Knowledge Creation in Cross-Border and Cross-Sectoral Collaborations

Exploring EU Externally Funded Security Research and Innovation Projects as Communities of Practice

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Abstract: The purpose of this paper is to explore how knowledge creation in EU externally funded security Research and Innovation (R&I) projects can be understood through the concept of community of practice (CoP). A multiple case study design was used to examine EU R&I projects with the Wenger's identity-practice framework that characterizes conventional CoPs. Qualitative data analysis was conducted based on rich empirical data collected during June 2015 – July 2017. The results of the study suggested that the EU R&I project consortium is a knowledge community in its own right, which knowledge creation cannot be fully understood if analysed as traditional project organizations. CoP framework can provide a meaningful way to investigate how explicit and tacit knowledge is created and shared within a project consortium and across different consortiums. Namely the engagement in different phases of the work undertaken by the project consortium can help to understand how the socialization facilitates knowledge creation and transfers, as well as identity development as the project evolves. As a whole, CoP theory can provide new insight in the knowledge creation in cross-border and cross-sectoral collaborations. It can provide a meaningful way to explore how the knowledge is emerged through a practice in project consortiums before, during, and after the projects.

1 INTRODUCTION

This study seeks to answer the question 'how knowledge creation in EU externally funded security Research and Innovation (R&I) projects can be understood through the concept of community of practice?' The main contribution of this paper is to provide new insight to the debate on knowledge creation in cross-sectoral and cross-border collaboration endeavours, such as those of EU R&I projects.

Knowledge is increasingly being highlighted in the literature as the key source of competitive advantage for organizations (Garavan and Carbery, 2007) or commodity (Drucker, 1993; Kenwey et al., 2006), which needs to be managed (Munro, 2005). Due to the advancements in technology and international economic integration, the activities of an organization are no longer tied up to a certain geographical location, and the ability to capture and create knowledge has become a central feature (Daft et al., 2014). In this 'network society' many of the traditional hierarchical forms of organization are breaking down, the organizations are increasingly coming to resemble networks rather than hierarchies emphasizing also the role of social relationships within and between the organizations (Castells, 1996). Consequently, the organizations have sought to employ techniques to map knowledge and control the flow of information across the organizational borders leading to increased interest towards knowledge protection (e.g. Intellectual Property Rights) and knowledge management strategies (Munro, 2005). At the same time, there is an emerging view of knowledge as an intellectual common, which is open for general use as a public good (Hardt and Negri, 2000; Polster, 2001). There are several examples of emerge of these intellectual commons, such as Free Online Universities, and EU Funded Projects. Common to these initiatives is that instead of trying to define, defend and regulate

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knowledge they seek to take the advantage of information economy and focus on knowledge management strategies that foster knowledge production and creation (Hardt and Negri, 2000). Ability to learn, and create new knowledge has become central for the productivity and effectiveness of contemporary organizations (Daft et al., 2014).

There is a number of knowledge communities where knowledge transfers and mutual learning can take place, such as knowledge networks, virtual teams or multidisciplinary project teams (Kietzman et al., 2013). In addition, the EU externally funded R&I projects have been increasingly recognized as important vehicles for cross-sectoral and multidisciplinary collaboration and knowledge exchange. All these communities can provide a meaningful way to facilitate knowledge creation by enabling individuals to share knowledge and information around a certain problem or area of interest. However, the inherent challenge of these communities is related to encouraging the knowledge exchange to take place, and codifying the knowledge creation and transfer process.

In knowledge management literature the notion of *practice* has become central (Gheradi, 2000; Newell and Galliers, 2006) in explaining how knowledge is shared and created in an organization. According to Newell and Galliers (2006) knowledge is not a resource that can simply be transferred but as emergent from recurrent interaction among people in the context of established routines and procedures or practice. The idea of learning through practice is also inherently rooted to Lave and Wenger's, concept of 'Community of Practice' highlighting that knowledge is created through active participation in communities (Lave and Wenger, 1991). In these communities relationships are built, experiences are shared, new knowledge is created, and problems are solved through social interactions between community members (Brown and Duguid, 1991, 1998, 2001; Wenger, 1998; 1999, 2000).

