

Federating citizen's knowledge: a report from the trenches

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Abstract. Knowledge Federation aims at becoming a principle of social organization that grows around the concept of knowledge creation and sharing. We present past and present research on the analysis of knowledge creation and sharing patterns in artificial societies. We show which insights it has given us about the processes that may help in facilitating such type of organization emerge. We compare with actual practices of social engagement processes in knowledge sharing and pinpoint similarities and differences with the theoretical simulated results. This is the basis for posing some research questions about the knowledge creation and federation processes and their relationship with social structure, pre-existing and emerging, and the difficulties posed by some special types of knowledge that arise in the human-centered examples discussed.

Key Words citizens, social organization, emerging social structures, complex networks, knowledge interchange, design knowledge.

1. Introduction

Knowledge Federation aims at becoming a “principle of social organization that grows around the concept of knowledge creation and sharing” (Karabeg and Lachica, 2008). The main goal of this principle is to spawn processes that eventually will increase the collective intelligence of a society, which is the main goal of the endeavour started from the ideas of, among others, Douglas Engelbart (Engelbart Hypothesis). This, of course, raises the question of which type of knowledge interchanges may induce a sustained process of knowledge federation conducive to a more “intelligent” social group. Contributions about the types of patterns that may sustain knowledge federation have been proposed (Park, Karabeg). The question is how we can get some insight about the impact of these patterns. That’s a tough question to answer but we can approach it from the knowledge gathered from other fields. We will present briefly some work done in the area of agent-based social simulation where the question of the interplay between individual interactions and overall group properties has been for long a matter of debate and research (Andreasson). The type of research that is relevant to Knowledge Federation is the one that focuses on interaction that are mainly knowledge sharing and interchange interactions between individual agents.

An interesting side effect of taking this line of research is that it also provides us with glimpses on the type of “social structure” that these type of knowledge interchanges may create. Not only that,

they will show some of the role of the social structures in facilitating or blocking the propagation of these new patterns of interchange, patterns that may result (as the Knowledge Federation project proclaims) a change of the social structure/organization itself. Some previous research on the properties of these structures may also give some information about the resulting properties of these structures in terms of intelligence or, at least, of the ability to solve new problems, i.e., of learning.

Of course the translation of the features of knowledge interchanges that operate at an abstract, simulated level, pose great problems when trying to apply them to human groups. Nevertheless, we will try to distil some simple principles from these simulations and try to see how they may be identified in the actual processes for several specially crafted situations of knowledge interchange with humans. These situations have involved plain citizens trying to join their knowledge to create new solutions in very different settings, ranging from urban redesign, to museum exhibition design and self-learning groups. The comparison may help us in finding some interesting research questions for the Knowledge Federation project understood as an evolutionary social change project.

2. Social organization around knowledge: insights from the social simulation field

The question of how to organize knowledge exchanges to favour some characteristics or to see which type of organization emerges has been tackled by several authors and different perspectives. In the area of intelligent agents it has been addressed under the name of team formation, in the area of social simulation, different approaches to this, it has been addressed from the standpoint of social exchange theory applied to knowledge objects. In our own research we have addressed the problem from the perspective of emerging, evolutionary social structures.

Most of the models on which these simulations are based assume that agents are not malevolent and try to increase some type of resource. Some approaches suppose that the drive to do so, is the existence of some overarching optimization feature that is somehow known by agents, so that all their “microactions” are addressed toward maximizing or optimizing this feature. For example, some models do characterize the “intelligence” or “resilience” of the whole group as the factor to be maximized. Other approaches, adopt a different perspective for example to assume that agents are driven by the goal to increase their own stock of resources.

Of course, one of these resources could be knowledge itself. From that perspective, both approaches (the global perspective one) or the other (the individualistically driven optimization agents) simply use some type of representation of tokens of knowledge to be exchanged. They also suppose that in each exchange some knowledge remains and some knowledge actually is modified.

The fact that two agents have exchanged knowledge once has several implications. Known patterns from other cases where the social exchange theory has been applied (gift exchanges, advice exchange, etc.) indicate that there is a tendency to repeat exchanges with agents that have helped us in increasing some resource or to exchange it for other worthwhile one (we use the term “worthwhile” instead of “valuable” for precise sociological reasons that can be seen in [Stark 2009](#)). This, over time, adds some information on the environment and specifically about the characteristics of other agents. Step by step, a set of more stable relationships arises and this tends to create some type of “social structure”.

It is interesting to see which type of structures emerge from this type of resource exchange because depending on the type of structure the resulting social group ability to tackle with novelty and learn

can be improved or dramatically diminished. One can see that the design of the interaction patterns is critical.

