SETTING UP COMMUNITIES OF INTEREST FOR THE ITS INDUSTRY

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Abstract: The concept of Communities of Interest (CoI) is used in a variety of landscapes to describe an agglomeration of entities that can be of any type of organizations or people that are concerned with the exchange of information in some subject area or that share a common goal or environment. In the landscape of Intelligent Transport Systems (ITS), important actors include enterprises, academia, policy makers, associations, consultancies, and, of course, the public as end users. The paper presents an approach for setting up CoI in the ITS field. These can be structured around specific cases, which can act as examples of good practice and bases for gathering relevant stakeholders. In this paper, four cases of CoI, focused on particular sub-fields or activities such as traffic management, water-based transport of goods and railway safety, are examined. The creation of these Communities, according to the proposed approach, should follow a structured process with clearly defined incentives and processes for ensuring their goals. The proposed approach advocates the functioning of CoI in two or three different tiers, from an "internal" one that includes only the CoI organizers and administrators to an "external" one that is open to the general public. Certain paradigms of this approach based on "NEWBITS", EC-H2020 funded project, are provided in the paper. As a critical component for the efficient functioning of the CoIs a web-based platform is proposed, on which the interactions between the members of a CoI and their engagement to new initiatives and projects can be organized, motivated, supported and monitored. The key role of CoI is to support a more intensive and productive interaction between ITS stakeholders, which in turn can facilitate and accelerate the application of ITS solutions in practice and advance the field forward.

Keywords: communities of interest; intelligent transport systems; processes; online platform; innovation; smart solutions.

1. Introduction

The concept of Communities of Interests (CoI) has been used in a variety of different environments and settings (Aiello et al., 2005; McDaniel et al., 2006). One of the identified definitions of a Community of Interest (CoI) is an agglomeration of people -or actors in general, such as organizations- that are concerned with the exchange of information in some subject area (Renner, 2001, p.4) or that share a common goal or environment (Aiello et al., 2005).
Using the above definition, it seems that the CoI is a broad concept that can be used for any group of actors, organizations or stakeholders operating within a given field and/or environment that exchange information and strive towards a common goal. CoI however, should not be confused with other structures, such as networks. Communities and networks can be viewed as two different aspects of social structuring which, as a result, require different forms of developmental work. In a "network", which is viewed as a set of nodes and links, identifying information flows and helpful linkages, the emphasis lies on the personal interactions and connections among participants. On the other hand, the concept of "community" places greater emphasis on the development of a shared identity around a topic that represents a collective intention (Wenger, Trayner & de Laat, 2011).
In practice, communities and networks are often difficult to differentiate. Very few groups have one of the above aspects so clearly pronounced that can be easily identified as "pure" communities or "pure" networks. For most groups, the two aspects are combined in various ways. A community usually involves a network of relationships, while many networks exist because participants are all committed to some kind of joint goal or venture (Wenger, Trayner & de Laat, 2011). Communities and networks produce social capital, the networks and connections among people, which complements "traditional" resources such as physical and human capital, in order to produce better outcomes for innovation and growth (Akcomak & Ter Weel, 2009). Communities also allow the exploration and support of interaction between actors, which enhances collaborative practice (Davis & Mason-Jones, 2017).
It follows that in the field of ITS, CoI can consist of stakeholders that are working -or at least communicating- with each other while striving towards the common goal of developing and establishing an intelligent transport system or promoting an innovative service / solution into market (Angelidou et al., 2015). Therefore, joining together an assortment of ITS actors and stakeholders into a CoI, that makes them operate one with other, can be an important step towards enhancing ITS and moving from ITS to Collaborative ITS, and the benefits that they entail (Piorkowski, 2010).

2. The Profile of the ITS Industry

2.1. General Information on ITS, Market Value, etc.

The ITS domain covers all modes of transport and considers all elements, i.e. the vehicles, the infrastructure, the drivers and users, all interacting together dynamically (ITS Handbook, 2011). More specifically, ITS cover travel information services, transport management systems, a broad range of mobility services (e.g. smart travel cards, integrated ticketing services), vehicle control and safety systems (e.g. anti-collision warning and control systems) and transportation pricing systems (e.g. electronic toll collection, variable parking fees) (Optimism Project, 2011).