The EU Framework 7 and H2020 programmes contribute to solving complex societal challenges and create new innovations through funding cross-border and cross-sectoral research and innovation activities. The distinct feature of EU Funded R&I project consortiums is that they function in cross-sectoral and cross-border form. As the key purpose of the EU R&I projects is to innovate new solutions, exploring the knowledge creation practices in EU externally funded projects became paramount for better understanding the effectiveness of such endeavors to innovate new solutions. Despite the strong emphasis in striving for innovations, the knowledge creation in cross-national and cross-sectoral project consortiums has remained rather unstudied. Since EU R&I programme is the key instrument for implementing the European Innovation Union (European Commission, 2017) there is an increasing need to understand how these consortiums function, how the individuals are bind together, and what are the implications to knowledge creations and transfers as the individuals participate in the EU R&I project consortiums. Thus, the purpose of this paper is to provide further insight to these issues by borrowing from the theory of community of practice (CoP) (Lave and Wenger, 1991) to explore the knowledge creation of EU externally funded security related R&I projects. Multiple case study design was used and data was collected from four EU R&I security project consortiums. The key argument of this study is that although the EU R&I project consortiums share many of the characteristics of multidisciplinary project teams, from the knowledge creation perspective they should be viewed more as communities.

2 THEORETICAL FRAMEWORK

A growing body of literature (Boland and Tenkasi, 1995; Engeström 1999; Wenger et al 2002; Blackmore, 2010) promotes a view of socially-constructed, collective knowledge as the predominant source of learning, creativity and innovation. This social-constructivist view to knowledge creation highlights the role of social interaction as the primary mean to acquire and transfer knowledge (Jaleel and Verghis, 2015). Within knowledge creation theories two types of knowledge are usually defined; explicit and tacit knowledge (Nonaka, 1994; Brown and Duguid 1998; Cook and Davenport and Prusak, 1998; Wellman, 2009; Chung, 2015). Nonaka and Takeuchi (1995) proposed a dynamic model of knowledge creation, which is anchored on the critical assumption that human knowledge is created and expanded through a social interaction between tacit and explicit knowledge (Nonaka 1994, Nonaka and Takeuchi 1995). The alternative view to knowledge creation suggests that tacit knowledge cannot be converted into explicit knowledge, yet it can be transferred between people for example by means of mentoring and apprenticeships (Davenport and Prusak, 1998, 72). In both views the explicit

knowledge refers to codified knowledge that can be expressed in words, sentences, numbers or formulas which are context free. It may include theoretical approaches, problem solving, manuals and databases. Such knowledge is rather easy to transfer through different knowledge artefacts, such as reports and videos. Tacit knowledge is subjective and is experience based knowledge that cannot be easily expressed in words, sentences, numbers or formulas. It also includes cognitive skills such as beliefs, images, intuition and mental models as well as technical skills such as know-how and language skills. (Nonaka and Takeuchi, 1995.) Because of this, tacit knowledge is often context dependent and personal in nature. It is hard to communicate and deeply rooted in action, commitment, and involvement (Nonaka 1994). Tacit knowledge is transferred though socialization, engagement in sharing and creating knowledge through direct experience.

There is a broad agreement among scholars that knowledge creation is in the heart of an innovation. (Quintane et al. 2011; Popadiuk and Choo 2006; Lam 2006; Swan et al. 1999; Obeso and Luengo-Valderrey, 2016).Tacit knowledge is regarded as being the most valuable source of knowledge, which most likely leads to new innovations in the organization (Wellman, 2009; Obeso and Luengo-Valderrey, 2016). Consequently, Gamble and Blackwell (2001) link the lack of focus on tacit knowledge directly to the reduced capability for innovation and sustained competitiveness. Nevertheless, due to the difficulties to manage and control tacit knowledge many of the organizations are concerned with explicit knowledge or those aspects of knowledge that can be made explicit. That is portrayed in their knowledge management strategies that seek to effectively map, locate and transfer the knowledge (Munro, 2005). According to Cook and Brown (1999) rather than trying to codify and transfer the tacit knowledge into explicit, the focus should be on knowledge creation process (process of knowing) (Munro, 2005, 55). Innovation is not primarily a matter of rational problem solving, but of creating the terms in which a problem is expressed (Munro, 2005, 61). Hence, knowledge creation is not only about mapping the knowledge, but it is also a process of posing problems. Common to the different views on knowledge creation is that they highlight the importance of social interaction to capture and transfer of tacit knowledge. Consequently, to foster innovations, knowledge communities have emerged as a key domain in the realm of knowledge creation.

Theory and evidence suggest that knowledge creation and sharing are "*processes that involve often spontaneously formed groups of individuals*" (Corso et al., 2008). Among the different types of informal networks, communities of practice (CoP) seem to be the most interesting from a knowledge creation point of view. The idea of communities of practice is that learning occurs in social contexts that emerge and evolve when people who have common goals interact as they strive towards those goals (Wenger, 1998). Original research in CoPs has focused on communities in which members are collocated and face-to-face communication is the primary form of interaction (Brown and Duguid, 1991; Lave and Wenger, 1991; Wenger, 1998). However, as organizations become increasingly geographically distributed, there has been a demand on expanding the scope of the concept. Consequently, also governmental and international organizations are increasingly interested in understanding how knowledge creation can be effectively facilitated in different communities: online teams, professional groups, multilateral collaborations, and development projects. The CoPs are increasingly studied in different contexts (Laxton and Applebee, 2010; Vuorisalo, 2012, Obeso and Luengo-Valderrey, 2016).