2.1 Social structure arising from knowledge interchange ... or preventing it

We have to remark here that the structure that arises from exchanges, at least in a simulated environment, can be traced, represented and analyzed. The burgeoning “Science of Networks” (Waasserman 94), abounds in methods to do precisely this, i.e., analyze the characteristics of dynamic networks of interacting agents. In our case what we can study are the characteristics of networks of agents that interact by exchanging and sharing knowledge.

It is quite revealing that the characteristics that make some type of complex networks interesting have some resemblance of some of the general insights on the type of structure that correspond to “learning organizations” in the organization and business literature (Carley, Triarchy). That is, hierarchical and centralized networks seem to correspond to organizations that have the same structure and that have problems in adapting to environment or learning fast. On the other hand the “flat” structures of lean and adaptive organizations seem to correspond to some types of complex networks that respond well to changes in the environment and that over time show a consistent ability to learn and adapt. One has to remark, however that not all complex networks seem to have the same abilities. That is, being complex doesn’t necessarily guarantee that the network learns and adapts as a group. It is also interesting to see that on those networks based on knowledge interchange and sharing not all of them stabilize around a desirable structure, that is, one that ensures that the “organization form” corresponding to the network will keep interchanging, learning and sharing. Even more interesting, those networks that do show such characteristics are based on individual patterns of knowledge exchange with very peculiar characteristics. If the conditions of exchange do not fall within a certain range of possibilities, the resulting network does not show the “interesting” structures that are associated with further learning. That is, the conditions under which knowledge is interchanged influence of the type of network (social structure) that arises over time and the type of structure limits the conditions for knowledge interchange, a typical behaviour for an emergent, complex system.

2.2. Some general characteristics of “interesting” patterns in “interesting” social groups

In general the social structures that are “interesting” in the sense that is of concern here, i.e., of improving the overall knowledge stock and learning ability of the group can be associated with some types of networks generally called “small-world” network. They are easy to characterize at a macro level.

They are organized around a relatively small number of clusters of nodes (people in the case of social structures), with short paths from one person from another in the group. Inside this clusters there either one or a very small number of nodes (people) where everyone is connected to within the cluster. Of course, the well-known and interesting fact is that this short paths stem from the intricate interconnectedness of people in cliques and clusters, not because everyone is connected to everyone else.

Moreover these networks show special structure in the sense that some nodes (people) in the network play a very special role. If they are removed from the connections in the network the whole

structure starts to degrade and loses their characteristic structure. These are special nodes, called in the literature “connectors”.

Structure is just barely half of the story. What our own research has shown us is that the type of knowledge that is change and the conditions of interchange have a very important role in maintaining these interesting characteristics in the network. Not all types of knowledge interchange give raise to interesting patterns of connection.

To summarize, these are the main findings.

- a) *Benevolent gurus*: these are very connected nodes that everyone tries to connect in order to offer and receive knowledge. Over time some of the knowledge of well-connected nodes is very much useful than the knowledge of individuals just arriving to the network which makes these well-connected nodes a very much desired partner for knowledge interchange. Of course from the point of view of this extremely knowledgeable nodes, there seems to be little interest to connect with “novices”. However, over time, if they don’t agree to interchange some knowledge with less knowledge agents, both their “guru status” degrades and the whole structure degrades. In a way, it is for the benefit both of the “gurus” and the whole of the social structure that they have to keep sharing their knowledge.
- b) *Harshness of exchange*. Although, as previously said, there is a benefit in exchanging knowledge between very dissimilar nodes, that doesn’t mean that you have to give your knowledge to the first one that ask for it, the first time you meet. “Harshness” refers to the dissimilarity between the knowledge level of two agents involved in an interchange and also involves a time dimension: experimentally it seems that is better to administer repeated requests for interchange parsimoniously. That is, you can interchange knowledge with a lot of other agents that have less knowledge than you do but you have to do it over time. That is, the best strategy for the overall maintenance of and interesting social structure and a high level of knowledge of the whole group seems to for “gurus” to wait for “novices” to show that they are able to increase knowledge over time at a reasonable pace. At that moment, you, as a guru should enter in an interchange with a “novice”. There are different ways to interpret this behaviour but it is reminiscent of the apprenticeship patterns that can be seen in several learning communities.
- c) *Diversity*. Not from our own research but from others (Scott), the diversity level of knowlede and capacity for learning seems to play a significant role in the creating of desirable interchange patterns and overall capacity of the group to learn and solve problems.

