as Google Sketchup, Google earth and 3d virtual worlds such as Second Life or ActiveWorlds, etc, hold great promise for use in collaborative planning.

Laurini R. (1998) examined some of the collaborative software/Groupware tools that were available for use in supporting collaborative work. While there has been great advancement in ICT since then, the conditions that he gave for success when using Groupware 1) the will to participate 2) training and 3) well designed system, are important to consider. To the WS participant, a big number of these emerging ICT tools are too feature-rich requiring too much of a steep learning curve than they are willing to indulge in. Nijkamp P. (1993) gives a summary of the type of system design appropriate for different users as shown on Table. 1. The important point is that professionals such as Information specialist and Policy makers might need more complex, feature-rich systems, but the decision maker and the local citizen is best served by an easy to understand,

Table 1: System and data design for different users (Nijkamp, 1993)

Type of role	Information demand	User demand	Type of GIS
Informationt Specialists	Raw Data	-Analysis -Flexibility	Large Flexible
Policy Preparers	Raw and Pretreated data (=information)	-Analysis -Good Flexibility	Compact Manageable
Decision Makers	Strategic information	-Good accessibility to users -Weighting and optimizaiton models	Small and beautiful"
Interested Citizens	Information	-Good accessibility to users	"Small and beautiful"

easy to use systems. Even though many ICT tools that enable same-time/different place collaborative work by remotely located teams are available, the challenge of fitting these tools to the user needs still remains. The case study presented in this paper adds a new dimension to the WS process by introducing the use of internet videoconferencing together with WebGIS to support same-time/different place collaboration scenario in distributed WSs. This setup while trying to retain the merits of face to face meetings gains the merits of multiple distributed WSs mentioned earlier.

Videoconferencing is the next best thing to face to face meetings which are considered as effective methods for consensus building. This method of communication has recently been gaining popularity especially in the private sector due to the time and economic savings which often translate to greater meeting attendance. It is touted as being environment friendly as it reduces the need for long distance travel. WebGISs on the other hand provide tools for obtaining, managing, analyzing and deploying spatial data and associated attributes to a wide range of potential users over the web. Spatial data constitute the core of the information needed for visualization and analysis of phenomena useful in decision making. Many WebGISs serving different purposes are rapidly being implemented and the use in particular has increased dramatically due to their affordability and rich functionality enabled by the combined power of the GIS engine and the high accessibility provided by the internet.

3. CASE STUDY: COLLABORATIVE COMMUNITY "TREASURE MAP CREATION” WS

3.1 Overview of the “Treasure Map creation” WS

The "Treasure Map Creation Workshop” (henceforth tmWS), like in many other local governments in Japan, was an effort spearheaded by the urban planning department of Tahara City Local Government (TCLG) to involve local residents in the decision making process. The tmWS targeted elementary school pupils to discover what they, from children's point of view, considered as most appealing (treasures) in their home town. The ideas gathered from the tmWS would later be considered in the creation of the districts master plan. The tmWS was also viewed as an opportunity to introduce and involve the young citizens in the planning of their local area which would not only help them know more about their local living environment, but also initiate them to the idea of participatory planning from a young age by encouraging them to give their opinions and see them take shape.

The tmWS brought together multiple stakeholders such as the local government, local residents and a community based organization, our university, a local consulting firm and local elementary schools (Figure 3.). The authors served as the project managers/leaders of tmWS charged with the management and organization as well as with the provision of the ICT tools to support the whole process.

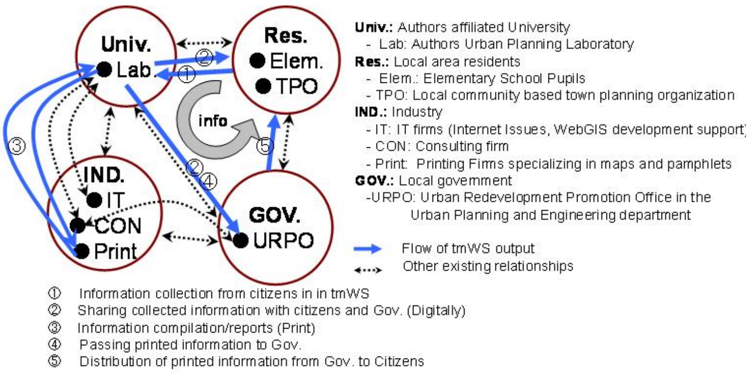

Figure 3: Central role played by the University in the tmWS

3.2 The shift to distributed WS method

The initial plan laid out by TCLG was to hold the tmWS in the conventional, face to face WS where all the participants gather in one venue. However, the plan took on a new form whereby the tmWS would be held as a single WS to be cohosted in two different venues within the premises of the two elementary schools. The shift can be viewed as an effort to meet the needs shown below.

