KNOWLEDGE SHARING, CULTURE AND MEDIA USAGE IN AN ACADEMIC NETWORK: A NETWORK ANALYSES OF THE EBEREA IRSES CASE

Authors

Abstract

Collaboration between scientist in Europe and China is becoming more and more relevant in order to exchange know-how, and stimulate academic exchange in order to realize market entrance as well as innovation in both European and Chinese markets. This paper explores how collaboration merges and what the cultural impediments or challenges are. To do so we analysed how a network in the field of eBusiness research developed over time in the context of a specific EU-funded project and how cultural attributes and preferences for information exchange and media-preferences affect the networks. Based on Social Network Analyses making use of data collected on two moments in time, at the start of the project and after two years, we will not only give a description of the network but also explore how this network is affected by cultural and media preferences of members of the network. The results indicate that the network has expanded and became denser. Although there is still a strong trend towards interactions and collaboration with universities of origin and within national boarders, we see some interesting clusters between individual researchers that overcome the boundaries of universities and national orientation. With regard to cultural aspects we found evidence contrary to Hofstede’s assumptions, more over we could in no way relate Hofstede’s concepts in a significant way to network concepts. In a similar way also preferences for formal and informal communications or specific channels didn’t have a relation with networks measures.

Keywords: Network analyses, knowledge sharing, collaboration, culture, media richness.
1 INTRODUCTION

Research networks often consist of scholars from several countries, working in different universities and maybe in different continents. Core objective of these networks is to exchange knowledge, discuss research agenda’s, and explore opportunities for research collaboration. The European Union has a deliberate policy to stimulate academic collaboration within in Europe, but also between Europe and other parts of the world such as the USA or China. One of the projects to stimulate international collaboration between the EU and China is the eBerea project (eBusiness Education and Research Network for Euro-Asian Collaboration). The eBerea project concerns a network, which was established in 2007 and dedicated to promoting and facilitating research on eBusiness and eServices among China and Europe (www.eberea.org). Since 2010 the eBerea consortium runs as an EU FP7 Marie Curie’s International Research Staff Exchange Scheme project “eBerea Irses”. With this relatively new funding type EU helps research organizations to cooperate with others, through a coordinated exchange program for their staff (http://ec.europa.eu/research/mariecurieactions/about-mca/actions/irses/). Compared to individual Marie Curie Actions, that provide mobility possibilities to individual researchers, this action provides support to research organizations to establish or reinforce long-term research cooperation. The eBerea Irses project studied in this paper is implemented by a network of five EU universities and three universities in China. The duration of projects was 4 years.

International collaboration is studied quite extensively. On a theoretical level this paper contributes to research in the field of knowledge sharing between research communities and community of practice. In this paper we focus on the network of researchers as well as on the way information is exchanged, and how individual researcher are collaborating by partaking in activities as joint research projects, exchanges, communities, forums and other activities (Ardichvili et al. 2006). With regard to SNA we look into how a network changes over time, and analysed how network structure and centrality of certain nodes, ties and cliques dominate the collaboration. Not only social network play a role in collaboration, but also spatial temporal, cultural and cognitive distance between partners makes practical collaboration more complex, and affect knowledge exchange and collective learning. Therefore the objective of this paper is to find out whether the project succeeded in reinforcing long-term research cooperation between partner universities as well as individual research and how the cooperation is influenced by cultural and media preferences. Therefore, we illustrate the patterns of interaction and collaboration in the eBerea Irses project and track the change of the network of researchers since the beginning of the project. To achieve this objective we structured the paper as follows: first we present a literature review on knowledge sharing, culture and use of media, then we describe the eBEREA project and research method. Last we present the results from the network analysis and end with conclusions and discussions on expansion of the network and cultural aspects in collaboration.
Innovations and creativity, also in research, are derived to a large extent from collaboration between partners. Nonaka (1994) proposes that new knowledge can be created by dialogue, which brings up conflicting views. It seems that mixing of people with differing backgrounds and cultures would be the way to innovativeness. However, a prerequisite for innovative co-operation is that the parties are able and willing to learn and share knowledge. This challenge is realized in many globalized projects collaborating with people at the other side of the world. Nooteboom (2000) explains that information is useless if it is not new, but it is also useless if it is so new that it cannot be understood. That means there is a trade-off between need for cognitive and cultural distance for the sake of novelty and cognitive proximity and for the sake of efficient absorption (Nooteboom et al., 2007). Nonaka (1991; 1994) suggests that, in addition to creative chaos, the enabling elements for the process of organizational knowledge creation are requisite variety and redundancy of information. This need for variety and at the same time overlapping knowledge domains of individuals is concerned with balancing cognitive distance and cognitive proximity, as mentioned by Nooteboom (2000).

