Mobilized Collaborative Services in Ubiquitous Network*

Miaosen Gong[1], Ezio Manzini[2], and Federico Casalegno[3]

[1] Jiangnan University, 1800 Lihu Avenue, Wuxi 214122, P.R. China
Miaosen.gong@gmail.com
[2] Politecnico di Milano, Via Durando 38/A, Milan 20158, Italy
Ezio.Manzini@polimi.it
[3] Massachusetts Institute of Technologies, 20 Ames Street, E15-368, Cambridge 02142, USA
Casalegno@mit.edu

Abstract. The paper inquires how collaborative services evolve in ubiquitous network. By comparison study in systems of solutions and interactions of services, it defines a conceptual framework of spaces of auras in mobilized collaborative services, proposing four kinds of network and interaction structures: *Peer-to-Peer (P2P), Role-to-Role (R2R), Peer-to-Common (P2C) and Role-to-Centre (R2C)*. The conclusion of discussion is that in MCS, the form of space of auras decides mainly the way of interaction, the structure of system and degree of relational quality.

Keyword: Collaborative Services; Social Innovation; Ubiquitous Network.

1 Introduction

The phenomena of collaborative services (Jegou &Manzini, 2008) and production are emerging and booming in two contexts by different ways: they emerge as *Creative Communities* (EMUDE, 2006; CCSL, 2007; Meroni, 2007), on one hand, in everyday life such as Car-Pooling and Co-Housing; on the other hand, in cyber space they appear as *Open Source Method* (Mulgan, Steinberg & Salem, 2005) initials, such as Linux and Wikipedia. The former are groups of people who creatively and collaboratively solve everyday life problems by themselves, and their behaviours imply environmental sustainability and increase the social fabric. The later are volunteer-powered, internet-enabled and geographically-dispersed *Networked Information Economy* (Benkler, 2006).

As matter of fact, with diffusion of *Information and Communication Technologies* (ICTs), the two spaces become nearer each other. In particular, high diffusion of *Mobile Communication Technologies* (MCTs) arise *Ubiquitous Computing* (Weiser, 1991), *Personalized Network* (Wellman, 2001) and *P2P Relational Dynamic* (Bauwens, 2005; 2008). The synergetic relationships between virtual spaces, physical spaces and social spaces evolve to a hybrid space, *Space of Auras* (Casalegno & Susani, 2005), which is more conductive to social interaction between people and their communities.

* The research is partly supported by "the Fundamental Research Funds for the Central Universities" (JUSRP11136). The Author gratefully acknowledges the support of K.C.Wong Education Foundation, Hong Kong.

P.L.P. Rau (Ed.): Internationalization, Design, HCII 2011, LNCS 6775, pp. 504–513, 2011.

The research starts with hypotheses: 1) Design could play important roles in promoting social innovation with new design paradigms; 2) The convergence between social innovations in everyday life and radical innovations in cyber spaces could generate new transformation of our lifestyles towards sustainability; 3) Mobile communication and ubiquitous computing, bridging physical spaces and cyber spaces, could be key enabling technologies in this convergence. The principle concerns of this research are: How MCTs enable collaborative services; what are the values of them; and how collaborative services evolve in this convergence.

2 Promising Cases and Design Proposals

Around these concerns, the research conducted three empirically-based research activities through mixed approaches between phenomenological and action research: one cases study and two research-based design projects. The cases study, Connectivity for Social Innovation, is research collaboration between DIS-INDACO, Politecnico di Milano (POLIMI) and MEL-Design LAB, Massachusetts Institute of Technologies (MIT). It aims to investigate the creative applications of mobile communication for social changes all over the world and identify the promising cases of collaborative services enabled by MCTs. The two design projects aim to explore

Table 1. Categories of cases and proposals

Categories	Promising cases	Design proposals	No.
Producers/consumers networks	Cell Bazaar	FINDING THE FRESH	2
Community-based initiatives	Neighbourhood Watch Wildlife	PRO.POST.E FINDING THE FRESH	4-1
Result-oriented encounters	Baltic Sea Alternetrides	LA MAGLIA MOMS TALK TAXI POOLING	5
Mutual-support circles		BIBLIOTICKET PRIDE HOUSE	2
Caring and support activities		AGORA’	1
Competences, time and products exchange	MCT-supported Time Bank	BOOKCASE	2
Mapping diffused information	People’s 311 Ushahidi Platial Maps	CANTASTORIE PRO.POST.E YESTERDAY ONCE MORE FOOTPRINTS	7-1
Mobilizing volunteers	BabyGoHome Amber Alert Baltic Sea The Extraordinaries Cell phedia Pedigree Fighting Avian	RITAGLI DI QUOTIDIANO	8-1
	15	13	28

the potential solutions of collaborative services in ubiquitous network society. The first one, LSF07: Digital Service and Collaborative Network, was synergized into the final synthesized Lab in master programme of service design at Design Faculty, POLIMI, in collaboration with Commune Sud di Milano and TeleCom; the second, Chita08: Collaborative Service and Mobile Communication, was organized at School of Design, Jiangnan University (JU) in China as a formal collaboration between POLIMI and JU.

