Sechi, Guido; Skilters, Jurgis; Borri, Dino; De Lucia, Caterina

Conference Paper

Knowledge Sharing And Enrichment In The Republic Of Latvia: The Role Of Physical Vs Virtual Community Linkages

KNOWLEDGE EXCHANGE IN HYBRID COMMUNITIES: A SOCIAL CAPITAL-BASED APPROACH. EVIDENCE FROM LATVIA

Guido Sechi[1,2], Jurgis Skilters[1], Dino Borri[2], Caterina De Lucia[2]

[1]Centre for Cognitive Sciences and Semantics, Lomonosova iela 1, University of Latvia, LV-1019, Riga (Latvia)
[2] Department of Architecture and Urban Studies, Via Giovanni Amendola 126/B, Technical University of Bari, 70126, Bari (Italy)

Abstract
The present paper is an attempt at investigating the dynamics of knowledge exchange in a hybrid community at the *micro* level of analysis. The theoretical framework is based on social capital theory as defined in community and organisational studies, and on applied epistemology and knowledge management studies. The proposed model hypothesizes a positive effect of social capital dimensions and personal motivation on the quality of knowledge exchange, which should enhance in its turn the growth of individual knowledge (different dimensions are hypothesized). A quantitative empirical analysis based on structural equation modelling at the individual level is carried out among the members of the National Library of Latvia community (a partly virtual, partly geographical one), in order to test the above mentioned hypotheses. Findings show some common results in organisational and community studies (above all, the positive effect of trust capital on the quality of knowledge exchange), but also some peculiarities which in particular suggest relevant differences with purely virtual communities.
Keywords: hybrid communities, social capital, knowledge sharing, structural equation modelling

INTRODUCTION

In the last decades, in social sciences, there is a general consensus that ICTs have had a modifying impact on the concepts of neighbouring, proximity, and social capital (Hampton and Wellman, 2003). This has led to a strong attention in sociology, organisational science, and to some extent regional science, to the issue of the extent to which virtual communities can be substitutes for traditional, geographical ones. Such an issue has several implications. One of the most relevant and debated is related to the cognitive benefits of virtual networking. An effective impact of non-geographical channels on knowledge sharing would imply the independence of knowledge from geographical contexts and boundaries, with relevant socio-economic consequences. Such an issue is however controversial. Critiques (e.g., Camagni and Capello, 2005) argue that knowledge exchange and innovation growth based on global virtual channels (ICTs) is limited by lack of social trust and sense of belonging in virtual communities. Indeed, in organisational and regional studies there is consensus about the strong predicting role of social assets for the effectiveness of knowledge and information exchange in organisations and territories. This leads to another side of the problem, which is crucial to address cognitive dynamics: that is, the possible reproducibility in virtual environments of social assets which are embedded within geographical communities and networks. Mutating the terminology from territorial innovation studies, it is possible to say, in other words, that the issue amounts to investigating whether a virtual community can reproduce the main features of a *community of practice* – from the point of view of social assets which are embedded in networks and the consequent cognitive benefits of such assets. Next to it, a reflection on cognitive assets and the obstacles to their access is needed. This requires a careful taxonomy of involved factors and an effective cross-fertilization of social and cognitive science threads.

The present paper is an attempt at investigating the effectiveness of knowledge exchange in a mixed physical-virtual environment, rarely investigated in literature – a *hybrid community*. The approach is based on sociology and social psychology threads (social capital and social cognitive theory) and on epistemological reflections on the nature of knowledge and its inherent barriers to sharing. A quantitative approach is adopted for the empirical analysis, based on structural equation modelling (Joreskog and Sorbom, 1979) to be carried out at the *micro* (individual) level.

Our study shares several topics with Gaved & Mulholland (2005), focusing on networked characteristics of community, and one of the few studies investigating hybrid physical-virtual networking. We especially hypothesize that the interaction between online and offline

communication significantly extends and enhances social interactions in particular and cognitive processing in general.

LITERATURE REVIEW
Towards a definition of community
A comprehensive and unifying definition of what counts as a community in general and epistemic community (community of shared knowledge) in particular is still lacking. We argue that what is common to all kinds of communities are

> (a) Collections of associative links, nodes, themes, whereby links and nodes can refer to both human and artificial agents (such as knowledge repositories, e.g., libraries). In case of online communities, communicative links and nodes lack a physical co-occurrence.
> (b) Interaction structures, implicit or explicit shared norms and shared principles of behavior, support / feedback cycle, and shared goals,
> (c) Impact of technical infrastructures and format- or channel-specificity.