1) The large size of the study area and the limited time available for the tmWS clearly needed a new WS method that would enable maximum coverage of the area in a short time. Also, since the tmWS targeted 6th grade

children, there was also need to consider reducing the maximum distance each participant has to walk.

2) Since the tmWS was on a normal school day, the administration of each school preferred to have the WS be held within its own premises and in line with the school schedule.

3) The large number of participants (more than 100 including support staff) divided into 9 groups that would each require enough space for uninterrupted group discussions limited the choice of suitable venues. A large number of equipment also needed to be secured for use in the tmWS. These included at least 20 digital cameras, 20 computers, 2 Webcams, at least 4 projectors, printers, USB memory devices, network cables etc. Holding the tmWS within the premises of the respective schools, using the facilities available there would greatly reduce this task while offering more space for group discussions.

4) To the authors, the tmWS provided an opportunity to try out and research new methods to deal with problems such as time and place limitation, issues that have been observed in conventional WSs

Table 2: Preparation for the tmWS

Date (2007)	Contents
7/20	①First meeting with URPO staff of TCLG, Consulting firm where TCLG made clear their expectation from the tmWS. This was followed by constant communication with URPO representative resulting in changes to distributed WS, customization of the WebGIS to meet the tmWS demands, preparation of the Web-cameras set-up process, etc.
10/24	①Meeting with the administration and staff of the elementary schools and URPO to explain the tmWS objectives and expected flow. ② Questionnare survey to find out what the pupils considered as their communities “treasure”. This would be used in WebGIS icon creation. ③ Checking the venue layout (internet access points, power sources and numbers, needed network cable lengths, etc)
11/5	①1st audio/visual test using Videoconference system. ②1st test using computers in the two venues to access the WebGIS ■ mainly checking network connectivity
11/13	①2nd audio/visual test using Videoconference system. ②2nd WebGIS access test using multiple computers (same number required for the WS) in the two venues ■ mainly checking network connectivity, quality of service and fall-back options in case of network and WebGIS server problems
11/16	①3rd audio/visual test using Videoconference system. ②3rd test using multiple computers ■ main focus on resolution of issues that arose from during the 2nd test.
11/21	tmWS day

3.3 Venue set-up for the tmWS

To support the distributed tmWS, the two venues were set as shown on Figure 4. There were 78 pupils from the 6th grade of two elementary schools, 53 from one and 25 from the other. There were 9 groups in all requiring 9 facilitators and at least one support staff for each group. The facilitators were mainly drawn from University students who were up to the task with a little training, while the support staff included members from URPO, TPO, a consulting firm, and teachers from the two schools. Two of the authors were each based in each venue as moderators while the other was stationed in the University to deal with any WebGIS server problems that might arise.