As results, by cases study one hundred cases with an ad-hoc format are collected and fifteen of them are finally selected as typical promising cases of collaborative services in ubiquitous network. And they are defined as *Mobilized Collaborative Services(MCSs)* for their distinct characteristics; by design projects, thirteen design proposals are developed, based on the local contexts and real problems, as potential solutions or scenarios of MCSs. As table_1 the cases and proposals are complementary to fill in the different categories.

3 Space of Auras and Dynamic Social Ties

Comparing between MCSs and those from creative communities, they have strong common in the nature of being collaborative but as a whole they are different in what are possible to do and the way of interaction. In MCS the interaction happens in different spaces (cyber space and physical one) and in different way. Taking another example of city maintenance, there is a creative community, Public spaces renewal in Norway [1] (Meroni, 2007). In that case, the neighbourhood spontaneously work together to renewal their public spaces. By doing it, the social ties are reinforced between them. In this study, the case of "People's 311" is a MCT-enabled city maintenance system where interactions happen in different "spaces" and ways. Obviously, the elective community of former case is still based on the neighbourhood, a door-to-door network (Wellman, 2001). While in the second case, the elective community is largely based on person-to-person network (Wellman, 2001). The similar comparisons can be done between other service ideas like community-based agriculture, Car-pooling, Time bank, City Maintenance and etc. In a word, mobile communication and ubiquitous network change the processes and experiences of interaction in the collaborative services.

Ubiquitous network transcends spaces between geographical locations, moreover, between the cyber spaces and the physical and social spaces, which integrated into a hybrid space, space of auras: it is fluid, dynamic, intangible, but "liveable", and it serves as a catalyst for social relation (Casalegno, Susani & Tagliabue, 2003). In those cases and proposals, the interactions take place in sophisticated and multi-facets spaces where we can find the flow of social relation is very different from those creative communities. The social ties between the participants are flexible, dynamic and diverse. The relational quality (Cipolla, 2006) is proposed as a key element of collaborative services in EMUDE. And this idea indicates several characteristics: firstly "clients" and "providers" are interwoven; secondly they require mutual responsibility and high degree of trust; thirdly, they propose the achievement of

[1] Retrieved from www.sustainable-everyday.net/cases

wellbeing based on interpersonal encounter. This relational quality still exit in MCS, however it has been transformed into different forms of relationship. It's true that the "clients" and "providers" are interwoven, such as Finding the Fresh and Agora'. But in more cases, there is no difference between "clients" and "providers" at all. The relationship between the participants becomes peer-to-peer partnership such as Wildlife and Biblioticket. In some cases, the participants don't work for each other, but with common values, such as Baltic Sea and The extraordinaries. The different forms of relationships ask different ways of interaction and different degree of social ties.

Furthermore, the mutual responsibility and high degree of trust are still favourite conditions for MCSs, but the threshold of the condition largely decreases when the accessibility and identical trust increase, such as Neighbourhood watch, they don't have to know each other well. In some solutions, the collaborative services don't depend on the relational quality but on the common value between them, such as Baby Go Home or Pride house. The flexible and diverse social ties between participants generate much more possibilities to collaborate. Finally, interpersonal encounter is still an important way to achieve the wellbeing in most of MCS. But interaction in virtual space or virtual interpersonal encounter is also essential part of wellbeing, such as Wild life or La Maglia. In case of The extraordinaries and proposals of Ritagli di Quotidano, they shows it's also possible to achieve wellbeing by the collaborative action with common value instead of interpersonal encounters. The dynamic interaction brings dynamic social ties.

