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BLE2017-2230

Resource Integration in the IoT Era: Focus on Smart Community

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This paper should be cited as follows:

Care, S. and Colurcio, M. (2016). **"Resource Integration in the IoT Era: Focus on Smart Community"** Athens: ATINER'S Conference Paper Series, No: **BLE2017-2230.**

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8 Valaoritou Street, Kolonaki, 10671 Athens, Greece
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URL Conference Papers Series: www.atiner.gr/papers.htm

ISSN: 2241-2891
13/07/2017

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Abstract

The IoT is transforming both the social and the business ecosystem leading to a more "connected life". From the social point of view the IoT enables a smart life as it allows people to manage different activities – sport, health care, banking, education, housing, movement, entertainment, etc..- through their smartphones or notebook and providing advantages in terms of time and everyday life simplifying. From the business point of view, the IoT offers a lot of opportunity to manage the "big challenge"; it affects all kinds of industries as by collecting data from various connected sources, combining them with data from other sources and using big data analytics, decisions and actions -that can have important implications for firms, can be taken and made. The paper aims to build a theoretical framework about the fundamentals of value co-creation in a specific IoT context: the smart community, that is a community where citizens and organizations distribute the information and develop innovative partnerships. The theoretical focus is on resource integration as fundamental of value co-creation. The paper is basically conceptual but provides empirical evidences about the emergent motivations, behaviours, and practices of smart communities through the analysis of 11 case studies. We argue that IoT offers opportunities for the development of new competitive business as well as for the societal wellbeing. The paper contributes to the theoretical debate on resource integration advancing knowledge about the way through which resources are integrated in practice; it frames the topic of the IoT in a marketing perspective adding new and fresh insights about a theme uncharted in marketing literature so far.

Keywords: Internet of Thing (IoT), Smart Community, Resource integration, value co-creation.

Introduction

The Internet of Things (IoT) is a current topic in technological and cybernetic field as well as in the application practice; it refers to networked everyday objects that- due to the digital sensors equipment interconnect to each other (Li et al., 2011) and can became active participant in business processes (Haller et al., 2013).

The Internet of Things has a transformative power as – concerning the collection and the combination of data from different and interconnected sources – it affects all kinds of industries and may impact decisions and actions of the firms (Michel, 2014). Indeed, companies are transforming themselves to extract value from traditional industrial sectors by delivering digital, data-rich service (Colurcio and Verre, 2017). Already a couple of years ago influential companies predicted the IoT would boost global corporate profits by twenty-one percent and a market around $19 trillion dollars (Kharif, 2014).

Recent management studies (Leminen et al., 2012) emphasized the ecosystem approach stressing that the core IoT elements include the concept of "the ecosystem" and "the business model" as platforms, technologies and processes form the ecosystem core whereas the members of the ecosystem (companies, public institutions and individuals) create business models.

This stretched concept of the IoT highlights the role of collaboration and networking between individuals and institutions (Edvardsson et al., 2014; Koskela-Houtari et al., 2016; Colurcio and Verre, 2017).

According to the marketing perspective of Service-Dominant logic (SDL) (Vargo and Lusch, 2008) the resource integration (Kleinaltenkamp et al. 2012, Colurcio et al., 2014; Mele et al., 2014) is the main process to create value. All the actors are resource integrators (Vargo and Lusch 2008, 2009) and the main condition for triggering the value co-creation process depends on the interaction (Plé, 2016) and on the satisfaction of the actors (Mele et al., 2010).

Given this, the IoT should enable and foster value co-creation as it enhances the communication and the interaction making connected different entities, that is businesses, governments, and consumers (Meola, 2016).

Nevertheless despite this intuitive link, to our best knowledge marketing research that treat the IoT according to a value co-creation perspective lack so far.

Our paper aims to build a theoretical framework about the fundamentals of value co-creation in a specific IoT context: the smart community (Li et al., 2011), that is a community where citizens and organizations distribute the information and develop innovative partnerships (California Institute for Smart Communities, 2001).

The paper is basically conceptual but it provides fresh insights about the emergent motivations, behaviours, and practices of smart communities through illustrations.

Our study advances knowledge about the IoT as it provides a marketing perspective of the phenomenon.

The remainder of the paper is organized as follows: first we provide the conceptual background of the paper in which resource integration concept in

literature, Internet of Things, and smart communities are sketched out. Then we present some empirical evidences on the topic of RI in smart communities. Finally we discuss the results of case study e draw main conclusions.