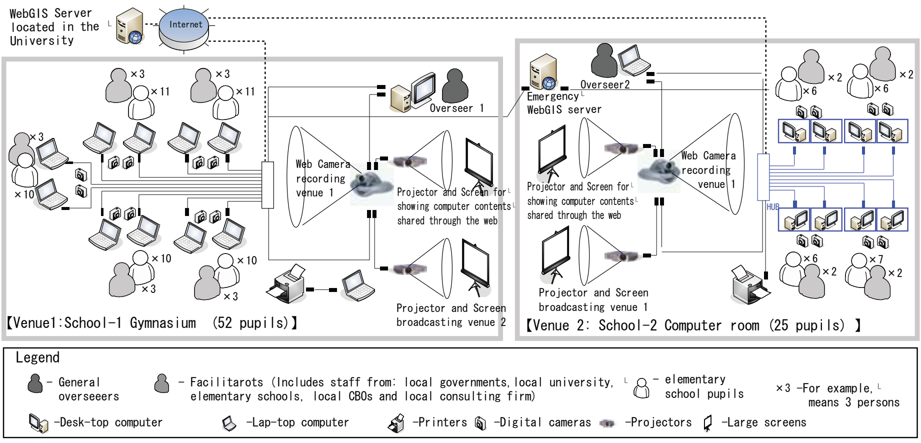

Figure 4: The venue layout for the tmWS

The WebGIS system employed in this study was developed in partnership by Toyohashi University of Technology, Kogakuin University and Informatix Inc. It runs on Geognosis.NET whose base GIS engine is Cadcorp Spatial Information System® (SIS) and can therefore be used to view the many kinds/formats of data supported by SIS. It has evolved through tests in many WS scenes resulting in a compact easy to use/understand system for gathering obtaining, managing/storing and sharing information collected. It is also very flexible in that, by just changing the menu items and the icons, it can be customized to fit any WS theme. (The theme shown on Figure 5. is a customization for the "Treasure Map Creation WS".

Apart from the essential features such as Map view, Map navigation and data input functions, other features that we have recently added include:

1) Commenting Function: for adding comments, opinions or asking questions on collected information, 2) Evaluation Function: for polling and

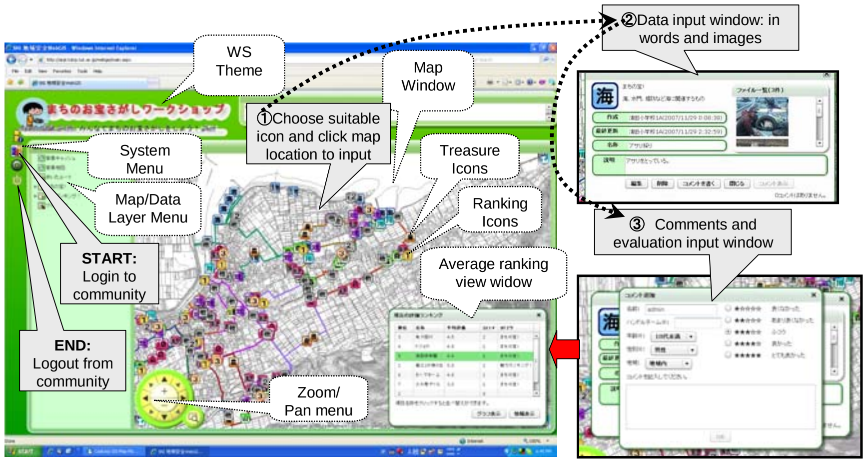

Figure 5: The interface and functions of the WebGIS system used

rating of collected data by users 3) Reply Function: for users to post replies to comments made or questions asked 4) Ranking Function: enables viewing of collected data ranked based on the number of comments/questions made (the amount of interest) as well as based on the average evaluation points given. The interface of the WebGIS system is as shown on Figure 5.

The videoconference system allowed the the tmWS participants to hear, see, converse with each other using large projector screens (Figure 6). In this study we used the Polycom® VSX 7000s videoconference system which is a standalone system that offers excellent voice and video quality as well as a high level of security without the need for any installing special software. It can also transmit the computer screen contents of user, useful for presentation. These tools were used as shown on Figure 7.

Figure 6: Listening to presentation from the other venue through the video conference system