**Knowledge sharing and use of channels.** Sharing knowledge takes place in Community of Practice (CoPs) (Lave & Wenger 1991) characterised Communities of practice as groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. (Wenger 2011). The sharing of knowledge is broadly speaking a flow of knowledge from one to another through a given set of methods. Depending on the type of knowledge, one method can be more appropriate than another. Referring to the distinction between tacit and explicit knowledge, explicit knowledge is easy to write down in the form of data, formulae, codified procedures or universal principles and can therefore be transferred relatively easy and through a variety of channels.

<table>
<thead>
<tr>
<th>Level of collaboration</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Not Linked</strong></td>
<td>Researchers do not work together at all and have separate goals.</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Researchers share information only when it is advantageous to either or both goals.</td>
</tr>
<tr>
<td><strong>Cooperation</strong></td>
<td>Researchers share information and work together when an opportunity arises</td>
</tr>
<tr>
<td><strong>Coordination</strong></td>
<td>Researchers work side-by-side as separate organizations to achieve common goals; efforts are coordinated to prevent overlap.</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>Researchers work side-by-side and actively pursue opportunities to work together, but do not establish a formal agreement.</td>
</tr>
<tr>
<td><strong>Partnership</strong></td>
<td>Researchers work together as a formal team with specified responsibilities to achieve common goals (have a Memorandum of Understanding (MOU) or other formal agreement).</td>
</tr>
<tr>
<td><strong>Fully Linked</strong></td>
<td>Researchers mutually plan and share staff and/or resources to accomplish common goals.</td>
</tr>
</tbody>
</table>

Channels for sharing explicit knowledge may include documents, soft or hardcopy, shared by mail, email, text messages, but also channels like telephone calls or memos. Tacit knowledge on the other hand includes insights and intuitions, and is not easily visible and expressible (Nonaka and Takeuchi...
1995). Therefore it demands a more ‘involved’ kind of channel, and is therefore easier transferred in close contact settings, or through channels that allow richer media to be shared. Most common channels are face-to-face talks and video-conferencing software, like Skype.

**Knowledge sharing, collaboration and networks.** Collaboration can be looked upon from different angles, thus defining it in many different ways. Katz and Martin state that the most obvious definition on collaboration must be to illustrate how closely two or more people work together to achieve common goals (Katz & Martin 1997). But how closely must people work together to achieve collaboration? Harris et al. (2008) made a seven-point list to identify how closely people work together. Table 1 shows the seven steps in the collaboration hierarchy of researchers and the explanation at each level.

**Knowledge sharing and culture.** Several studies indicate that the effectiveness of knowledge sharing is influenced by the cultural values of the individuals involved (Hutchings & Michailova 2004; Bhagat et al. 2002). Transfer of this knowledge, commonly divided in tacit and explicit knowledge, is therefore subjected to the preference of the individual. The preference of the individual is a concept that is much more complex than just the national culture one originates from. Where national culture could be a layer of personal traits defining collective behavior in groups, there are much more influences that alter ones behavior. This research tends to focus on culture as defining factor in behavior. It could just as well be social, geographic, demographic, organizational or economic factors that define small groups of individuals to behave the same. Given these complications, the research tends to discover if culture defines (part of) humans preference in sharing knowledge.