Communities both in physical and virtual sense have an epistemologically distinct concept of agency. Sense of belongingness and sharing joint goals generate a "we-identity" and "we-intentionality" of communities (cp. discussion on shared intentionality and agency: Gilbert, 2004, Tomasello, 2009, Searle, 2008).

Social categorization and generation of self in communities

Knowledge exchange in communities is enabled by processes of social categorization (for an overview cp. Leary & Tangney, 2003, Fiske, Gilbert, Lindzey, 2010). The core part of social categorization and the ground of epistemic agency is the generation of self-representation. On the one hand, self is generated by the sense of being unique; on the other hand, self is generated by the sense of belonging to a community (Brewer, 1991, Brewer & Gardner, 1996). Further, if we explore the structure of the self-representation we can explore different mutually interacting groups of factors: (a) the internal experience-based factors of the subject (beliefs, goals, norms), (b) representation of significant others as a part of self-representation (Saribay & Andersen, 2007), and (c) functionally important parts of the environment the agent is involved in and interacts with (Clark, 2011, Menary, 2010, Wilson, 2004).

Hybrid communities
Networked characteristics of community are rarely discussed in respect to *hybrid communities*, that is, communities which incorporate both physical and virtual communication linkages (Gaved and Mulholland, 2005) and are characterized by framed interactions (Koch, 2005). (a notable exception: Wellman and Milena, 1999). In such communities, network infrastructure consists of both online and offline linkages; physical (offline) and digital (online) relationships generate a complementary structure where online links often support offline relationships and vice versa. Hence, it can be assumed that hybrid communities overcome shortcomings which characterize pure online and offline communities.

At the individual level, the analysis of hybrid communities has crucial consequences for the conception of self. On the one hand, physical face-to-face communication generates an extended conception of self because of including representation of significant others in the representation of the self (Saribay & Andersen, 2007, Brewer, 1991, Brewer & Gardner, 1996). On the other hand, digital, computer-mediated communication generates a cognitive extension as well – functionally significant links and nodes used in knowledge transfer are a part of the extended conception of the self, supporting the second-wave extended mind paradigm (Clark, 2011, Menary, 2010, Wilson, 2004).

Further, hybrid communities raise question related to the epistemological agency, belongingness and feeling a collective identity with the community: although an answer to this questions is outside of the empirical scope of the results of the present paper, we could generalize that hybrid communities possess collective cognitive states enabled by the belongingness of the individuals

involved. According to the seminal framework by Gilbert (2004, 96) there are two main collective cognitive states: (a) cognitive states that characterize established communities or groups and (b) cognitive states of "two or more people without any presumption that they constitute an already established group." Perhaps, at the individual level there are some members of communities possessing different or even incompatible opinions but sharing the same attitude or opinion if explored at the community level. Collective cognitive states generate beliefs that are based on joint commitment: "*A population, P, believes that p* if and only if the members of P are jointly committed to believe [...] that p." (Gilbert, 2004, 100). Although we are not able to provide empirical evidence for the joint commitment thesis, we argue that the hybrid communities possess it.

Physical and virtual communities: social assets and cognitive dynamics

The study of virtual communities from the point of view of the reproducibility of social assets which are observed and relevant in geographical communities – and their consequent capability to enhance, among other effects, virtuous cognitive dynamics - is widespread in sociology and organizational science (Rheingold, 1993). Social capital-based community studies and organisational studies widely describe the nature of such social assets. Authors generally agree about the reproducibility of trust as the key factor behind knowledge and information exchange. In geographical community studies, trust is meant as one of the main social assets which lead to socio-economic development (Putnam, 1993). In terms of social capital taxonomy, trust is one of the main components of relational capital – that is, the set of assets which are embedded within linkages and networks (meant as structural capital). Ridings et al. (2002) state that trust enhances information sharing in virtual communities; trust is in its turn enhanced by perceived responsive relationships, disposition towards trust, belief that others confide personal information. Usoro et al. (2007), too, state that trust is an antecedent for knowledge sharing.