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Cooperative ITS (C-ITS) is a subcategory of ITS that has been defined by the European Committee for Standardization (CEN) and European Telecommunications Standards Institute (ETSI) as: "A subset of the overall ITS that communicates and shares information between ITS stations to give advice or facilitate actions with the objective of improving safety, sustainability, efficiency and comfort beyond the scope of stand-alone systems" (NEWBITS Deliverable 2.1 Overview of ITS initiatives in the EU and US).
In other words, C-ITS comprises communication between vehicles (V2V), between vehicles and infrastructure (V2I), infrastructure to vehicle (I2V) and/or between vehicles and other transport participants (V2X), such as pedestrians and cyclists.
Regarding the market areas, in two recent studies (ITS Market Analysis, 2016; ITS Market Insight, 2016), ITS market is segmented by a) component, b) type, and c) application. The component segment relates to market characterisation by technology, comprising surveillance camera, interface board, monitoring & detecting system, telecommunication network, software and others.
The second classification segments the market into five (5) types: Advanced Traveler Information System (ATIS); Advanced Traffic Management System (ATMS); Advanced Transportation Pricing System (ATPS); Advanced Public Transportation System (APTS); and Cooperative Vehicle System (CVS).
The third ITS segment is divided into eight application categories, namely: Traffic management; Road safety and security; Freight management; Public transport; Environment protection; Automotive telematics; Parking management and Road user charging.
According to a report by Global Industry Analysis of April 2014, the global ITS market will reach $26.3 billion by 2010, driven by continued rise in vehicular traffic and the need to regulate traffic flow, enhance road safety, and escalate awareness of the socioenvironmental implications of traffic congestion. From a geographical point of view, it is estimated that Asia-Pacific is foreseen to dominate the ITS market in the forecast period of 2016 – 2022 (Market.biz).

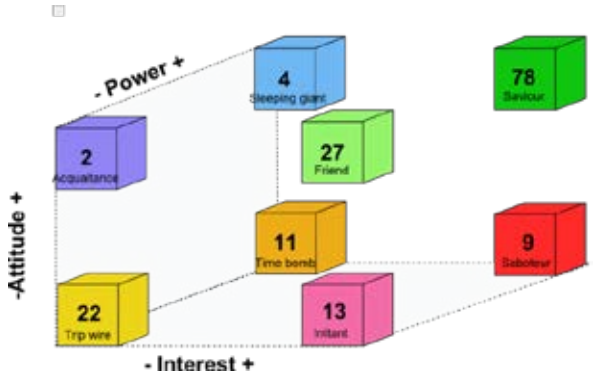

Fig. 1.
Categorisation of stakeholder by interest, power and attitude.
Source: NEWBITS Project (2018), D6.1 CoI Configuration Synthesis Report

2.2. Important Actors

The NEWBITS Project mapped ITS stakeholders, which was not necessarily based on stratified sampling, as the primary factor was ease of accessibility, but it still yields interesting results concerning some features of the ITS industry. The mapping identified 166 stakeholders from 150 unique organisations, which in turn are professionally associated with 4,006 global entities.
The first component included stakeholders interest-power-attitude mapping which, has been performed according to the methodology proposed by Murray-Webster and Simon (2006). This creates a three-dimensional grid based on three characteristics which are important to know when initially considering stakeholders: Power (potential or actual influence), Interest (in the project or program) and Attitude (to the project or program). The grid produces eight different labels based on the position of stakeholders along the dimensions.
The relatively high number of stakeholders (78 or 52% of the total) that have high power, attitude and interest for the project can be considered extremely positive and very hopeful for the functioning of the CoI, as is the fact that a very low number (9 or 6% of the total) have high power and interest combined with low attitude and can be listed as saboteurs.
In short, the vast majority of the mapped stakeholder (90%) were based in the EU, and mainly in Spain, Greece, the UK and the Netherlands. Roughly one third of the stakeholders came from the field of academia, another from the field of industry, while the rest were mostly ITS associations and policy makers. Nearly half of the stakeholders specialised in all or potentially all ITS market segments, while out of those who specialised in a particular segment, advanced traffic management systems (ATMS) was the most common one. Finally, regarding stakeholders' target market, 42% mainly targets the public market, 31% the private market and 14% focuses on B2B.