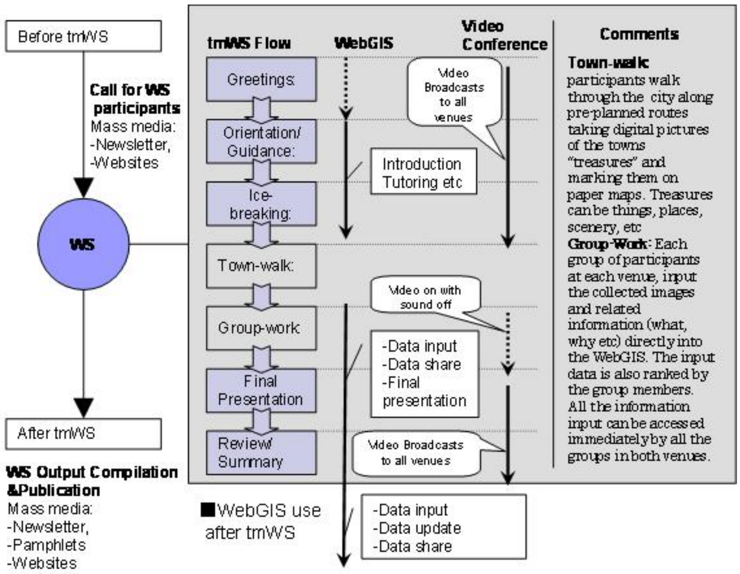

Figure 7: WebGIS and Videoconference systems use in tmWS

3.4 Results from the tmWS

Figure 8 shows the routes taken and information input into the WebGIS system by the tmWS participants, while Figure 9 shows more detailed information gathered by one of the groups for the "Treasure Map" creation and ranked during the group discussions. Information from all the groups are

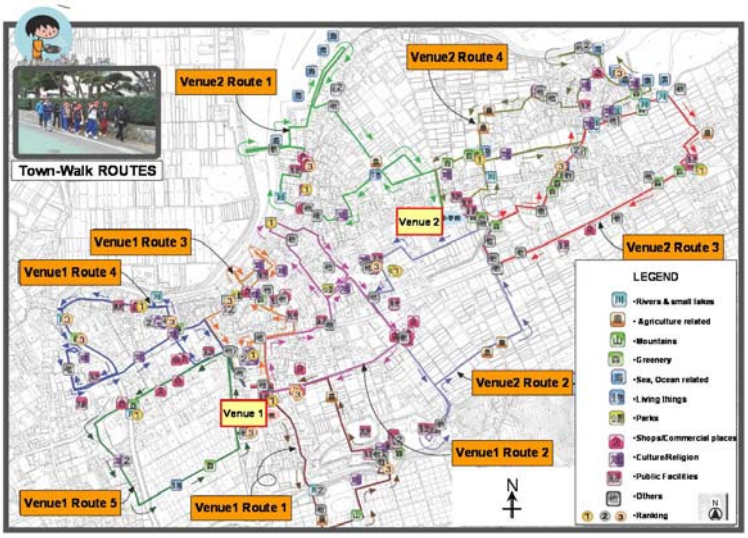

Figure 8: The final map of the study area showing routes taken by each group, discovered "treasures" and ranking for the top 3.

later compiled after the WS and distributed to all the WS participants as well as local area residents. Figure 9 shows a page from the "Community Treasure Map" pamphlet made for distribution. Holding the WS in 2 venues made it possible to cover the whole of the required area within the given limited time. The issues of information filtering and black-boxing that often accompanied WS output compilation mainly due to extensive re-editing during the compilation process were reduced because the data input directly into the maps through WebGIS by tmWS participants were later shared over the web or in print format as pure as possible with little or no editing. In addition, storing the WS information in an easily accessible database would make it easy to monitor the progress ensuring that the information collected during the WS are made to good use by the responsible entities.