4 Relational Forms for Interaction

Mobile communication arises the spaces of auras in MCSs. In auras, the dynamic interactions generate dynamic flow of relation, and dynamic social ties. By looking

Table 2. Relational forms of cases and proposals

Relational forms	Promising cases	Design proposals
Peer-to-Peer	Neighbourhood Watch Wildlife Alternetrides	LA MAGLIA MOMS TALK BIBLIOTICKET TAXI POOLING
Role-to-Role	Cell Bazaar MCT-supported Time Bank	FINDING THE FRESH AGORA' BOOKCASE
Peer-to-Common	People's 311 Platial Maps BabyGoHome Cell phedia Ushahidi The Extraordinaries	CANTASTORIE PRO.POST.E YESTERDAY ONCE MORE FOOTPRINTS RITAGLI DI QUOTIDIANO PRIDE HOUSE
Role-to-Centre	Baltic Sea Amber Alert Pedigree Fighting Avian	

into the promising cases and design proposals, the research focuses on the framework of interaction between actors and systems and the flow of relations regardless of different services ideas and contents of interactions. It is found that there are several relational forms implicated in them, depending on the different structures of interaction, and catalyzing the different social ties between the actors. Those relational forms can be synthesized as: Peer-to-Peer, Role-to-Role, Peer-to-Common and Role-to-Centre as Table 2.

4.1 Peer-to-Peer

Peer-to-Peer relational form connects actors directly. Actors are usually in the same position of the system, forming a decentralized and flat network, an inter-personal network. By mobile communication, the actors can reach each other with interpersonal interactions, by acting or reacting. It's an extreme case of interwoven between clients and providers. There is no difference between actors.

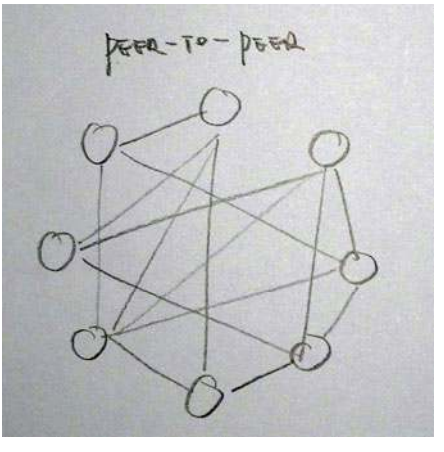

Fig. 1. Peer-to-peer

Since the interactions may take place between any of actors, it requires a certain degree of relational quality between them. As matter of fact, in most of solutions, they are based on certain communities. How much degree of relational quality they need depends on what kind of services they deal with. In the case of Wildlife, actors use it to post or receive the urgent and vital information, which calls a high degree of relational quality, while in proposals of Taxi pooling, actors use it for car pooling once, which calls much less. In most of solutions, the identities of actors have to be recognized and guaranteed in certain way, which is often empowered by mobile communication.

And the interactions both take place on the cyber space and physical space. In most of solutions, they keep in connection and keep ready, which provide a favourite context for the interaction in cyber space. The interaction may lead to physical encounter. And the interactions in cyber spaces are usually preparation of physical encounters. Whatever interactions in cyber spaces or physical spaces, they enhance to social ties effectively.

The direct interactions between actors promote the dynamic social ties. Actually actors have high autonomy in persons who they would like to interact with different reasons and motivations. Slowly there will be some tribal communities (Casalegno & Susani, 2005) appearing in the network. The social ties between them are relatively dense. The strong ties facilitate the interactions between them, and diffuse the density of social ties, so on and so forth. Finally the average social relations arise and the spaces of auras become denser.

4.2 Role-to-Role

Role-to-Role relational form means the actors specify their roles in the solutions. They also can connect directly but mainly between the corresponding positions in system. According to problems that solutions meet, the interactions are oriented to give the meaning of specific roles, and actors know their roles in system and how to act.

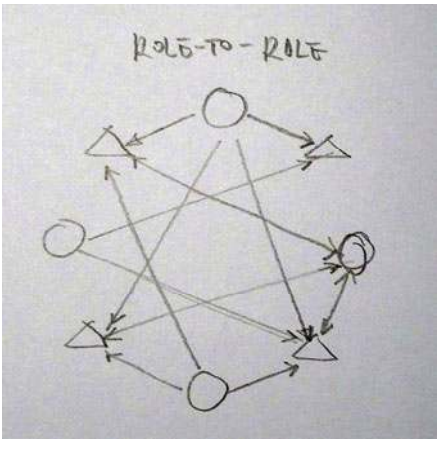

Fig. 2. Role-to-role

In this relational form, the relational flows between actors are not symmetrical and they are usually in two sides of problems. And actors in each side play a specific role in solutions. As they also connect directly, it also requires certain degree of relational quality depending on what specific tasks they collaborate. The actors with different roles can be interact in quite different way, for example, in the proposal of Agora', the actors with questions have to intend to propose request while the tutors have to wait the request. They have different autonomies in actions and need different degrees of trust.