There are other aspects that have to do with the ability not only to increase the overall level of knowledge of the whole social group but also to be able to innovate. There is evidence that innovation spawns in groups that use some of these patterns of interaction and also make use in a very peculiar way of existing structures (see the work of Vedres and Stark for this).

Another interesting aspect is the fact that some of these patterns of interaction spread around the whole social faster than others. The spread of norms and conventions has been thoroughly studied (Klittock, Delgado) and shown to depende heavily on the structure of the social group. It would be interesting to study how the knowledge about how to interchange knowledge is spread.

All these results from an apparently obscure and remote discipline may be of help for the Knowledge Federation endeavour, specially if it has to impact human organizations and societies.

The translation of the desirable properties of some of these interchange exchange patterns into norms and conventions for human groups may be a way to go.

We revise in the following how some of the aforementioned features of knowledge interchange can be related to actual practices in human collaboration settings or how some of them have been purposively translated into conventions for interchanged. We hope that the review is helpful to establish possible lines of research and new developments to guide the Knowledge Federation as a means of social organization.

3. A comparison with human situations

In the following we describe projects where we have been directly involved and where either we have observed the ongoing social collaboration practices through the lens of the desirable properties of knowledge interchanges or we have worked together with other practitioners and researchers to devise mechanisms and interactions between participants in projects that were directly inspired by the *Harshness*, *Benevolent Gurus* and *Diversity* patterns.

A minority of the projects and situations operate in hi-tech online environments. Most of them are processes that are low-tech counterparts of processes requiring sophisticated technological platforms like peer to peer collections of computers or repositories of information organized as wikis or similar solution. The patterns of interaction between real people replicate without any digital technology some of the interchanges and interactions that usually are mediated by digital technology or that take place between digital artifacts with or without human interaction but using information and, to some extent, knowledge. All cases correspond to experiences where the participants were plain citizens interested in working together and learning together.

In the process of creating possibilities, conditions and patterns of interaction for these citizens in these experiences to engage in knowledge interchange there was also provision for representing and

The situations and project that will briefly sketch in the following cover very different interest areas and also, in principle, resort to very different types of knowledge.

(all these cases will be expanded and explained in more detail in the final version of the paper)

Education: Peer to peer learning groups

This is a project that started at Citilab, led by Pau Domínguez (Domínguez, 2010). It involved the creation of a dynamics between citizens without no previous knowledge of technology. The idea was for them to elaborate their own learning agenda around the concept of a project. That is the learning process they were devising should take as a point of departure a project of their interest. By focusing in creating their own online journal a group of 20 citizens were able to learn to use technologies such as wikis, blogs, media repositories, editing tools, audio, video and general image tools and to learn the process of designing a regular, periodical publication. In the process they also learn the subtle negotiating abilities to make editorial decisions and also have to learn or improve their text, audio, and video communication strategies and skills.

The initial groups was seeded by the knowledge of a “guru” (Pau Domínguez) that established clear interaction and knowledge exchange patterns, given precise conditions under some of the participants could engage in knowledge interchange with peers and with gurus (either herself or other “gurus” coming from the own citizen group over time).

Urban Design “Broth Cauldrons”

This is a format that is being used in the project UrbanLabs OS, which is a participatory process addressed to urban design. The goal is to create a “Urban Operating System” that regulates the norms and convention for participation and interaction between citizens, the city administrators and professionals in urbanism and architecture. The goal of this operating system is to become a knowledge system to create collectively new projects to improve a given city.

A “Broth Cauldron” is a gathering of people that have previously identified other people that are proposing projects in the city similar to the ones that one is interested in. The “Harshness” condition here is that the project has to be evaluated as of sufficient merit to get you in one of the cauldrons. The *diversity* factor involves detecting when one of the several “cauldrons” should split into groups, merge with other cauldron, interchange one or more of its members, etc. much in the vein that Peer to Peer systems reconfigure themselves in response to the variations in the tasks at hand. Some of these patterns of interaction are inspired by Platoniq’s Bank of Common Knowledge experience.