In social capital-based cognitive studies, however, the structural / relational dichotomy has been deemed insufficient to describe all relevant aspects of social capital with regard to knowledge exchange and transfer effects. An enriched taxonomy has been proposed, in the field of organisational science. by Nahapiet and Ghoshal (1998) who add a cognitive component representing the mutual compatibility of agents with regard to shared vision, culture, language.

Chiu et al. (2006) empirically study the effect of social capital and personal motivation on knowledge sharing in virtual communities, combining Nahapiet and Ghoshal's taxonomy of social capital and Bandura's social cognitive theory (1989). Cognitive social capital, community expectations, and trust are found to affect exchange quality; structural social capital, norm of reciprocity and identification, and community expectations affect exchange intensity.

Physical vs virtual in regional science

Implications for regional science threads related to knowledge and information exchange – territorial innovation studies in particular – are extremely relevant. One of the most controversial topics in such a context has been, in the last years, the assessment of the real impact of ICTs on knowledge growth and the extent to which virtual channels can be substitutes for geographical proximity. As mentioned above, Camagni & Capello (2005) argue that lack of social trust and sense of belonging in virtual communities limits the positive impact of ICTs on knowledge and innovation growth. On the other hand, Lundvall and Nielsen (2008) state that ICTs have positive effects on knowledge exchange; however, such effects are strongly dependent on the nature of exchanged knowledge.

The issue of inner barriers: the nature of knowledge

Quite surprisingly, social capital studies investigating knowledge transfer dynamics rarely attempt an epistemological discourse and discriminate between different forms of knowledge. Such a lack of interest for such an issue is surprising since it is relevant for two main reasons. First of all, since Nonaka (1991; 1994) it is acknowledged that information and knowledge are two distinct concepts, which may follow different social learning patterns (Inkpen and Tsang, 2005). Second, although most debates on the social exchange of knowledge, as evident from the previous paragraphs, are

focused on the interaction of agents and their social linkages (of an affective and cognitive nature), which are reflected in the relational and cognitive dimensions of social capital, Szulanski (1996), investigating knowledge exchange in large organisations, finds out that it can be affected by the inner complexity of knowledge as well.

THEORETICAL FRAMEWORK

The aim of the paper is the investigation of the interplay existing in a hybrid community between social capital (meant as social assets which are embedded within networks), personal motivation, the quality of knowledge exchange, and the growth of individual knowledge, among individuals belonging to a hybrid community.

Quantitative studies on hybrid communities and knowledge dynamics are basically absent in literature; however, a few relevant studies which analyze such dynamics in the context of virtual and organisational communities do exist. The adopted framework partly relies on the model developed by Chiu et al. (2006) in investigating knowledge transfer in virtual communities, taking into account the contribution of both social capital and personal motivation to the intensity and quality of knowledge transfer. The hypotheses of Nahapiet and Ghoshal (1998) and the findings of Tsai and Ghoshal (1998) on the correlations among different social capital dimensions and their effects on inter-unit knowledge sharing in large organisations are also a basis for the model. Two features, however, make the present approach different: a) the hybrid nature of the investigated community; b) the attempt at discriminating between different forms of knowledge.

As for the former, the study of a mixed physical-virtual community provides with the possibility to investigate the effects of both face-to-face and virtual structural capital on social assets and cognitive dynamics, and compare them.

As for the latter, a knowledge taxonomy is adopted, based on two popular dichotomies:

a) Russell (1998)'s distinction between experiential and declarative knowledge, that is, knowledge derived by experience, of a procedural nature (*knowledge by acquaintance*); and knowledge derived from notions and data sources, of a declarative nature (*knowledge by description*);

b) Nonaka (1994)'s distinction between information (organized data) and knowledge in the strict sense (information-sustained belief).

The identification of different forms of knowledge and the presence of a factor measuring the quality of knowledge exchange allows to investigate the relevance of barriers to access which are related to the nature of knowledge itself, as in Szulanski (1996).

THEORETICAL MODEL

Variables

The choice of social capital dimensions is based on Nahapiet and Ghoshal's work (1998), which has set the standard for a taxonomy useful to investigate the cognitive benefits of social capital:

Structural social capital, meant as networks, linkages, that is, the social networking structure of a community;

Relational social capital, meant as positive attitudes among members of a community (e.g. trust towards community members). Putnam (1993) defines it as consisting of trust and shared norms. Nahapiet and Ghoshal (1998) attribute to it a crucial motivating role for knowledge exchange dynamics.