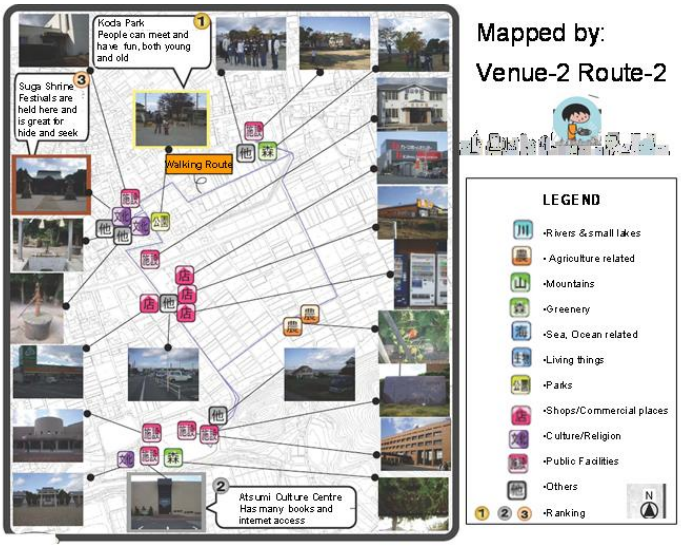

Figure 9: Example of a detailed Map created by one group

Figure 10: A page from the final "Treasure Map" for distribution

4. DISCUSSION ON THE DISTRIBUTED WS SUPPORT METHOD

4.1 The Issues pertaining to the distributed WS

By holding distributed concurrent WSs in two different venues, issues that arose included schedule management/synchronization, securing of equipment, getting and training facilitators and support staff, network access/speed and security problems, data sharing and communication, etc. These issues can be roughly classified into management and technical issues and are seen as essential for success in multiple distributed WSs. Most of these issues can be identified and tackled through a careful project and risk management scheme.

1) Schedule management: In distributed WSs, schedule synchronization through careful coordination of progress in all the venues is identified as an important issue. There is need for constant and “stealth” communication between the moderators located at each venue subtle enough not to draw undue attention from the WS participants. Free VoIP services such as *Skype* can be utilized to create an extra back channel for such communication, with a back-up plan for use of mobile phones in case of internet access problems. Another issue concerning the schedule management is the designing of the WS to get the best out of each support tool to lessen any negative influence on discussions by carefully examining where, when and for what purpose the WebGIS or the videoconference system is to be used during the WS and clearly showing it in the schedule program.

2) Securing Support staff and Equipment: A relatively large number of equipment, facilitators and support staff with some knowledge on the tools to be used were needed to ensure smooth progress of the tmWS. However, it was found that with distributed WS, there was a bigger choice of venues that can be used due to the reduced number of participants per venue. Therefore, it was easier to find venues with equipment that could be used in the WS.

3) Safety of Participants and equipment: The narrow roads and fairly busy traffic in the study area combined with the liveliness of the young participants was cause for concern during the Town-walk step of the WS. To ensure the safety of the participants, the following were done: 1) Increasing the number of groups to reduce the number of children per group 2) Increasing the number of support staff per group 3)Stressing on safety during the orientation step 4) Getting accident insurance for all the participants (Transferring responsibility)

4) Internet connectivity/ access speed: The tmWS was mainly planned with its core dependent on the internet. Internet service use is only possible when all the combined elements (all the service providers, networks, traffic, etc) work smoothly resulting in a medium fraught with uncertainty. The following steps were taken to deal with this uncertainty: 1) Performing a number of pretests at the venues with support from a local IT firm, 2) Placing someone on standby at the central server, 3) Setting up an emergency WebGIS server within the TCLG LAN. However, despite doing a number of pretests, the following issues mainly related to network speed problems arose.

①Poor audio and visual quality

② Slow WebGIS access.

During the tmWS, these problems negatively affected the quality of the WS proceedings. It became clear that a more robust back-up plan should have been put in place to enable a staged reduction in dependence on the internet during the WS. For example, if the sound and video quality deteriorates, the video could be cut out and only the audio transmitted, etc. In order to raise higher the quality of distributed WSs, these issues could have been identified and dealt with if a more comprehensive WS management plan had been adopted. As a fall-back option, it is a good idea to have more traditional tools such as paper maps in case of persistent network problems.

5) Network and device security: The authors in the past have experimented with the use of wireless local area network (WLAN) and WebGIS in same-time/same-place setting where all activity was confined to the WLAN. In the tmWS however, there was need to for internet access using the TCLG network. The following extra security measures were taken to reduce security risks: 1)Thorough security scans (antivirus, spyware, etc) of computers and all the digital media to be used in the WS such as USB storage devices, cameras, etc, 2)Use of network cables for connection instead of creating WLAN spots in each venue to reduce the risk of unwelcome access.

4.2 Implications for application of Distributed WSs in Citizen Participatory Planning

Some of example cases in which distributed WS method can be useful are given below.

1) **WSs in Mountainous rural areas**: Japan is mostly a mountainous country with most of the towns and villages that make up most of the local

governments located in river-valleys spread widely across the ragged terrain. These rural mountainous settlements are currently plagued by many critical social issues that threaten their existence. Many citizen and local government lead efforts including WSs are being held to search for the way forward. Cases of collaborative planning and mergers of multiple municipalities, issues that need for collaborative planning on the greater regional scale are many. For such scattered settlements, and issues affecting a region as a whole, holding distributed WSs offers big effort, economic and time saving merits.