Impromptu Urban Space Coworking: Breakout

This is a format that we have developed with Laura Forlano’s group in New York City and refined separately both in New York and in Barcelona. It consists in gathering people in a given public space and work together by taking advantage of the existing internet open infrastructure (public or share wifi). The call for a meeting is done online and the decision over the place to work is done collectively also online. Previous to the meeting, a description of the proposed work task or project is uploaded to a common platform by would-be coworkers. This includes a description of one’s interests and abilities as well as a which other abilities is required to fulfill the work project described. Interactions then proceed between prospective coworkers before the actual gathering takes place. The *diversity* factor is enhanced by an intensive communication plan on several online platforms (specially those addressed to freelancers) just the week before the actual meeting. When the meeting start a fast round of presentations for those arriving that day who have not given previously details on the online platform. *Harshness* is identified with the fact that you only have a given set of rounds to be included in other projects if you don’t really have a definite task at hand or a project described and your abilities are not convincing for the groups you apply for. *Gurus*, include highly knowledge professionals and experts that register for the event at the same time as everyone else with no special treatment. The benevolent guru condition is implemented in a special requirement for gurus to respond to queries on site during the event, even if they come from a different project group.

Codesigning exhibitions: a case of learning design knowledge

One way for science centers and museums to become active in their communities is to invite citizens to not only to provide content, but also to participate actively in the process of science communication that goes on the institution. The classical and well-known exhibition format was the basis for exploring participatory co-creation and co-design processes in science and technology at two different institutions simultaneously. “From contemplation to participation and beyond” is a research area of CoCreating Cultures that started with the Expolab project between Barcelona and California (Tech Museum of Innovation). In contrast to other experiences in participation, in this case it was the public who actually performed the design function, becoming designers of the whole exhibition and not just only providers of ideas or feedback.

The project set out to create an exhibition about how internet technologies have affected the day-to-day life of ordinary people. This topic was used because it could serve as a basis for eliciting a common but highly variable experience for adults. The rationale for the exhibition was to relate these experiences to underlying science and technology concepts of the Internet and digital technology. The team of professionals at CoCreating Cultures and the Tech Museum provided no assumption about what these impressions could or could not be in order to keep a neutral strategy which consisted in creating situations where the citizens could elaborate on responses to the question “How the internet has changed your life?”.

The project proceeded in two main phases: one of open ideation and another of open design. In the first phase an invitation to participate was followed by four workshops held at different places in Barcelona (Citilab, Fabra i Coats Cultural Factory, the Born Neighbourhood and Center for Contemporary Culture). In these workshops hands-on rapid prototyping, collages, and other generative design techniques were used in order to isolate clusters of ideas and their possible physical realizations. The result of these were not only a consistent set of six themes to form the actual exhibition but actual physical prototypes built by the participants which portrayed the main ideas, content, appearance, and interactivity around possible exhibits.

When the first generative phase was complete, a thorough analysis of workshop materials (videos, audio transcripts, photographs, actual prototypes, etc.) was done to provide a basis for the design phase. The material was converted into “design briefs” and entered in the Tech Virtual online platform (<http://thetechvirtual.org>) as a reference for exhibit design and construction. These were guidelines for other participants who built virtual models corresponding to the themes. In most cases these online volunteers were completely unrelated to the original workshop participants and were located in completely different countries. That started a phase of online design sessions that resulted in more than twenty proposals (more than two proposals for each of the six themes). These design sessions took place weekly on the shared virtual space between Citilab and The Tech Museum using the Second Life 3D virtual collaborative environment. When the session finished an open online and offline poll took place to selected the most compelling designs and approaches. A final process translated the Second Life designs into technical specifications for fabrication.

The *diversity* factor was enforced by inviting plain citizens (Citilab user base and other people that were found on social networks), designers, journalists, museums specialists, etc.

The *harshness* factor was left low at the beginning of the process and was increased as it proceeded since there were more requirements for anyone willing to contribute beyond the initial prototyping session. Indeed whenever one without previous professional background in design was volunteering a new design solution he was invited to interact with professional designers either online or offline. That created an interesting learning loop on both sides. Also the use of Second Life, urged people to learn new skills about virtual worlds and, specifically, construction of objects in virtual worlds.

The *benevolent guru* factor was enforced by requiring professional designers to respond to user’s suggestions once they had shown their commitment to participate and their will to learn new skills. That was specially the case in the help given to people willing to learn the details of Second Life or other design tools.

Journalism: Wikidiario

Wikidiario is a journalism project at the crossroads between journalism education and research on new forms of interaction between the public and the newspaper professionals. It is a private company but it has the support of the Autonomous University of Barcelona School of Journalism and also the National Autonomous University of Mexico. It takes as a point of departure the increasingly active role of the public in content creation. At the same time, it concedes that not everyone is used to the practices of journalism, specially quality journalism. It was thought as a learning system from the very beginning both in the sense of a system for learning to becoming a journalist and also a system that learns about the best journalists and the best match between public and editorial line. Also about managing the whole system. We specifically built in diversity, harshness and guru's benevolence.