Table 1
Identified top ten important entities through number of connections

Label	Number of connections
ITS America	159
International Road Transport Union (IRU)	135
Connekt / ITS Netherlands	126
ISINNOVA	112
Dpt of Mechanical Engineering, Univ. of Western Macedonia	102
Shenzhen Huaru Technology Co., Ltd.	101
ITS Taiwan	88
ITS Finland	82
ITS Spain	78
TREDIT S.A.	70

Source: NEWBITS Project (2018), D6.1 CoI Configuration Synthesis Report

After the creation of the list of the 6,951 connections, a social network analysis tool was used, to identify key components about the network. Social network analysis (SNA) is a powerful way to organize a connected world. Network analysis revealed insights into the ways that the identified entities connect with one another and form groups. The graph presented in Figure 2 has been constructed using force-directed placement according to Fruchterman- Reingo algorithm. Using the SNA tool, we could focus and analyse specific nodes to understand how each node is connected and its importance to the global ITS landscape.

Fig. 2.
Fruchterman- Reingo Network Map
Source: NEWBITS Project (2018), D6.1 CoI Configuration Synthesis Report

3. A Novel Approach for setting up ITS Communities of Interest

Strategy-consulting businesses rely extensively on consultants' tacit knowledge to solve clients' problems and often invest on building strong knowledge networks or communities of interest to develop people-to-people connections (Venkitachalama & Willmottba, 2017). However, while there are plenty of references in the literature about the form, features and functioning of CoIs (Briard & Carter, 2013; Fischer, 2001) there seem to be no specialized defined frameworks for setting up such CoI. Perhaps it is assumed that setting them up is a straightforward process that needs no special definition, or that they come together naturally in the context of particular projects and initiatives. The experience of several experts involved in the NEWBITS project, however, suggests that the success and active functioning of CoI is not guaranteed.

3.1. The Proposed Novel Approach

The proposed novel approach includes the following four steps presented in Figure 3.

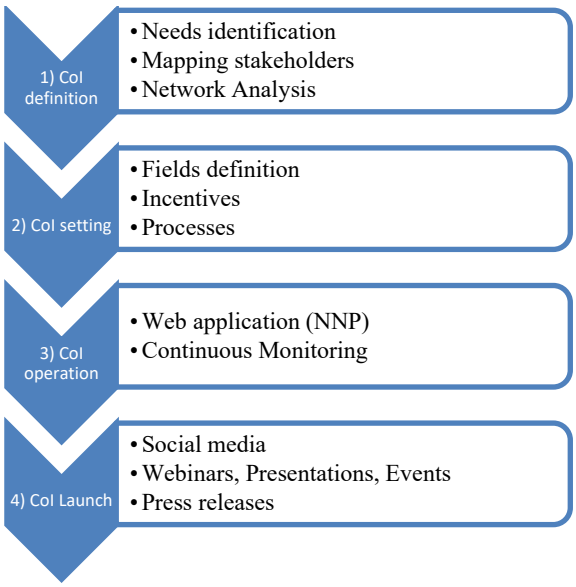

Fig. 3.
A novel approach for setting up CoI
Source: NEWBITS Project (2018), D6.1 CoI Configuration Synthesis Report

To configure the proposed CoI effectively, first it should be justified why potential members would participate in the CoI. The reasoning of such an action is considered a quite complicate multi variable process. The participation in any Community of Interest has both tangible and intangible benefits. CoI are considered as one form of socialization for serving specific scopes. There are different forms of associations or groups of interests that attempt to fulfil similar scopes as the proposed four, NEWBITS, CoI.
The members of CoI can get insight from leading actors such as industry associations and other stakeholders on issues related to the (C) - ITS field regarding the four case studies. The case studies, target key priority areas applicable to ITS and C-ITS across Europe. Initiatives on ITS and C-ITS in Europe and elsewhere, demonstrating best practices from different points of view and how to implement similar in a variety of circumstances, will be also included. The content created by the project's consortium members during the development of the NEWBITS project will be available for discussion among the CoI members. The interaction with other members featuring companies and associations is one of the key benefits. These interactions are the realization of the networking opportunities between the members of the CoI.
The foreseen benefits for the potential members will be further elaborated, though according to initial feedback from the consortium: i) raising the awareness on the state of the art on the fields of (C-) ICT; and ii) the development of common initiatives (Projects EC funded, national and private) are considered important. Potential match making of suppliers and customers of the C-ITS solutions / services and the potential opportunities to implement crowdfunding campaigns look promising.
The operation of communities requires time and effort from their members, so members need motivation in order to contribute effectively (Abouzahra & Tan, 2014). The issue of potential incentives that can be used to motivate stakeholders and actors into joining the different tiers of membership has been pointed out between the NEWBITS partners. What follows is the result of a brief study on potential incentives that are used in forming CoIs.
Incentives that can be used to motivate actors into joining the CoI can be divided into categories, such as practical, financial, social and emotional. Financial incentives are usually a main driver. However, direct financial incentives obviously require the availability of funding for this purpose, which is not always available. The literature shows that incorporating economic incentives can even be counterproductive (Camerer & Hogarth, 1999), or that economic incentives have a tendency to increase quantity but not quality (Mason & Watts, 2009). When considering financial incentives, it is also possible to open up the focus and include not only tangible but with intangible incentives, such as the access to future benefits or access to funding sources, as it is usually found in start-up accelerators' environments. The consideration of potential incentives should not ignore the sociological and psychological aspects stemming from these approaches, which are vital as means for the self-organisation of such communities and are often missing from peer-to-peer systems (Antoniadis & Le Grand, 2007).
Each of the four CoI includes three tiers. Each tier is defined by its scope, members and visibility to public. Tier 1 is comprised of the project partners and the organisations directly involved with the project, aiming to internally support the NEWBITS work packages. Tier 2 has the role of an advanced group of ITS experts. Tier 3 is essentially open to all and has the role of promoting ITS and ITS-related initiatives and collaborations. The following diagram (Figure 4) presents the structure of the web platform that was created to support the above four CoIs and their three Tiers.