As the actors with different roles are in the context of common problems, they have concrete targets to connect each other. The interaction between then may effectively enhance the social ties of them because of the complimentary between the roles. Even though the direction of interaction is oriented by role, there have rich possibilities in who to connect. Theoretically each actor in role A is open to all the actors in role B, and vice versa. Therefore the arising of interactions will also diffuse the dense social ties between the different "roles". The multi-facets of roles can catalyze the social ties to diffuse faster.

4.3 Peer-to-Common

The relational form of Peer-to-Common doesn't ask the direct interactions between actors. Individually actors involve the services with common interests, objectives or values. They are in the same position of system with peer relationship. By interacting with system, actors contribute their individual values to the common value. In the meaning time, they can share the commons that results in contributions from every one. Therefore, the indirect interactions take place between actors in the media of commons.

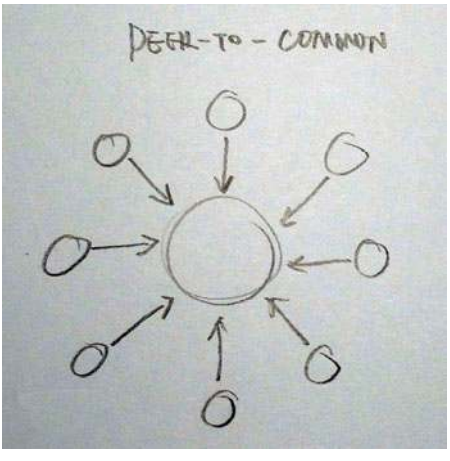

Fig. 3. Peer-to-common

Since actors are not asked to connect directly, it requires less relational quality between them. And the systems are relatively open. They welcome more participation without rigid identities certifying as it's not necessary that actors need to recognize each other. The priority of their focus is the common, so the more people involved, the stronger common becomes, in certain sense, regardless of the relational qualities between them as a precondition of network. But they understand well what they do for the common and the personal wellbeing in doing that.

In general, the actors don't need to ask anything from each other as necessary step in the process, but direct connections between them are not exclusive. In most of cases and proposals, the actors are visible each other in system. So if they want, they are able to interact with anyone of them. They have high autonomy in what they do and whom they want to connect. Because of that, with strong common value, even the direct connections are not asked, but instead they are enabled well.

The form of Peer-to-Common is based on the interactions between the system and each actor, but not limited by them. As matter of fact, it calls for physical encounters and co-actions. Because the commons usually have several levels to arrive, the interaction between the system and actors only can reach the basic level, where they get ready to second one. Once they arrive the basic common, the motivations of physical encounter become stronger. And interpersonal interactions and co-action are enabled.

4.4 Role-to-Centre

The form of Role-to-Centre looks similar to Peer-to-Common. Neither does it ask direct interaction between actors. And actors work for strong common values, in most of cases, they are vital or urgent problems and the interactions between actors and systems have to be so conductive that they are centralized by the institutional system and the connections between actors become less important.

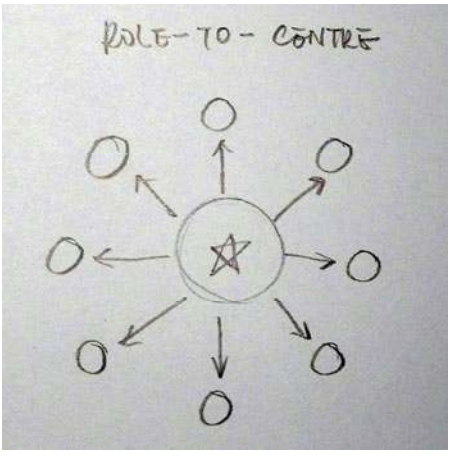

Fig. 4. Role-to-centre

The network of this form is centralized and usually the centre is institutionalized. So the collaborating of actors is based on the trust between actors and centre instead of that between actors themselves. Therefore, it doesn't require the relational qualities between actors. On the contrary, the problems will be solved by interactions between system and each of actors individually. In this form, the common value of actors is usually very strong and specific, so that they understand well what to do and how to do as the rules that are defined in advance. What actors mainly do is to follow the rules actively or passively according to positions in service systems. In those cases, the much less space of decision making leads much less necessary of interaction between actors and relational qualities.