Cognitive social capital, meant as common narratives, language, vision among members of a community (Nahapiet and Ghoshal, 1998)..With regard to knowledge exchange dynamics, it is associated with combination capability and relative absorptive capacity (Lane and Lubatkin, 1998).

Such a taxonomy is extremely influential in studies investigating knowledge sharing and enrichment in organisations and communities. However, many social capital theorists, in particular those who study social capital assets as resources owned by individuals or groups rather than collective ones (e.g. Bourdieu, 1986), and those who adopt a *network* approach (Portes, 1998; Burt, 2001), define social capital as the set of assets (that is, the relational and cognitive dimensions)

which are embedded within networks, excluding networks themselves from such a definition. In the context of the present paper, which adopts an analysis approach at the *micro* (individual) level, structural capital is not included in the theoretical model; it is hypothesized that it consists of a mix of face-to-face and virtual networking, and the attention is focused on embedded social assets and the way in which they interact with motivational factors and knowledge sharing in such a context, characterized by a hybrid social network infrastructure.

Besides, on the basis of preliminary factor analysis, we identify two sub-dimensions of cognitive capital:

a) a component related to the existence of a common language;

b) a component related to a common professional background.

Personal motivation, as in Chiu et al. (2006), is divided into two sub-dimensions:

a) motivation related to personal benefits;

b) motivation related to community benefits.

Three dimensions of knowledge are taken into account, by combining the Russell and Nonaka dichotomies which are quoted above:

Declarative knowledge, or *know-what*. This is knowledge about facts, consisting of organised data (information) and knowledge about sources of information. It is a simple form of knowledge, not characterized by relevant inner barriers; the main barriers to its access are rather related to the context and to the involved actors.

Procedural knowledge, or *know-how*. This is knowledge about procedures, practical skills. It is characterized by relevant inner barriers, since it is usually tacit. Organisational learning studies investigate the ways through which it can be made explicit. It can be linked to Polanyi (1967) and Nonaka and Takeuchi (1995)'s tacit knowledge, and to Schon (1988)'s knowledge-in-action.

Conceptual knowledge, or *know-why*. This is knowledge about laws and principles. It is usually expressed in coded forms and languages, not understandable for everyone; besides, it requires the ability of connecting causes and effects. Hence, it is characterized by relevant inner barriers.

Hypotheses

The hypothesized model is a *partially recursive* one – that is, it follows the patterns of *path analysis* (Bollen, 1989). Social capital dimensions and personal motivation are supposed to enhance the intensity and quality of knowledge exchange, which, in their turn, have a positive effect on the growth of individual knowledge dimensions. As mentioned above, most hypotheses are based on the findings of Tsai and Ghoshal (1998) in the context of inter-unit knowledge exchange in large organisations, and on Chiu et al. (2006) study of knowledge transfer in virtual communities. The hypotheses are listed following.

Relations between social capital dimensions

Hypothesis 1. Communication (a) and profession-related (b) cognitive social capital positively affect relational capital. Tsai and Ghoshal (1998) find support for such an hypothesis, which implies a positive effect of shared vision on perceived trustworthiness.

Effects of social capital on personal motivation

Hypothesis 2. Relational capital positively affects altruistic personal motivation. It is supposed that a trustful climate enables community-oriented behaviour.

Hypothesis 3. Communication-related (a) and profession-related (b) cognitive social capital positively affect altruistic personal motivation. It is supposed that a common language and terminology, and the perception of common interests, may lead to a behaviour aiming at collecting useful information and knowledge.

Effects of social capital and personal motivation on knowledge quality

Hypothesis 4. Relational social capital positively affects knowledge quality. Trust is found to be an antecedent of knowledge exchange both in organisations (Tsai and Ghoshal, 1998) and virtual communities (Ridings et al., 2002). Chiu et al. (2006) find empirical evidence that various dimensions of relational capital affect not only intensity, but also quality of knowledge exchange in virtual communities.

Hypothesis 5. Cognitive communication (a) and profession (b) social capital affects knowledge quality. Relative absorptive capacity is considered an enabling factor of knowledge exchange both in territorial innovation theory (Boschma and ter Wal, 2007) and organisational science (Nahapiet and Ghoshal, 1998). Empirical studies are contrasting: Chiu et al. (2006) find evidence for this hypothesis in the context of virtual communities; Tsai and Ghoshal (1998), in the context of large organisations, do not.