A lot of research on knowledge transfer has been done on the basis of Hofstede, Trompenaars and Triandis’ theories on culture, each of them using their own concepts (Trompenaars & Hampden-Turner 1997; Triandis et al. 1988; Hofstede 1991). Hofstede’s work has been criticized for having methodological flaws and focusing on territory of nation states (McSweeney, 2002), in the absence of alternative models it provides a framework that may help understand cultural differences. Sticking to the terminology of Hofstede (Hofstede 1991, 2001, 2011), like so many researchers have done (Rice et al. 1998; Ardichvili et al. 2006; Guo & Ambra 2003; Hwang et al. 2003), most studied concepts in this field are: individualism/collectivism, long/short term orientation and low/high uncertainty avoidance.

**Culture and use of channels.** Collectivism is closely associated with respect, dignity and modesty (Triandis et al. 1988). Modesty is especially interesting as it is proved to directly influence one persons’ self-enhancement (Kurman 2003). Modesty explains one’s reluctance towards participation in online communities and internet based knowledge databases (Bansler & Havn 2003). Intrinsic behavior of people in a collectivistic environment makes them feel that participating in online communities and internet based knowledge databases are a form of bragging or showing off. Empirical findings from Ardichvili et al. (2006) support this claim, stating that, in Chinese culture, it is not acceptable to stand out in the crowd or to speak up a lot. For individualism and collectivism, it is also, according to the same researchers, the tendency to share knowledge between members of the same group (in-group) easily, but a strong tendency of distrust towards people of the out-group. This
difference in treating in- and out-group members could be a real barrier in making collaboration work with people that at a first glance don’t belong to the trusted in-group.

Related to individualism/collectivism is the issue of face. Face may be defined as “the positive value a person effectively claims for himself by the line others assume he has taken during a particular contact” (Goffman 1955). It can be seen in close relation to respect, prestige and honor. Hwang et al. (2003) confirmed the relationship between gaining face and individualism, but also found suggestions, that fear of losing face, respectively the willingness to gain face, would influence the way they choose between formal and informal communication channels. Informal communication that is likely to form bonds between individuals that ultimately result in collaborations (Kraut & Egido 1988). Next, media richness theory plays a role in defining knowledge transfer preferences among different cultures. Media richness is a concept used to define the ‘capacity’ of a communication medium in transmitting a message from a sender to a receiver (Bodensteiner 1970). When looking at the choice of media, the media richness theory points out that there is no, one best choice, but it would depend on the situation and organizational structure what choice of media would be most effective (Bouwman et al, 2005; Daft & Lengel 1983; Trevino et al. 1990; Zmud et al. 1990).

With the introduction of computer-mediated communication (CMC), globalization, and generally increasing streams of information, preferences of media channels are changing. When trying to link media richness to culture, the above might just influence different cultures choice in using different forms of communication, regardless of the equivocalness but dependent on their own preference. With especially collective cultures putting a lot of emphasis on relations between individuals, groups and for instance family and organizations, a distinctive preference towards high media rich media, seems very likely. Several researches have proven this theory in fact (Guo & Ambra 2003; Ardichvili et al. 2006). The extent to which cultures prefer to use a certain media channel might hamper them in making collaborative ties with fellow researchers on a distance. Kraut & Egido argue that especially in the initial stages of collaborations rich media is key (Kraut & Egido 1988). Literature suggests that where face-to-face contact was very important for collaborations to be effective, this negative impact of distance has for a large part been covered by the emergence of many computer mediated communication media (Jones et al. 2008; Cairncross 1997). In conclusion cultural traits, knowledge transfer concepts and collaboration are closely related and need to be considered in analyses of collaboration networks.

3 THE EBerea IRSes CASE

eBerea, (www.eberea.org), is a research network dedicated to advance research and higher education in the fields of electronic business in EU and China. It builds on networks of researchers for the exchange of information between and among Chinese and European Universities. Originally, the network was established by researchers in two Finnish and two Chinese universities: Helsinki University of Technology (now part of Aalto University, AALTO), University of Jyväskylä (JYU), Southwestern University of Finance and Economics (SWUFE) and Xi’an Xiaotong University (XJTU). In 2007, the rectors/presidents of these four founding member Universities signed a
Memorandum of Understanding to advance joint development of educational programs, the exchange of staff and students, and research cooperation by and between the universities. The eBerea network did not have any dedicated funding but was building on enthusiasm and vision of a few individual professors about collaboration of eBusiness research between Europe and China. In practice, the cooperation was supported by separate short time projects ran by the professors.