Anthropologist Etienne Wenger can be considered as the founding father of the CoP concept, who defined the CoP as "*a group of people who share a set of activities and who interact to achieve shared objectives and to maintain their community*" (Lave and Wenger, 1991). According to Wenger (1998, 1999) CoPs enhance in sharing and transferring tacit knowledge by individuals and groups and also provide organizations with innovation as community members improve their practice through the continuous creation of knowledge. Unlike an organization, which has well-defined bureaucratic structures, a CoP is often an informal network of people who share expertise and knowledge and who develop a shared identity around a topic or set of challenges. Consequently, a CoP focuses on a specific domain and its members develop their practice by communicating the problem and discussing on the possible solutions collectively (Wenger et al. 2011).

Wenger (1998) identifies three common characteristics, which differentiate CoPs from other knowledge communities. These three characteristics are: (1) Domain, the area of interest or domain of knowledge, which defines a set of issues, creates a common ground and a sense of common identity; (2) Community, the space, where a group of people

who interact, learn together, build relationships and through this develop a sense of membership and reciprocal commitment; and (3) Practice, the shared repertory of competencies and common resources (i.e. routines, symbols and language) that members have developed and with that they can be effective in their domain. There is an increasing consensus that the best way to improve organizational learning is not to focus on capturing, codifying and documenting knowledge of individuals, but rather to concentrate on ways, through which knowledge can be shared, discussed and applied in innovations (Mittendorff et al. 2006). Hence, understanding the practices how individuals engage in such communities is central for knowledge creation to take place. According to Wenger (1998), how practice is shaped in a community and how practice shapes a community are reflected along three dimensions: (1) Mutual engagement; describes how community members interact with each other in practice; (2) Joint enterprise; embodies the shared interest of community members and the goal of the community as a whole, and symbolizes what the community is about; and (3) Shared repertoire; consists of routines, words, ways of doing things, stories, gestures, symbols, genres, actions, or concepts that the community has produced or adopted in the course of its existence, and which have become part of its practice. According to Lave and Wenger (1991) a shared repertoire reifies the history of a community's past engagement, which in turn, can help community members participate in future practice. As a whole, a community of practice involves, thus, much more than technical knowledge or skills associated with undertaking some task. Members are involved in a set of relationships over time and communities develop around things that matter to people (Wenger, 1998, Wenger et al., 2011).

In addition to practice, Wenger highlights the centrality of 'identity' for the community to unfold. He argues that the formation of member identities is embedded in practice. This means that communities develop a collective identity that becomes part of the identities of its members. Through learning, community members negotiate new practices based on past and present practice, diffusing and accumulating knowledge and reproducing and reshaping their identities. They reshape current practice to new forms, and they themselves create new identities during the process (Brown and Duguid, 1998, 2001; Lave and Wenger, 1991). Consequently, the strength of CoPs in handling knowledge can be understood through the evolution of practice and identity which result from a *''shared history of learning''* (Wenger, 1998, 86). In these ways, CoPs provide an effective environment for not only knowledge sharing, but also knowledge creation for all members (Brown and Duguid, 1998, 2001; Lave and Wenger, 1991). CoPs function as information exchange and interpretation nodes, knowledge retainers thereby offering an effective platform for transfer of tacit knowledge across the organizations boundaries (Wenger, 1998). They can provide a meaningful way to facilitate and capture the process of knowledge creation.

The studies of knowledge creation have highlighted the significant role of collaboration in creating new knowledge (Fong, 2003). Project teams and task forces are good examples of collaborations. Structure and knowledge creation in multidisciplinary project teams has been widely studied (Senge, 1990; Nonaka, 1994; Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998; McDermott, 1999; Kietzman et al., 2013; Shiko et al., 2015). According to McDermott (1999) characteristic for project teams is that they are held together by a certain task, driven by deliverables, milestones and results. In addition, a project team typically has designated members who remain unchanged throughout the project. Finally, a project team is dissolved once its mission is accomplished.

The other forms of multidisciplinary collaboration, such as the EU R&I project consortiums fulfill many of the characteristics of traditional project teams to great extent ((e.g. formal structure, task orientation, and bind with a certain timeframe) Kietzman et al., 2013), they also inherent elements that would suggest their function to differ from traditional multidisciplinary project teams. For example, EU R&I consortiums function in cross-sectoral and cross-border manner. They have been designed to encourage practitioners, governmental institutions, research agencies, non-governmental organizations and Small and Medium Sized enterprises (SMEs) to share knowledge across the organizational and national borders without a clear structure. In addition, the project consortiums are formed around a common area of interest rather than certain task or function. Finally, the individuals involved in the work of the project consortium often continue the collaboration in new forms even after the project has been accomplished (Pirinen, 2017).