Hypothesis 6. Both community benefits (a) and personal benefits (b) oriented personal motivation affect knowledge quality. Various studies (e.g. Butler et al., 2002; Zhang and Hiltz, 2003) suggest that personal expectations (both egoistic and altruistic) play a relevant role in the will of people to share knowledge within communities and organisations. Chiu et al. (2006) find partial empirical support for such hypotheses.

Effects of knowledge exchange quality on individual knowledge growth

Hypothesis 7. Knowledge exchange quality affects the growth of (a) declarative (b) procedural (c) conceptual knowledge. Szulanski (1996) finds evidence of causal ambiguity being the main barrier to access to knowledge in organisations. Therefore, it seems reasonable to hypothesize that personal knowledge growth is affected by the quality (in terms of reliability, accurateness, completeness) of sharing.

Besides, a default hypothesis for structural equation modelling (that is, correlation between exogenous variables – in this case, the two sub-dimensions of cognitive capital) is included in the model.
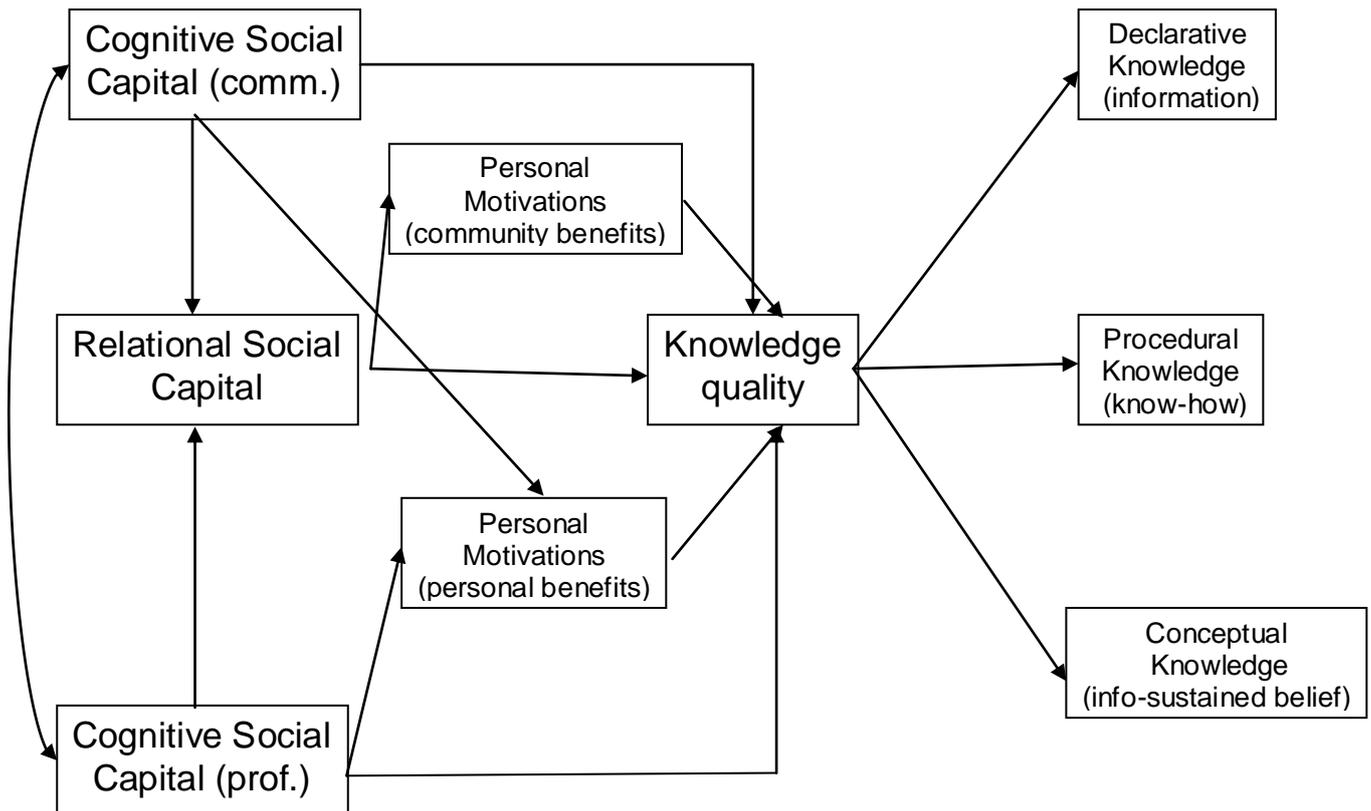
Figure 1. Theoretical model