Wikidiario works by using two online entry points. One is "No te calles" (It could be translated as "don't remain silent") and the other one is Wikidiario.info. The first one is just a channel to get any type of "news" any citizen wants to upload (via web or cellphone) in different forms: text, images, audio, etc. The second one is the newspaper properly speaking.

Users are separated in two main groups: contributors from the public and editors. Anyone can contribute a piece of information or hint at a possible scoop or an issue that may require a thorough journalistic research work. There several processes of news selection and contributor (editor or citizen) selection operating at the same time any time.

A citizen can repeatedly contribute information (data, hints, leads) that end up in an important piece of news, a report or a documentary. By monitoring the impact of his or her contributions along time, editors (and special senior editors called "senators") can decide to invite him or her to actually join in a reporting group of editors in fact become an editor.

Editors can be promoted to senators by a similar process, i.e., if they are able to scout repeatedly good news *and* good editors.

The decision about what news to promote to the fronpage as well as the distribution of news around the different sections of Wikidiario is done as mixed decision between citizens votes and editors and senators recommendation. Both editors and senators can be "downgraded". The first if they repeatedly fail to spot good news and contributors or don't provide a mentoring function to recently spotted citizens that may become editors. The second ones can be demoted if they don't provide mentoring to editors. In this way, *Harshness* is enforced for everyone, irrespective of their role but it is adapted to the initial functions of each different type of professionals. Gurus (editors and senators) have to be inherently benevolent. *Diversity* is guaranteed by the openness of appeal to any type of citizens.

4. Conclusions: some research questions

Dino Karabeg asked in one of his papers about Knowledge Federation '*What can we do to facilitate the development of a remedial social organization of knowledge creation and sharing in practice?*'. Many of the papers presented at KF 10 are focused on the development of techniques operating on knowledge representations. Here we have adopted a different perspective that we hope can complement other efforts. We have focused on the processes of knowledge interchange that give raise to "interesting" social structures. That is, "interesting" in terms of the goal of creating a collective body with increased intelligence to tackle with complex tasks or problems.

We have remark the role of some simple patterns of interaction in knowledge exchange. Also, we have referred to previous research in simulated societies that contribute some evidence on the relevance of this type of interactions. We have tried to illustrate how some of this patterns can be implemented in real settings with real people. It is our feeling that the Knowledge Federation ultimate goal hinges critically on our ability to get citizens engaged in the processes that give support to it, and also to let them organize according to the principles we are starting to explore.

There are some aspects that may be of interest for further research.

The patterns of interaction that we have explored work well in settings where agents work individualistically following benevolently their own goals. Of course it is interesting to see that this amounts to a fairly positive outcome of self-organizing with any further centralized communication or coordination. However, this is a very idealized situation. In most cases, agents do have explicit information of some several global parameters or information. A good example may be the case of looking for Climate Change solutions collectively. There is information about a common goal and explicit, globally shared data and knowledge about it. It is important to see in which ways this could alter the types of interaction that are relevant or useful.

Diversity means that not only different types of agents and people interacting but also many different types of knowledge and knowledge representation. It would be worth studying how the patterns of interaction commented here can make use of several ways of representing knowledge specially crafted for Knowledge Federation that have already been presented in this conference and previous ones.

Talking about types of knowledge, it is very interesting to see that some of the examples described here created design knowledge. This is a very complicated type of knowledge that sometimes involves types of knowledge that are really hard to describe and convey. The practice of design sometimes stems a lot of knowledge from the interaction with materials tested for the objects being designed. Also design knowledge of more abstract entities -exhibitions, urban plans, etc.- usually involve representations in forms that are not so easy to technological, automatic or assisted treatment, difficulting its federation. This is specially acute in learning knowledge about the design process, as it happens in the Metadesign and Open Design approaches. Some of the tools that are very useful for creating and designing Open Source software (versioning, for example) that are at the basis of fruitful knowledge interchange and sharing in the software community have no counterparts when applied to Open Design projects in products, services and interactions. Something as simple as compragin two versions of a design (a very simple thing in software versioning) is extremely cumbersome with knowledge expressed as blueprints, images, or 3D prototypes.

The coupling of the dynamic evolution of knowledge and the corresponding social structures for different types of representations is also an intersting line of research.

Last but no least, the ways to engage plane people in all these processes should be also a matter of deep research. We have some hints from very specialized areas like Open Source Software, fabbing, media remix and others. This should be taken as a good starting set of cases to start from in order to find attractive engaging ways to get people in this new type of social processes of common learning.

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