As a whole, knowledge creation in EU R&I project consortiums seem to be rather unstudied. The most relevant studies related to the topic can be seen as work of Doctor Pirinen (2015, 2017). He addressed Knowledge Sources and Transfers and

Learning in EU R&D projects by studying externally funded R&D projects and their integration into higher education functions. In his works, Pirinen outlined the implication of integrated R&D projects to knowledge creation demonstrating that "*international research consortiums can be as steering forums for higher education and knowledge sharing through this challenging and integrative way*" (Pirinen, 2015, 328). Furthermore, Pirinen argues that "*the creativity and innovation related knowledge is produced in kind of knowledge-creating communities, such as research consortium and teaching community in universities and within teacher teams with participators from the working life.*" Pirinen (2017) refers to these communities as 'network-based communities' that work and learn collaboratively, and which establish a common interest, objective, dignity and commitment with a focus on knowledge objects and artefacts. These works provide a point of reference to argue that the EU R&I project consortiums rather than representing traditional project teams, should be further explored as knowledge communities which bring together individuals across organizational and national borders to share and create knowledge around the common area of interest.

3 METHODOLOGY

The data collection of this study was cumulative, and it was systematically used for a qualitative analysis between May 2015 and July 2017. The data was collected according to externally funded security related R&I projects (n = 4) at Laurea University of Applied Sciences (UAS) which were analyzed as cross-cases. The case study approach allowed the researcher to explore practices (social interactions) and community (identity artifacts) in its natural environment, thus allowing for exploring the knowledge creation in the context of EU externally funded security-research R&I projects (Gall et al., 1996).

Since the knowledge creation in international EU R&I project consortiums has not been previously studied from a CoPs perspective, exploratory case study design provided an appropriate way to generate further research questions and new information about the topic in question (Yin, 2012). An exploratory case study can be used to discover theory or identify further research questions for future study by directly observing a social phenomenon in its natural context (Yin, 2012; Corbin and Strauss, 1990).

Case study design enabled to use several data collection methods and sources. In-line with case study approach (Yin, 1994) the primary data used in this study was collected through unstructured informal conversations; documentation about the projects analyzed collected during observations and participation to the project-related events, workshops and face-to-face and online meetings (n=52); reviews of project-related documents including the management data (n=4); project output documentation, such as minutes of the meetings, reports, slideshows, and e-mail exchanges; online tracking of the project's activities such as Social media postings, discussion platforms. Characteristic for the exploratory case study approach, the data collection was taking place already before the research questions were formulated.

Qualitative content analysis across multiple cases was used to explore the practices (social interaction) and community (identity artefacts) in EU R&I project consortiums. Deductive and inductive reasoning was applied to explore how the EU R&I project consortiums could be understood through community Wenger's practice-and-identity framework of CoPs (Wenger, 1998). The framework was used to categorise rich data and inductive reasoning was applied to explore the patterns emerging from data. The data collection and analysis stages in this study were undertaken concurrently (Hartley, 1994). Development of the categories was grounded in the original data by revisiting the previous stages of analysis before proceeding further.

Yin (1994) emphasized that multiple cases strengthen the results by replicating the patterns thereby increasing the robustness and providing external validation to the findings. Within this multiple case study, data was gathered to generate findings that in principle were likely to be similar. Therefore the cases within this research generally reflect a literal logic, strengthening the findings compared to a single case study. In addition, data triangulation (as described above) was used to increase validity of the study. (Shih, 1998).

Empirical data used in this study was collected from the following four (4) cases.

Case 1: IECEU: Improving the Effectiveness of Capabilities in EU Conflict Prevention [Project ID 653371; Funded under H2020] project seeks to improve European Union conflict response capabilities Through analyzing and assessing best practices and lessons learned from European Union Common Security and Defence (CSDP) Missions the project seeks to find out how to increase the

interoperability of resources in the crisis management and peace building and what the potential for pooling and sharing of EU capabilities and technologies is. The ultimate goal of the project is to provide new solutions, approaches and recommendations for EU to guarantee long-term stability. The project falls into a category of 'Coordination and support action' and it seeks to address the societal challenge with a multidisciplinary and international consortium that embeds of nine (9) organizations representing the Governmental, non-governmental organizations, Universities and Private companies from 6 European countries. The project timeframe: 12.5.2015-31.01.2018.