The research carried out by eBerea researchers focuses on business modelling and design of electronic business and services. Research collaboration in this field of research is to provide a solid foundation for developing the educational, scientific, and cultural as well as business relationships between the regions. Through the collaboration the European partners can have access to valuable sources of information in China, such as market statistics and comparative case studies. Perhaps more importantly, the eBerea partners are expected to benefit from the creation of an eBusiness cluster and social network of researchers in the field. This would foster the growth of future eBusiness higher education network. The experiences, concepts and mechanisms could then be implemented in other relationships of the participating universities and in widening the eBerea network with new European and Chinese partners. In 2009 four new universities joined eBerea: Delft University of Technology from the Netherlands (TUDelft), Åbo Akademi University from Finland (AAU), University of Trento from Italy (UNITN) and Renmin University of China (RUC). This increased the number of eBerea partners to 5 European and 3 Chinese Universities. At this point the network made the co-operation more coordinated by setting up a management board and by agreeing on by-laws. In 2010 the EU approved an application by eBerea consortium for financial support from FP7 Marie Curie’s International Research Staff Exchange Scheme. The four-year Irses projects are designed to reinforce research collaboration of universities through seconding and hosting researchers between Europe and China. It can fund at least part of the traveling costs from the research exchange, both from China to Europe and from Europe to China. The Irses project, combined with other smaller research project such as Ubiserve (http://ictalliance.org/future-services/), provided the eBerea universities the possibility to foster and increase their research collaboration ties within the eBerea network.

The areas of research were divided in main categories such as: i) business modelling and design, ii) regulatory issues and trust enhancing mechanisms, and iii) financial services for consumers and citizens. Each work package included a number of research tasks which were carried out by the eBEREA participants during the and between researcher visits.

4 RESEARCH METHOD

Questionnaire and Sample. Data was collected in June and July 2013 by making use of a web questionnaire that was send out to all known participants, that were included in some of the activities of the eBerea network (N = 115), from the eight universities. The most participants are from China (N = 79) and Finland (N = 28). The questionnaire contained questions on (1) affiliation, nationality, and university visited; (2) cultural aspects based on 12 items from Hofstede et al (2008), media richness and scales on formal and informal communication and (3) networked related questions. The networked related questions presented individual researchers (with photo’s) grouped by university, and asked
network members to rate to what degree they have been linked ranging from not linked, communicated, cooperation, coordination, collaboration, partnership, fully linked based on Harris et al., 2008 (see table 1).

**Non-response.** There are two main types of non-response: unit non-response and item non-response. Unit non-response refers to actors’ answers completely missing from the network, that is when an actor does not participate in the survey at all. Item non-response refers to some data of some actors missing, if a person for example does not complete the survey or leaves some questions unanswered (Huisman, 2009). Here we consider the set of eBerea researchers (115 researchers) and the links between all of them. From this set, 48 of the participants did not or declined to answer, creating a unit non-response rate of 42%. Furthermore, in the instructions of the questionnaires, the participants had the option to leave empty the answers referring to people they do not know at all, thus an item non-response is considered as response of not being connected/having collaborated with a participant.

Concerning the unit non-responses, even though for network analysis, in theory, response rates of 90% or more are desirable, in practice, population surveys may have more than 25% non-response rates (Knoke, 2012). Especially when it comes to non-anonymous answers, like in the case of gathering network data, this percentage is sensitive to increase. In the eBerea case, due to the unit non-responses, out of 13110 (=115*114) possible links, 48*114=5472 (=48*(115-1)) or 42% of links would be missing, even though they could be referred by those who took the survey. The information provided by the respondents of the survey can therefore prove useful, as the links between non-respondents and respondents are indicated by the respondents. As Huisman illustratively points out: “This information can and should be used to adequately analyze the incomplete network” (Huisman, 2009).