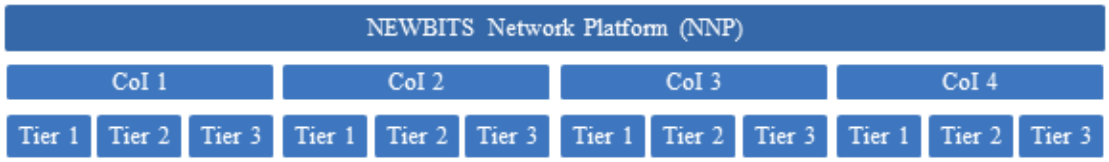

Fig. 4.
NNP to support four Communities of Interest and three tiers per CoI
Source: NEWBITS Project (2018), D6.1 CoI Configuration Synthesis Report

Nowadays, the development of digital platforms and online applications is expanding radically, affecting significantly human activities at all levels, from policy making and governance, to socioeconomic models of production (Kakderi, Psaltoglou and Fellnhofer, 2018). Collaboration platforms, as the proposed NNP, support collective participation in the innovation process, to boost network effects, and enhance the collaboration and creation of bottom-up innovative solutions to complex problems by their members.

3.2. Examples of this From the NEWBITS Project

The NEWBITS project, exploring new business models for ITS, featured the creation of four different CoI, each structured around a particular sub-field of ITS, and each based on one of the project's case studies. Each initial case study, along with the small group of actors directly involved in it, formed the nucleus of each CoI. Other actors and stakeholders that are active in each particular sub-field were subsequently drawn or invited into the CoI. The four communities are presented in more detail below:

CoI 1: Sustainable Intercity Mobility; Intelligent carpooling services for city communities
It regards a CoI built around intelligent carpooling and car-sharing services made possible by advanced C-ITS platforms that provide state of the art capabilities, such as coordinating different route planners and providing real-time routing advice. The scope is to improve traffic flows, reduce emissions and increase urban road transport efficiency. End users also benefit from lower cost. This CoI aims to involve all relevant stakeholders' groups identified in the related case study: city authorities, transport authorities, Academia, ITS service providers, funding bodies, ITS associations, social media, marketing companies and end users (consumers of the ITS service).

CoI 2: Efficient Traffic Management Systems; An energy efficient service for city intersections
This CoI is structured around the installation and use of intelligent traffic management control systems that provide adaptive traffic control strategies, such as the installation of bi-directional communication system between traffic lights and vehicles, which instruct drivers on how to move efficiently in order to expend less time and energy in intersections. The scope is to improve the flow of traffic and reduce delays and carbon emissions. The CoI will involve the following stakeholders' groups: cities, automotive suppliers, Original Equipment Manufacturers, transport operators, end users, ICT service providers.
The main incentive of the CoI is the identification of new business opportunities on collaborative intelligent transport systems.