There are two types of interactions in this form. The first one is quick response depending on commands from centre. In general, the actors are being connected. Unless messages come from centre, nothing different happens. The second one is vital information reporting depending on the situation of actors. According to the guideline of services, the participants will report information in situations where they are supposed to do. And the centre receives information from participants without commands. And the participants are much free to decide to report or not. Therefore, the first type of interactions focus on the co-actions to solve the problems that are un-expectable in when and where will happen; the second focus on the information collection of the problems that are un-expectable in when and where will happen as well, but the participants are not able to solve them.

For the interaction structures, in most cases, there are no direct social relations between actors, and the social ties between them are week. However, because of this characteristic, this network form can transcend between all the places and peoples where wireless communication are accessible. The centralized but flat structure and high diffusion capacity may generate strong bottom-up power to solve some problems which are difficult to do effectively and efficiently in traditional governmental system. As part of results, it may promote a large scale and diffused weaker social ties (Granovetter, 1978;1983), enhancing the social cohesion. In certain cases, physical encounters are asked as a way of co-action. Such as Baltic Sea, the participants are organized together to go to accident places. Through side-by-side co-action experiences, the weaker social ties become stronger.

5 Conclusion

To sum up, four interaction structures of network illustrate the four kinds of MCSs. They correspond different frameworks of interactions in services and empower the social ties of network in different ways (Table 3). They all have a flat structure without hierarchy system. Among them, both Peer-to-Peer and Role-to-Role are decentralized, and the interactions take place directly between actors. While Role-to-Centre is a centralized structure and interactions basically take place between centre and each actor. Peer-to-Common is between them: it has common that is not in the form of centre; the direct interactions between actors are not asked but enabled.

Table 3. Network and relational forms

Network	Peer-to-Peer	Role-to-Role	Peer-to-Common	Role-to-Centre
Structure	Decentralized	Decentralized	/	Centralized
Interpersonal interaction	Direct	Direct	Indirect	No
Interaction flow	Symmetrical	Unsymmetrical	Symmetrical+ radian	Radian
Relational quality	Middle	Middle	Lower	No
Social ties	Strong	Strong	Less strong	Weak

The different between Peer-to-Peer and Role-to-Role is interaction flow: in the former it is symmetrical and in the later it is unsymmetrical. Role-to-Centre illustrates a radian form of interaction flow, symmetrical with different meaning. Peer-to-Common is mixture between Peer-to-Peer and Role-to-Centre. It has radian form of flow between the actors and common, also has symmetrical flow between actors. The different structures of network and forms of interaction call for different relational qualities between actors. The first two structures call relatively high relational quality for direct interpersonal interaction; Peer-to-Common calls much less and there can be almost no such relational quality in Role-to-Centre. Except for the Role-to-Centre, all the network structures enable the dynamic social ties between the actors by the multi-facetted interaction in the space of auras.

Putting them in a wider phenomenon, it can be found that Peer-to-Peer and Role-to-Role are usually implicated in the cases of creative communities; whilst, Peer-to-Common and Role-to-Centre are usually implicated in cases of Wide Open. As it is mentioned at beginning chapters, there is a gap between the diffused bottom up creativities in everyday life and Wide Open innovation in cyber spaces. As matter of fact, our cases and proposals, as *MCSs*, cross the two spaces and bridging them in convergence.

References

1. Bauwens, M.: Peer to peer and human evolution - On the P2P relational dynamic. P2P Foundation (2005), http://noosphere.cc/P2P2bi.htm
2. Benkler, Y.: The Wealth of Networks: How Social Production Transforms Markets and Freedom. Yale University Press, New Haven (2006)
3. Casalegno, F., Susani, M., Tagliabue, R.: Atlas de Communication Aurale: Une Carte de la Communication et de Ses Flux. Sociétés: Revue de Sciences Humaines et Sociales 79(1), 89–104 (2003)
4. Castells, M., Fernandez-Ardevol, M., Qiu, J.L., Sey, A.: Mobile Communication and Society: A Global Perspective. The MIT Press, Cambridge (2006)
5. Granovetter, M.: The strength of weak ties: A network theory revisited. Sociological Theory 1, 201–233 (1983)
6. Ito, M.: Personal, Portable, Pedestrian: mobile phones in Japanese life. The Southern California Digital Culture Group. Annenberg Center for Communication, Los Angeles (2004)
7. Jegou, F., Manzini, E.: Collaborative services: Social innovation and design for sustainability. Polidesign, Milano (2008)
8. Meroni, A.: Creative communities: People inventing sustainable ways of living. Polidesign, Milano (2007)