Case 2: GAP: Gaming for Peace [Project ID 700670 Funded under H2020] is a project that seeks to address Societal challenge of Secure Societies-Protecting freedom and security of Europe and its citizens through identification of current gaps in training for the soft skills needed to perform successfully in multicultural EU missions, and based on the analysis to develop an innovative base curriculum and tool for delivery and further development of that base curriculum through the design and play of a multiple player online role playing game. The GAP consortium is multidisciplinary with expertise in the social sciences, computer science, end users (including militaries and police), and SMEs in game design, curriculum development and skill standardization and harmonization, and has support from stakeholders including the ESDC, UN bodies and NATO. The project falls into a category of 'Coordination and support action' and it embeds of 14 organizations from 7 European countries. The project timeframe: 2016-09-01 to 2019-02-28.

Case 3: EU_CISE_2020: European Union's Information Sharing Environment [Project ID 608385; Funded under FP7-SECURITY] draws a major space of opportunity for national and European maritime Institutions to collaboratively innovate their processes and systems, and for European enterprises to develop a new range of solutions and services competitive in the international market. The project is a Combined Collaborative Project and Coordination and Support Action and it embeds of 38 organizations from 15 European countries combining the expertise of governmental agencies, industry, research agencies and other relevant bodies among EU maritime institutions. The timeframe of EU_CISE_2020 is 01.06.2014 – 01.06.2018.

Case 4: MARISA: Maritime Integrated Surveillance Awareness [Project ID 740698; Funded under H2020] is new H2020 project, timeframe between May 2017 and September 2019. The overarching goal of this project is to provide the security communities operating at sea with a data fusion toolkit, which provides a suite of methods, techniques and software modules to correlate and fuse various heterogeneous and homogeneous data and information from different sources, including Internet and social networks, with the aim to improve information exchange, situational awareness, decision-making, reaction capabilities and resilience. The expected solution will provide mechanisms to get insights from any big data source, perform analysis of a variety of data based on geographical and spatial representation, use techniques to search for typical and new patterns that identify possible connections between events, explore predictive analysis models to represent the effect of relationships of observed object at sea. The project is an 'Innovation Action' and it embeds of 22 organizations representing 9 different European countries. The timeframe of MARISA is 01.05.2017 – 31.10.2019.

4 RESULTS

The results are presented following the Wenger's framework (domain, community, practice), as well as according to categories emerged from the data (project phases).

Domain: The domain of the four projects can clearly be identified. The common dominator within each consortium is related to the challenge it seeks to address. For example, EU CISE and MARISA are both strongly connected to maritime security domain, both seeking to address challenges related to effectiveness of information sharing and utilization among the European maritime security actors. GAP and IECEU projects are both positioned in a domain of crisis management and conflict prevention, both projects addressing the issue of conflict prevention from different perspectives. Common to all the project consortiums is that there seems to be a clear domain (area of interest) that has brought the individuals across the different organizations together to address the same societal challenge. The members of project consortiums are bound together through their interest towards the topic, rather than a formal obligation to complete a certain task.

Community: As described by Wenger (1998; 1999; 2000), identity plays a key role for community to exist. Identity itself becomes a system, which is constantly shaped by the individuals' engagement. Based on the analysis two dimensions related to identity could be identified; (1) Community Identity, and (2) Member Identities. With regards to Community Identity a few evidences point to the existence of a collective identity of the project consortiums. First, each project has created a community identity through several community artefacts, which distinguishes it from other similar projects or from the participating organizations; such as project name and logo; project website; social media account; common promotional material, and document templates. The name and logo and the associated artefacts enhanced the unique identity of the community also in relation to the participating organizations. Additionally, the individuals involved in the projects seemed also increasingly engage themselves to purely consortium-related activities although they still were involved in the other activities undertaken by their home organizations. This multi-membership (Wenger, 1998) manifested itself in engagement in different social media channels to discuss the ideas relevant to the project, organizing common social activities outside the working hours, using the project identity in their e-mail signatures, and also to produce separate business cards with the project identity.

Membership Identities became evident in all the consortiums. As members in conventional CoPs, the individual identities evolved by participating in the community's practice (Wenger, 1998). For example, the coordinators were among the most central members in the consortiums. They earned their reputations through their contributions to the community namely during the drafting of the project proposal. The empirical data also suggested that there is a clear pattern that the consortium members identified one another based on their competences and labelled those who would not meet the given deadlines, or would not possess competence to complete certain tasks. Such judgements were based on the actions of different members. Furthermore, it seems that the individuals working for the project often seized their personal and professional networks to bring new knowledge to the consortium. These external experts could also engage in the interaction, and hence also become part of the community. Often, the same individuals seemed to attend the events and engage in the conversations in social media. Although these individuals were not formally assigned to the consortium, through their engagement they become important knowledge resources and recognized participants of the community. The third pattern that was identified was when an individual from one organization was no longer officially involved in a project. Nevertheless, different than in traditional project teams (Kietzman et al., 2013), these individuals still seemed to hold a role in a consortium. They were perceived to be part of the community although they were no longer bound to it through their work.