CoI 3: Synchro-modal solutions for goods transport on water; Using real-time data to decrease idle time and increase efficiency of hinterland transport
This CoI is built around water transport with efficiency-maximizing solutions using synchromodality, which refers to the possibility of choosing the most optimal transport modality at transhipment points. This is achieved by collecting and transmitting real-time data on container transport, from ship tracking, container handling at port, inland ship and truck transport and handling of the containers at the inland terminal and eventually at the warehouse. The scope is to achieve better planning and shorter transport times by better insight into the logistics chain and the resulting decrease of idle time.
The main stakeholders of this CoI are parties in the supply chain of container transport: shippers, terminal operators, warehouse operators, research organisations, ITS and ICT service providers, Governmental and funding agencies, Port Authority.
The core incentive for joining the CoI is the improvement of the collaborative decision-making process across the various stakeholders.

CoI 4: Railway customer satisfaction and safety; Predictive maintenance for cost reduction and safety in railway operation
It concerns a CoI being built around predictive maintenance for railway networks, identifying and reporting potential issues requiring repair before damages and delays appear. The scope is to improve service efficiency and increase passenger safety. The main stakeholders in this CoI are organisations within the Railway Industry: train manufacturers, Railway infrastructure owners, train operators, service delivery organisations, Railway Regulatory bodies, Railway industry organisations, research organisations. The main incentive for this specific CoI is to foster a fully integrated business network modelling approach to railway industry.
The core functions and tools to support the four CoI through the NNP are the following: Set of tools to support NEWBITS implementation; a Content Management System (CMS); a networking space; a showcase of ITS and C-ITS applications and a Crowdsourcing / Crowdfunding function.

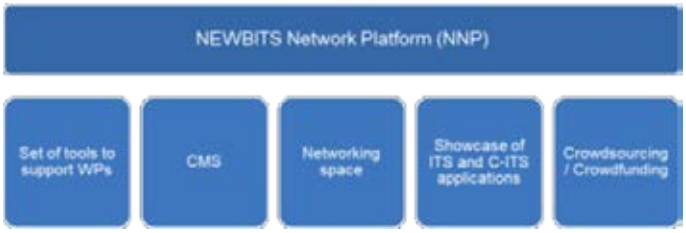

Fig. 5.
NEWBITS Network Platform NNP Core Functions
Source: NEWBITS Project (2018), D6.2 Definition of NNP

4. Conclusions

4.1. What the Novel Approach Offers

The proposed methodology is considered novel since it addresses the design and implementation of a CoI in a holistic aspect, taking into consideration from the very beginning the needs of its multi variable stakeholders. As it has been presented, the usual process of implementing a CoI was to identify a specific issue and, following that, to identify its potential members. In the described process, the key members of the CoI have been the ones who are gathered initially, and the CoI has been based upon their know- how and needs in terms of collaboration, in order to address key related issues.
CoI should be supported by online applications in the current networked business ecosystems. One of the success factors of innovative business models is the connection of the companies with each other, as well as with other important actors including the public authorities, to address common challenges in fast, resource-efficient and innovative ways. Online applications, such as the one being developed during the implementation of the NEWBITS project, aim to gather a large number of members, independently of their place of origin, to pursue specific goals and address common issues.

4.2. Further Research

The design and implementation of a CoI is a very challenging and multi-disciplinary issue. It does not only include technical issues for the implementation of the supporting platform but also human capital management issues and social capital ones. To construct CoI and make them successfully operational, initiatives should encourage people to be part of them and motivate them to be “active” as members. There are different theories on how tangible and intangible incentives are working in specific areas, which can be further examined.
In the latest years the emergence of cloud computing paradigm, has increased interest on the adoption of cloud computing from municipalities and city governments towards their effort to address complex urban problems. The analysis of the “STORM CLOUDS” paradigm as a solution for municipalities everywhere in order to (i) deploy a portfolio of smart cities applications related to governance, economy and quality of life on a single cloud-based platform and (ii) use the platform and its accompanied tools to migrate their existing applications to the cloud environment (Kakderi, Komninos and Tsarchopoulos, 2016) can be utilised as a basis to examine the opportunities and threats of migrating the NNP platform, ITS and C-ITS applications to the cloud to support new challenges.
Another issue that can be theoretically examined and justified is how the attitude of CoI members is changing while being part of community as an individual or as part of a company. As part of a company, the CoI member carries norms, values and regulations of the company, while as an individual member, such restrictions do not apply.
Humans are very social. One of the characteristics that we as humans distinguish from other life forms is that we effectively exchange information. Communities of Interest cover both our social aspect and the effective exchange of information, enhancing social capital, which, after all, is the mediating mechanism which transforms innovation to economic growth (Akcomak & Ter Weel, 2009). Communities of Interest cover both our social aspect and the effective exchange of information.

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