Conceptual Background

Resource Integration and Value Co-creation

Resource integration (RI) is the fundamental premise of value co-creation (Vargo and Lusch, 2008; 2009) and can be seen as a critical process for advancing service (Ostrom et al., 2010) within a service ecosystem perspective (Vargo and Lusch, 2011; Lusch and Vargo, 2014). "Value is always co-created" and "all social and economic actors are resource integrators" (Payne et al., 2008; Vargo and Lusch, 2009; 2011; Vargo and Akaka, 2012). Value co-creation is the "benefits realized from integration of resources through activities and interactions with collaborators" (McColl-Kennedy et al., 2012, p. 375) and the actors are connected through "reciprocal promises of value, operating to and from suppliers and customers seeking an equitable exchange" (Ballantyne and Varey, 2006, p. 334–335; Jaakkola and Alexander, 2014; Reypens et al., 2016). Value creation is always an interactive process that takes place in the context of a unique set of multiple exchange relationships and does not just take place in the activities of a single actor (Vargo and Lusch, 2010; Löbler, 2013; Findsrud et al., 2016).

Therefore, RI is central to understand and foster value co-creation in service system (Peters, 2016). Furthermore, according a trans-disciplinary perspective that sees actors not as only humans, but also machines and various combinations of humans and machines, the actor engagement constitutes a micro-foundation of value co-creation arguing (Storbacka et al., 2016). Specifically, Edvardsson (2014) puts forward that all actors possess the resources and these do not have value *per se* but merely potential value. Resources are *becoming* and the interaction through actors and resources generate new resources (Edvardsson et al., 2014).

Technology plays a key role in value creation. Kleinaltenkamp et al. (2012) stressed the role of technology in providing an operant resource or not whereas the early contribution on service system (Maglio and Spohrer, 2008; Akaka and Vargo, 2014) identifies the pivotal role of technology in the process of resource integration. Many studies that addressed innovation paid attention to RI as a central process (Colurcio et al., 2014; Frow et al., 2015; Aal et al., 2016; Siltaloppi et al., 2016). The main contribution for the advancing of understanding about resource integration can be ascribed to the conceptualization of service ecosystem (Vargo and Lusch, 2011) that is a complex, relatively self-contained, self-adjusting system of resource integrating actors connected by a shared logic of institutional arrangements. Very relevant on the point, and for our research aim, is the contribution of Lusch and Nambisan (2015) that puts forward the centrality of resource

integration process in the (service) innovation present a tripartite framework of a broadened view of service innovation that consists of i) service ecosystem; ii) service platforms and iii) value co-creation.

Technology is central into the integration process and the role of social media for the development of the interaction is particularly emphasized (Pitta and Fowler, 2005; Kozinets et al., 2008; Boudreau and Lakhani, 2013). Specifically the recent amazing and increasing overall interconnection and digitalization named Internet of Things (IoT) enhances the role of technology in enabling e better quality of life in the ecosystem (Kim, 2013; Ahmad et al., 2016).

The IoT

A search for "IoT" in two of main bibliographic database (WOS and Proquest, February, 2017) revealed that although in literature the interest in the IoT is increasing so that about 500 scientific articles show the word "IoT" in the abstract in last five years, the scientific production narrows down the technology management and information technology areas which deal with specialist aspects and envisage the potential for integration with other systems and protocols, such as the Cloud (Botta et al., 2014). Furthermore, there is not consensus about the definition of the IoT (Whitmore et al., 2015; Mulani and Pingle, 2016).

In a general way, it can be defined as the network of smart objects - physical assets- that have the ability to connect each other and communicate data through communication protocols (Sharron and Tuckett, 2016).

But the of range of the IoT is much bigger: it is transforming both the social and the business ecosystem leading to a more "connected life" (Li and Li, 2017). It allows people to manage different activities – sport, health care, banking, education, housing, movement, entertainment, etc..- through their smartphones or notebook (Boulos and Al-Shorbaji, 2014) providing advantages in terms of time and everyday life simplifying. From the business point of view, the IoT offers a lot of opportunity to manage the "big challenge"; the transformative power of the Internet of Things affect all kinds of industries as by collecting data from various connected sources, combining them with data from other sources and using big data analytics, decisions and actions -that can have important implications for firms, can be taken and made (Michel, 2014).

The IoTs can be looked as a dynamic network composed of smart objects that producing and consuming information and bridge the gap between the real world and the digital realm through generally the Radio Frequency Identification (RFID), Global Positioning system (GPS), developments in sensor networks, Micro Electro-mechanical Systems (MEMS) (Dohr et al., 2010; Kortuem et al., 2010; Miorandi et al., 2012; Lee et al., 2016; Rathore et al., 2016). The IoT is built on three pillars: i) identification, ii) communication and iii) interaction of smart objects – interconnected either among themselves that with end-users or other entities in the network. (Elmenreich et al., 2009; Dohr et al., 2010; Miorandi et al., 2012). Therefore the IoT allows the the creation of new independent networks that operate with their own

infrastructures (Bryant et al., 2007) as well as the creation of new services through the application of new and different modes of communication between people and things (Dohr et al., 2010) as its range is really coss-domain from a personal/social dimension (Atzori et al., 2010; Guo et al., 2011; Rathore et al., 2016) to a business dimension (Michel, 2014; Colurcio and Verre, 2017).

IoT and Smart Community

The term Smart Community refers to a new generation of technologies integrated into the real word and community (Nam and Pardo, 2011; Mital et al., 2015).