METHODOLOGY AND DATA

Given the complex nature of cause-effect patterns, and the ambivalent (both dependent and independent) role of intermediate variables, the chosen approach for the model analysis was structural equation modeling (Joreskog and Sorbom, 1979). The particular nature of variables, most of which are measured on psychometric scales (Likert, 1932), and therefore non-metric (Stevens, 1952), has led to the choice of an ad-hoc estimation method (Bayesian estimation). The survey was carried out among the members of the National Library of Latvia online community, a hybrid intentional community including several thousands of habitual members and over 70.000 occasional users.

Due to timing problems, the structural analysis which is described in this paper is based only on 56 observations. Therefore, the results are not completely reliable and the analysis must be merely meant as a pilot one to be further integrated on the basis of a larger sample.

RESULTS AND COMMENTS

Results support the significance of most hypotheses. Four of them, however, are found to be non-significant:

Hypothesis 1b. The non-significant effect of profession-related cognitive capital on relational capital seems to suggest that trust is enabled only by some aspects of cognitive capital, e.g. those based on a common language and understandable communication, rather than by the commonality of knowledge base and interests.

Hypothesis 5 a / b. The non-significant effect of both dimensions of cognitive capital on knowledge quality confirms Tsai and Ghoshal's findings (1998) in large organisations, but in contradiction with Chiu et al. (2006). Such discrepancies may depend on differences between communication channels in the different kind of investigated communities; in other words, this may be one of the dynamics for which the physical or virtual nature of networks matter. This would require further insights. However, it can be said that, at a first glance, the hybrid community seems to behave like a physical community rather than like a virtual one with regard to such a particular dynamic.

Hypothesis 6a. The non-significant effect of community-oriented motivation on knowledge sharing contradicts Chiu et al. (2006)'s findings. This finding may also depend on the differences related to the nature of investigated communities. However, community-oriented motivation is found to directly affect two knowledge dimensions (see below).

The default option on the correlation of the two exogenous variables is also found to be non-significant, which seems to imply the absence of common predicting factors outside the model.

Besides, some unexpected significant effects are found. One of them – the correlation between the errors of conceptual and procedural knowledge – may be interpreted as a spurious relationship based on exogenous causes. The other effects are more interesting:

Cognitive (profession-related) social capital directly positively affects procedural knowledge. It is a quite intuitive finding (interacting with people who have the same background leads to an increase in personal skills).

Community-oriented motivation directly positively affects declarative and conceptual knowledge. Such findings imply that a favourable environmental climate affects the growth of theory-based forms of knowledge, albeit to a slightly minor extent than knowledge quality itself. In terms of Szulanski's framework (1996) it amounts to say that both features of knowledge itself and environmental (agent-related) features concur in enabling the access to the two mentioned forms of knowledge. Such a result – quite intuitive with regard to declarative knowledge – is quite surprising with regard to conceptual knowledge which, at first sight, seems to be mainly characterized by inner rather than environmental barriers.