Practice: As suggested by Wegner (1998) the community practices has three distinct features; (1) Engagement, (2) Joint enterprise, and (3) Shared repertoires. The patterns related to engagement in the community were explored based on different phases of the project, which emerged from the analysis; (1) during initial scoping of the project; (2) during the development of the project proposal, (3) after the funding was admitted, and (4) during the execution of the project. As the cases analyzed represent four different form and type of consortiums, each of them inherent unique patterns of engagement, which may not exist in other projects. Nevertheless, a number of commonalities across the cases can be identified.

With regards to the initial scoping of the project, the data suggests that engagement in the community has started already before the initial scoping of the project has begun. A common motivation behind the engagement seemed to be that an individual or group of individuals interested in a certain domain, or working in a certain domain, had a need to look for external resources to reach these aspirations. Based on the data, at this phase four distinct engagement patterns could be identified; (1) a single organization has drafted a concept and searches for potential partners relevant to the domain through their own networks; (2) a single organization is willing to join a project consortium and searchers a potential consortium through its networks or official sites such as EU Participant Portal or networking events; (3) two or more organizations are/have worked together in a project consortium and are willing to continue the work in a new project relevant to their domain or to the previous projects they have worked jointly; and (4) a certain individual or organization is directly contacted based on a proposal of a previously known partner. In this first stage, the communication took mainly place through information technology (IT), such as e-mail, LinkedIn, Facebook or Skype.

Once the consortiums were formed, in the next phase, the engagement related mainly to the project proposal writing process. At this stage, the focus

was on information and knowledge sharing, as well as on review and provision of feedback to the written outputs. The communication took mainly place via digital means, and online meetings were often used to build an understanding of the purpose and methods used in the project. The contributions to the knowledge creation in proposal development seemed to take place mainly in a form of writing.

The third phase seemed to be the defining moment for the project consortium. Once the funding decision came, the level of engagement to the consortium activities increased rapidly. Information sharing seemed to become a central purpose for the interaction at this stage. The consortium members were requesting information namely from the coordinator to better understand their roles and responsibilities in the project. The information sharing took mainly place via e-mails and online meetings. Additionally, relationship building seemed to become increasingly central purpose of the socializing. It seems that the interaction within the consortium shifted towards more targeted partnerships - individuals seeking opportunities to get to know each another also at personal level. In all the cases, the whole consortium met for the first time face-to-face during the 'Kick-off meeting' which is organized within the first month the project is launched. Although, most of the interaction within the consortium takes place through IT, the face-to-face meeting at the beginning of the project seems to play a central role for the further relationship building to emerge.

At the project execution phase, the knowledge sharing takes mainly place through collaborative working area and database (e.g. eDuuni, Google Drive). Furthermore, in all the case projects the involvement of practioners in 'testing' and 'validating' the project results is central for the project outcome, and thus is emphasized. Therefore, the consortiums sought ways to invite external members to engage in the consortium activities and to capture their perspectives and knowledge to support the mutual learning. Workshops, seminars, online groups, and working groups were used as primary tools to capture the end-user perspectives. Furthermore, also in the execution phase the face-to-face meetings seem to play important role in relationship and trust- building among the consortium members. Namely among the governmental officials there seems to be some reluctance to share knowledge to other consortium partners and the personal relationships build among the consortium members during the events seem to help mitigate the barriers related to information and knowledge sharing. Moreover, at the project execution stage, the focus of the engagement is also on capturing and storing knowledge. In most consortiums, the explicit knowledge is captured in form of reports, documents, videos and recordings, stored in a common database or a collaborative working area. The knowledge is also captured in a form of blogs, slideshows, reports, visiting speakers, e-Learning tools, which are made available to externals. 'How-to-guides' are developed in order to capture some of the practices of the consortium and to enhance the coherence of the knowledge artefacts, such as reports and presentations, produced during the project. Table 1. summarizes the key engagement patterns emerging after the project consortiums were formed.

Table 1: Engagement patterns at different stages of the project.

Project proposal development	Funding decision	Project execution
1. Information and knowledge sharing; 2. Commenting and provision of feedback.	1. Overall consortium management; 2.Relationship building; 3. Information sharing.	1. Overall consortium management; 2. Relationship building; 3. Knowledge sharing and learning; 4. Knowledge capture and storage.