Based on that, instead of keeping out of the network the non-respondents, the reconstruction method is used, as it is also the most appropriate one for undirected networks (Huisman, 2009). Reconstruction assumes that actors share the same perceptions of their interaction. Thus, when the answer of actor i is missing, leading to the value X_{ij} to be missing, then X_{ij} is replaced by the value of X_{ji}, which is the answer given by actor j indicating his linkage with actor i. In the network analyses we only included those respondents that were mentioned and filled out the questionnaire. So people that were mentioned but didn’t fill out the questionnaire weren’t included in the network analyses, because then we would only have one perspective on the relation.

**Data-analysis.** Gephi as well as UCINET 6.0 (Borgatti, Everett, & Freeman, 2002) is used for network statistics and visualization. This allows to illustrate the structure of the current network of eBerea in individual and university level and use it as a basis for comparison with the initial eBerea network. Besides measuring the number of actors, the frequency of their interaction and the amount of collaborations among eBerea participants, density, centrality and other network measures are used focussed on cohesion and prominence.

5. **RESULTS**

On average every participant had contact with 23 other eBerea members at least once during the project, and with 7 of them frequent contact. The network has been developed through its lifetime, the
current network is analyzed and studied in comparison with the initial eBerea network. For this reason, only the “interaction” relation is studied, as this is the one corresponding to an initial study on the network (Yang, 2011). Table 2 summarizes the results that are discussed afterwards.

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Measure of the network</th>
<th>2013</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual level</td>
<td>Density</td>
<td>20.6%</td>
<td>16.2%</td>
</tr>
<tr>
<td></td>
<td>Degree centralization</td>
<td>52.2%</td>
<td>20.8%</td>
</tr>
<tr>
<td></td>
<td>Betweenness centralization</td>
<td>10%</td>
<td>30.9%</td>
</tr>
<tr>
<td></td>
<td>Average distance</td>
<td>1.9 steps</td>
<td>2.7 steps</td>
</tr>
</tbody>
</table>

As density denotes the ratio of existing and possible ties among participants, it can be used to compare the current eBerea network with the initial one. Higher density indicates more communication paths among participants (Haythornthwaite, 1998). While the number of participants increased also the density increased. Thus, after the three years of the eBerea program, information is now spread faster and more freely across a larger network than at the beginning of the program. Concerning the prominence of the network, the average distance among eBerea researchers is 1.9, meaning that every actor can reach another by 2 steps on average, whereas at the beginning of eBerea project the average distance among researchers was 3 steps. Individual researchers are currently closer with each other than at the beginning of the program. If we compare the networks with regard to its structure we see that nationality and affiliation still are dominant (see figure 1a and 1b).

**Figure 1 a** Network based on nationality  
**Figure 1 b** Network based on University

There is a central role for the project leader and for national champions, while some persons have a strong bridging position due to affiliation to multiple universities. On a network level China is most
prominent represented, followed by Finland. On a university level the University of Jyväskylä is most prominent. As can be seen from figure 1b sub areas of collaboration are mainly determined by the university to which participants belongs. If we look to the heirearchical clustering (Figure 1 c) within the network we find more or less four clusters, one centered around the project leader (Mariikka/Jups Heikkilä), one around Qi Li and Yu Zhang, one around Junying Zhong and Matti Hämäläinen, and the fourth of mainly Chinese researchers.

The preferences of researchers in collaborating with others that are based close to them can be illustrated through Table 3. The first column of the table indicates the country that the researchers are based. Italy is a special case because it only concerns one researcher. Dutch researchers are equally open to research with national as well as with international researchers. Researchers from China have focused more on collaborating within their country than outside. The overall E-I index of the network (-0.5) indicates a moderate tendency of individuals to collaborate more with people inside their country.