2) WSs in Urban-areas: Considering time limitations, the spatial sizes of the basic units that are the basis of community involvement in in densely populated urban areas are usually small enough to hold WSs incorporating town walks in one venue. However, in the sparser and wider communities in the suburbs or in cases where multiple communities want to hold joint WSs, distributed WS might be considered a suitable option.

3) WSs with a large number of participants: Venues that can accommodate large number of participants are limited and it is not uncommon to limit the number of participants in WSs due to the venue size limitations. This issue can be solved by holding distributed WSs.

5. CONCLUSION AND FUTURE WORK

Advancement in ICT technology has opened interesting new avenues for supporting citizen involvement in planning that when used correctly can be beneficial in increasing interactive exchanges between decision makers and the citizens while at the same time increasing citizen access to information, reducing information filtering, black-boxing and increasing transparency and better monitoring citizen proposals. In this paper, a new method employing internet videoconferencing and WebGIS to support distributed WSs was proposed and shown through a case study as a viable method for supporting the WS model of citizen participation. In the case study, a wider area was covered during the town-walk, and with the issue of venue capacity alleviated, more citizens were able to comfortably participate in the WS. Basing the process of information collection, sharing, compiling reports, and updating on ICT tools resulted in a more efficient process. Tools such as the WebGIS and the videoconferencing systems were also found to generate more enthusiasm among the participants. This could encourage more participation.

However, distributed WS management and technical issues such as schedule management, securing and education of support staff, securing enough equipment, safety of participants and equipment, internet connectivity and access speeds, WebGIS interface design and speed, were identified as important issues that need careful consideration for more successful practical use of this WS support method. Moreover, the unpredictability of the internet makes the preparation of a comprehensive back-up plan an absolute necessity.

While the main focus of this paper was the support of the WS process, promotion of a continuous public participation in the decision making process even after the WS is important. There is need for finding ways of promoting a sustained access and posting of new information to the WebGIS server after the WS.

6. REFERENCES

Arnstein, Sherry R., 1969, "A ladder of citizen participation", in Journal of the American Institute of Planners, Vol. 35, No. 4, July 1969, p. 216-224.

Grabow, S. H., M. Hilliker, and J. Moskai, 2004, "Comprehensive Planning and Citizen Participation", University of Wisconsin-Extension cooperative Extension Community ,Natural Resource and Economic Development Programs

Innes J. E. and E.D. Booher, 2000, "Public Participation in Planning: New Strategies for the 21st Century", Institute of Urban & Regional Development, Working Paper Series

Laurini R.,1998, "Groupware for Urban Planning: An Introduction", *Computers, Environment and Urban Systems*, Vol 22,4 , p. 317-333.

Leatherman J. and M. Howell, 2000, "Meaningful Input to Public Policy: Citizen Participation strategies", Kansas State University Publications, SERIES: Keeping on Track: Strategies for Dealing with Controversial Public Policy, Part 3

Nijkamp, P., J.H. Scholten, 1993, "Spatial Information System: Design, Modelling and use in Planning", *International Journal of Geographical Information Systems*, Volume: 7 Issue: 1, p.85-96

Ohgai A., Y. Gohnai and Watanabe K. (2007), "Cellular automata modeling of fire spread in built-up areas - A tool to aid community-based planning for disaster mitigation", *Computers, Environment and Urban Systems* 31(4): 441-460

Samuel, A., 2005, "Online engagement: Strength in numbers", from her blog on e-consultations, http://www.alexandrasamuel.com/categories/e-consultation/

Takafumi A., T.Yasunari and S.Takeru, 2006, "Decision-Making Support VR System for Citizen Participation to Urban Design", *Proceedings of the 5th International Symposium on City Planning and Environmental Management in Asian Countries*, No.5, p.103-114

Takeyuki O. and M. Kobayashi, 2006, "Research on disaster imagination game using the internet to promote the citizen's participation", Summaries *of technical papers of Annual Meeting Architectural Institute of Japan F-1, Urban planning, building economics and housing problems* Vol.2006, p. 475-476