Besides, it must be said that squared multiple correlations are relatively high. This implies that the explicative power of the model with regard to endogenous variables is acceptable.
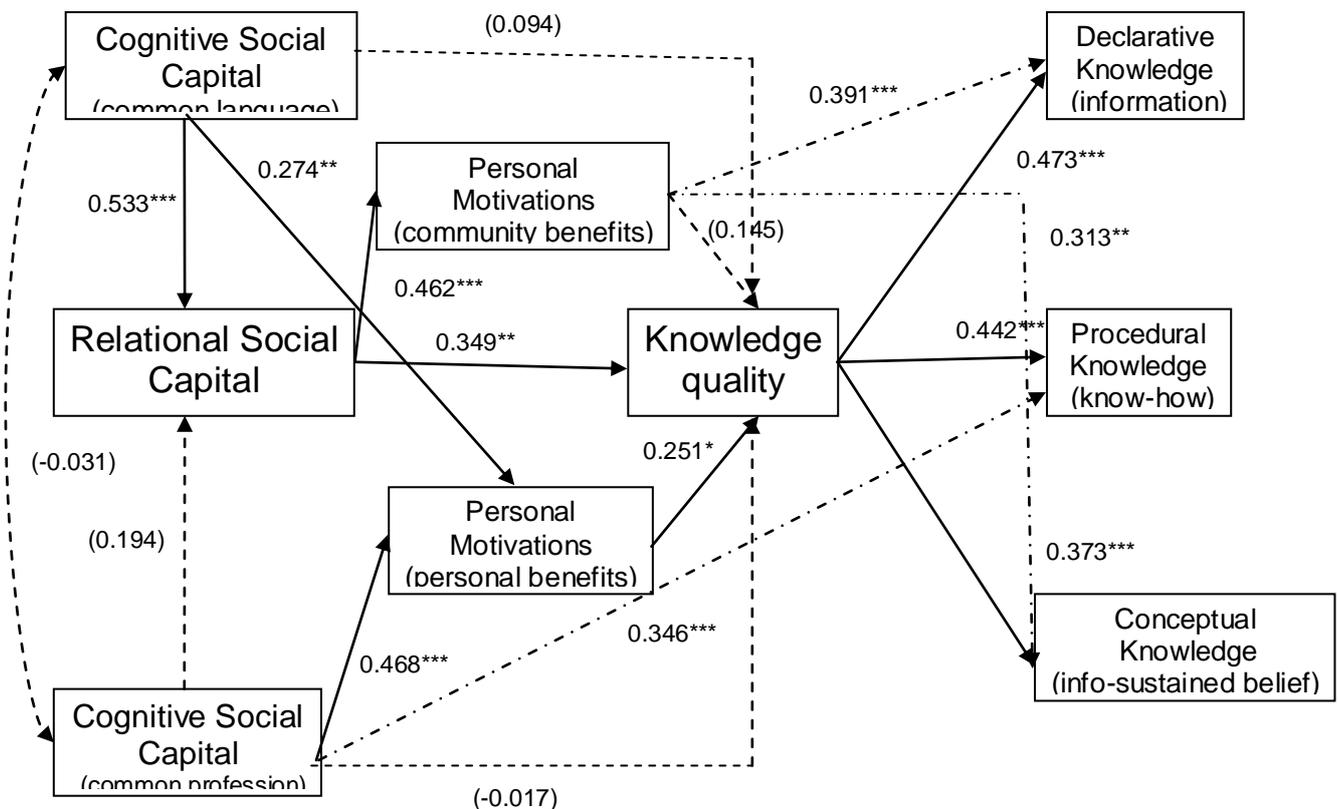

Figure 2. Results[1]

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[1] Solid lines: significant effects; dashed lines: non-significant effects; dot-dashed lines: unexpected significant effects

***: significant at 99% confidence level (error probability < 0.01)

**: significant at 95% confidence level (error probability < 0.05)

*: significant at 90% confidence level (error probability < 0.1)

CONCLUSIONS

As said above, the limited amount of data is a serious limit with regard to the reliability of findings, therefore the empirical analysis must be strictly interpreted as a pilot one. Results will be further tested in the next future on a larger sample of individual observations.

Such limitations aside, it can be said that such preliminary results confirm some common findings in organisational and community literature, whereas some unexpected effects are found, which may depend on the specific nature of hybrid communities. The main and most significant results can be summarized following:

- Social capital assets – in particular trust capital – positively affect (either directly or indirectly) knowledge quality exchange.
- Both quality exchange and (to a lesser extent) motivational factors are predictors of individual knowledge growth.

The non-significant effect of cognitive capital dimensions and the very modest effect of personal motivation on knowledge quality are inconsistent with analyses carried out among members of virtual communites (Chiu et al., 2006). Such results suggest to investigate in further details the nature of structural capital in hybrid communities, and the combination of physical and virtual networking. The inclusion of virtual and physical components of structural capital in the model may shed a light on many such dynamics.

Besides, further analysis will test the sensitivity of results to control variables of a socio-demographic and socio-economic nature, which may help identifying intra-community divides accounting for differences in socio-cognitive dynamics (see Lamont, 1992).

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