Joint enterprise: Based on the analysis the negotiation towards joint enterprise could be seen to take place during project proposal writing process. During the scoping of the project, the consortiums did not seem to have a clear joint enterprise: there was no formal agreement in place binding the individuals together; the individuals may have never met each other; and the purpose of the project was still unclear. Consequently, the topic of the funding call and the contributions from the coordinator seemed to be the key 'tools' to bind the partners together. The outcome of this process, and the purpose (joint enterprise) and goals of the project (and the consortium) were then formally verbalized in the Grant Agreement. Nevertheless, the negotiation over the joint enterprise seems to also be an ongoing process in the project consortiums. As the project implementation evolved, there is a tendency for the community to expand, and reassess its core purpose. This is evidenced in the ways the consortium communicates and disseminate the

project results at different phases of the project. Many of these activities have been outlined already in the Grant Agreement (dissemination, exploitation and communication strategy), yet many of the activities are innovated as the project unfolds. In addition, the consortium itself embeds innovation potential which was unforeseen when the project plan was created. A common pattern seems to be that the real exploitation potentials unfold as work of the consortium proceeds. These seem also to be the moments when the joint enterprise is most actively negotiated. The consortium partners seem to actively seek new ways to exploit and disseminate the project results and knowledge. They may search for new R&I project funding to leverage the knowledge created during the project, and seek to integrate the knowledge to existing and new education and training programs (Pirinen, 2015).

Shared repertoires: The empirical evidence suggests that over the time, the project consortiums developed a rich shared repertoire. All the individual project consortiums developed their unique routines (e.g. meeting protocol), gestures (language used in social interaction) and stories (based on shared experiences during the project-related events, and individuals). Nevertheless, the common pattern that can be identified across all the case consortiums was related to language. The transformation related to adaptation of common terminology was significant. At the beginning, different organizations representing different professional fields and organizations would face numerous challenges in understanding what was meant either by domain related terms such as 'capability', 'conflict prevention', 'data fusion', 'co-creation', or by EU R&I project related terms such as 'Grant Agreement' or 'participant portal. Nevertheless, by the time the project implementation was to take place, it seemed that the consortium members adopted both; EU R&I project related terms and acronyms (WP, DL, PO, dissemination) and project-related terms (IECEU, MARISA, SOTA, CPPB, user-community, soft skills) and where actively using them in their communications.

5 DISCUSSION

The study demonstrated that EU Funded R&I projects represent a unique form of a knowledge community. Such projects have brought together an array of organizations and professionals which are not usually seen working together. They have also enabled organizations and professionals to enter completely new domains while expanding their social networks, and learning new practices.

The knowledge created in EU R&I projects is treated majorly as intellectual common. The European Commission has an aspiration to maximize the impact of the different projects by emphasizing the exploitation and dissemination of the project results. Consequently, rather than just creating a new product, process or service, the consortiums are to engage end-users, policy-makers and other professionals to the knowledge creation and exploitation activities. As a result, the project consortiums do not only engage in task-related project activities, yet they are expected to engage the externals to knowledge creation, and to transfer this knowledge to wider audience. Furthermore, the knowledge created in one project should be transferred across the other consortiums. The study suggested that despite the efforts to connect the past and existing R&I project consortiums together, more measures should be taken to extract the tacit knowledge created project consortiums for broader audience.

According to Wenger's characterization of CoPs (Wenger, 1998), results of this study clearly suggests that CoP can provide a meaningful way to capture knowledge creation in EU R&I project consortiums. As suggested by Wenger's model, one key aspect of the CoPs is to describe how the community functions; the forms of mutual engagement, routines and purpose, which bind members together into a common social entity. Members of a community of practice are practitioners of that community: they develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems –in short, a shared practice. The partners of the four project consortiums were brought together based on their interest towards a common domain. Although, the individuals and organizations originally operated in separate domains or represented different disciplines, there was a common interest towards the topic – either personal or based on profession – which brought the organizations to form a joint enterprise. Furthermore, just as in conventional CoPs, community identity and individual member identities were developed during and through the engagement in the project consortium. Individual identities reflecting members' unique characteristics embedded with their professional background (coordinator, researcher, police, lawyer, and engineer) and competence demonstrated in their actions (good public speaker, good writer, task orientated, and socializer). Collectively members

also created a community identity, as the different projects were widely recognized by their name in the different professional communities and networks. However, some challenges occurred when a person known to the consortium was replaced by a new one. The identity is not only technical 'identity artefacts' but rather about the routines, language, actions that are embedded in the interaction within the community. Transferring this tacit knowledge to the new person seemed to require active socialization and mentoring. The study also demonstrated that EU projects represent a domain in their own right and to access such project consortiums require pre-knowledge of the domain (professionals working in a certain domain), personal connections, or personal motivation to enter a certain domain. When the organization is not seen as a natural partner in a certain domain, the role of individuals becomes central for gaining the access. As described by Wenger (1998) the strength of the CoP is that due to their informal nature, the participation to the communities is not limited by the traditional organization boundaries, but it is determined by the individuals' interaction (doing) in them. Consequently, for example, the organizations that had not previously been working in the field of Maritime security or crisis management could participate in R&I projects that sought to innovate solutions to related issues. The results of the study also suggest that namely in the security domain, there already exists communities working around certain challenges and topics, yet finding or accessing these communities without previous participation is challenging. However, once an individual or organization gain practice from a certain professional field through engagement in work of a project consortium, they also seem to be increasingly identified through the projects rather than their home organization. The data suggests that once participated in EU security related project 'legitimizes' the organization to enter the community of practioners, as well as become an important vehicle for such a community. Social scientists could became maritime security trainers, and coastal guards become co-creation experts. Cross-sectoral nature of EU R&I projects seem to be their defining character, facilitating also development of multiple identities (Wenger, 1998).