Aalto, SWUFE, XJTU and RUC have much higher dense ties when it comes to collaborations inside their own universities, whereas the members of AAU, JYU and UNITN form more collaborative ties with researchers outside of their own university. This means that, for example, eBerea researchers from SWUFE university are more possible to form collaborations with other researchers from SWUFE than with researchers from any other of the eBerea universities.

<table>
<thead>
<tr>
<th>Base country of researchers</th>
<th>Ties with researchers inside the country</th>
<th>Ties with researchers outside the country</th>
<th>Total</th>
<th>E-I index</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>246</td>
<td>48</td>
<td>294</td>
<td>-0.673</td>
</tr>
<tr>
<td>Finland</td>
<td>116</td>
<td>59</td>
<td>175</td>
<td>-0.326</td>
</tr>
<tr>
<td>Italy</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>1.000</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Overall rescaled E-I index* -0.498

In general the collaboration between the eight universities is intensified (see Figure 2 a and b). Aalto University, South Western University of Finance and Economics (SWUFE), Xi’an Jiaotong University and Renmin University of China have the most dense ties.
Interesting question is now how cultural dimensions play a role. First of all based on Hofstede’s measurement tool we have to conclude that the Chinese participants are more collectivistic than the European participants, the Chinese participants are more uncertainty avoiding than their European counterparts and the Europeans are actually more long-term oriented than the Chinese participants. This is contrary to what Hofstede in his initial study (1991) proposed. According to Hofstede Chinese participants were actually believed to score substantially lower on uncertainty avoidance and a lot higher on long-term orientation. Moreover combining characteristics of nodes focused on cultural dimensions as proposed by Hofstede with network analyses yielded no significant results.

With regard to preferences for formal or informal communication there is only a significant difference with regard to informal settings where fellow participants are met (Mean Chinese participants = .25; Mean European participants = -.53; t=3.002; df=65; p<.01).

With regard to use of media channels the preference is not so distinctive in this project as suggested in literature. There is a strong shared preference for using email. Secondly f-2-f meetings are preferred Chinese have a slightly stronger, however non-significant preference for Instant Messaging. After Email and IM, videoconferencing are most preferred over telephone calls. Again connecting the preferences of participants with regard to formal or informal communication, or the use of media channels didn’t yield any relevant relations with network analyses.

6 DISCUSSION AND CONCLUSION

Based on the analyses we can draw some interesting conclusions. First of all the eBerea network has developed over the years from a network with limited interactions to a larger network with higher density even under the condition that the network expands over time. The latter conditions would normally lead to a lower density. So it is clear that intensification of interaction and collaboration is slowly progressing. However collaborative ties are still stronger inside the university of origin than with people from outside the university. Based on physical proximity this is a result that can be expected. The same holds for collaboration among countries and continents: the researchers collaborate more with others close to them (from the same country or the same continent) than with others outside of their country. The central roles in the network have changed since its beginning, shifting towards the Chinese universities, whereas it was European universities that were the most
central ones at the beginning of the project. Finally, the lower average distance among participants comparing with the initial eBerea network shows that researchers came closer to each other during the years of eBerea project.

With regard to the cultural dimension, we have to conclude that our results are contrary to what Hofstede suggest. Although Chinese participants are a bit more collectivistic than European researchers, but not as strong as expected. Likewise the dimensions defining long-term orientation is almost equal between the Chinese and European participants, where Chinese were expected to be for more future oriented. The dimension of uncertainty avoidance holds the most unexpected result; pointing at a far more avoiding stance of the Chinese participants over the European, something that was expected in the opposite direction. Moreover we could not relate the cultural aspects to the network characteristics in a significant way. Also with regard to preferences for channels or the formal and informal ways of communication the results are rather homogeneous between the sub samples.

The research has some limitations. First of all, the size of the sample is small. The fact that eBerea includes only researchers of a specific domain (eBusiness) further limits the option to generalize the results for networks of researchers in general. The study also suffered from high non-response rate. The survey was also conducted in English which is not the native language of most of the participants, potentially hampering the response rates as well. The non-anonymous questionnaires are also another limitation of the study, they were, nevertheless, necessary. The time required to fill in the survey, could also potentially influence respondent’s answers in a negative way.

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