The engagement in consortium activities is central to relationship building and knowledge sharing among the consortium members. Although, the common interaction practice seems to be coined around e-mail exchanges and using collaborative working platforms, participation to face-to-face meetings seem to be crucial for relationship and trust-building and further information and knowledge sharing among the consortium partners. It seems that the technical tasks (study reports, software, tools) as agreed and outlined in Grant Agreement could be also delivered without strong personal ties or sense of joint enterprise. Nevertheless, the 'doing' and contributing and socializing seem to be the defining features that facilitate the knowledge creation in EU R&I project consortium. Willingness to share information and knowledge among the consortium members seems to be related to the participation in the community events, as well as to personal relationships and trust among the partners.

As a whole, the results of this study demonstrated, that CoP theory can provide new insight in the functioning and knowledge creation of cross-border and cross-sectoral collaborations. It provides a meaningful way to explore how the knowledge is emerged through a practice of consortiums before, during and after the projects. Contrary to traditional project teams - temporary social systems - in which knowledge is created only during the outset of the formal organization, the CoP approach demonstrates that the EU R&I consortium is a knowledge community and domain of its own, which is not formed only to accomplish a certain task. Participation to EU R&I projects may enable consortium members to access new professional communities, which can lead to continuity of work within the similar issues and with the same partners. This may facilitate knowledge sharing across the different EU R&I projects leading to further knowledge creation and innovations to take place. Furthermore, due to their rather informal structure, the EU R&I projects can be effective platforms to facilitate knowledge creation for the purpose of national governmental agencies. Such projects, as understood from CoPs framework, enable the interested individuals from different organizations to share information, and more importantly, tacit knowledge through regular interactions.

Limitations of this study need to be borne in mind. As the data collection applied ethnographic methods including observation, participation and informal conversations, the subjectivity of the researcher needs to borne in mind before building further generalizations of the study results. The study is also limited in its temporal frame, as it does not address ways that practice and identity emerge after the projects have been completed. Despite its limitations, the study demonstrated that community of practice framework can be used to further study

knowledge creation in cross-border and cross-sectoral collaborations such as EU R&I project consortiums.

The future research should study further how the elements, such as multidisciplinary, multinationalism and multi-location, impact on the functioning of the EU externally funded R&I project consortiums. One issue regarding the knowledge sharing within EU R&I project consortiums seemed to be related to the fact that the consortium members met seldom face-to-face. The issues inherent to online-based knowledge sharing is related to trust-building among the members and ability to maintain the motivation to engage in the community activities. More research should be made to investigate the practices that enable and limit the participation to multi-located knowledge communities. This could also provide important insight on the potential barriers and enablers to knowledge creation in such social systems. In addition, another interesting point of research would be to study, how the community or network of separate EU project consortiums evolve and change over time, and how the knowledge created in one project is exploited in the subsequent projects operating in the same domain. To ensure, that the knowledge embedded in individuals participating in such consortiums is not lost, it would be beneficial to develop, capture, and transfer good practices on specific topics also across the different project consortiums. These findings would enable to design better tools to facilitate synergies between different project consortiums, as well as develop appropriate knowledge management strategies to capture the tacit knowledge embed in project consortiums.

6 CONCLUSIONS

This paper presents a rich description of how EU externally funded security-related R&I projects can be understood through the notions of 'community' and 'practice'. As an exploratory multi-case study, the purpose of the study was to contribute to the debate on rather unstudied field and pave the way for further research. Whereas studies in knowledge creation in multidisciplinary project teams have failed to address the issue of forming cross-border and cross-national project consortiums, and knowledge transfers among such projects, the CoPs framework can help address these gaps. Consequently, this paper has made contribution to knowledge creation by expanding the utilization of CoPs framework to explore the knowledge creation

in cross-border and cross-sectoral collaborations, such as international project consortiums. Consequently this study has added to existing debate and methodology on knowledge creation practices. Finally, the study has provided valuable insight to the previously rather unstudied field paving the way for the further research related to the learning and knowledge creation in EU funded R&I projects.

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