A community is a social unit whose members share a common interest or geographical area and interact for a common benefit (MacIver, 2012; Xia et al., 2013; Maury and Vilas, 2015).

Today, there are different definitions of Smart Community (Lindskog, 2004). Table 1 shows main definition for the concept and highlights that there is a general meaning of Smart Community and a more specific meaning that refers generally to Transportation and Smart Cities (Anthopoulos and Fitsilis, 2010; Liang et al., 2012; Rabari and Storper, 2014; Maury et al., 2015; Mital et al., 2015).

Table 1. *The Concept of Smart Community*

Definition/Topic	**Author**
"Communities that provide an advanced communication and information infrastructure and that enables residents and organizations to make good and independent use of these technologies. To be "smart" the use of technology must be interactive or must lead to a transaction, that is, on-line activity must be more than a passive act. The members of smart communities must be able to use the technologies to transform information into knowledge".	Skrzeszewski, 2002, p. 3
A space where citizens and organizations distribute the information to develop innovative partnerships and use ICT application to transform positively life in terms of education, health care, and government services	Lindskog, 2004; Liang et al., 2012
Dissemination of new technologies	Xia and Ma 2013
Network for communication in real time	Gonzalez et al., 2008; Xia and Ma, 2011; Xia et al., 2013
"While technology and connectivity are at the core of creating a Smart City, the Smart Communities initiative acknowledges that it isn't sufficient to stop at technology to create livable places. A Smart Community uses technology to serve the needs of all the people that live there, while going beyond that technology to provide citizens with transportation sustainable choices. It also recognizes that this movement is not just limited to big cities. Smart Communities can come in many different shapes and sizes"	Paniati, 2017

Source: Our elaboration

The key elements of a smart community are: i) Technology: the tool that enables a smart community to function. ii) Digital Content: the building material. iii) Relationships between people. iv) Interactive/Transactional applications: Smart communities are socially and physically aware systems the processes (Skrzeszewski, 2002; Xia et al., 2011). Therefore Smart Community consists of a number of technologies and things connected that transform the physical environment and human interactions within their action area by involving homes, schools, offices, hospitals, services surveillance and emergency services, and cultural centers. Smart community allows a faster access to resources on conservation, safety, comfort, and pervasive healthcare (Ma et al., 2005; Anthopoulos and Fitsilis, 2010; Liang et al., 2012; Maury et al., 2015).

According to Liang et al. (2012) Internet of Things can be used for neighborhood watch and pervasive healthcare and presented the future research challenges, such as cooperative authentication and detecting unreliable nodes. The interaction of Things in the Smart Community allows members to share thoughts, ideas, knowledge, and experiences with the virtual community.

In addition, members with high levels of community sense are more willing to exert extra effort and to help others to achieve certain objectives (Tonteri et al., 2011), to improve livability, preservation, revitalization, and sustainability, of community (Bagozzi and Dholakia, 2002; Harrison et al., 2010; Chou et al., 2016).

The people share a strong sense of community, are part of the community and feel in obligation to give back to resources and informations (Wasko and Faraj, 2000; Tonteri et al., 2011; Chou et al., 2016).

Research Design

Sample

In this work has been used an exploratory and qualitative approach to build a theoretical framework about Resource Integration as the fundamentals of value co-creation in the smart community context (Li et al., 2011).

As both smart communities is an emerging phenomenon in Italy, we chose a multiple case study method (Yin, 2002), as it is useful for inductively developing a theory through the description and analysis of new phenomena (Baker and Foy, 2003). It is generally agreed (Yin, 2002) that the case study method is suitable for examining multiple features of a phenomenon and the interrelationships between them. Data triangulation (Bonoma, 1985) was also employed using a variety of tools, including documentary analysis, direct observation, and informal conversations. Our sampling strategy was based on four availability criteria used to select companies. First, we contacted Smartdatanet - the the first platform in Italy that connect the IoT and Smart Community- to take a census of smart commuities that are operating in the last three years. Thus, we defined a population of 50 smart communities that are

built on/use the IoT and are available on Yucca, that is the engine to elaboration and representation the data. From this group, we selected the eleven smart communities with the main aim to provide a better picture of the phenomenon under investigation (Lucas, 1974). Table 2 shows details of our sample.

Table 1. *The Sample*

CASE	DESCRIPTION
LIMPID	The Live Inducement of Multimodality by Promoting the Internet of Data project has aim to collection the data on traffic and transport for better viability. Area: Torino City.
O.N.D.E	It is a project to improve the service of collection of waste Area: Municipalities of many small cities
QUIES	This project carries out an acoustic monitoring in real time. Area: Municipality of Turin and Piazza Castello, C.so San Maurizio, Lungo Po Cadorna, Piazza Vittorio Veneto, Via Po.
SEeS@W	SEeS@w faces the problem of safety in working environments in an innovative way, putting together objects and people. Area: Laboratorio Baldi Riberi, AO San Giovanni Battista, Toxicology Laboratory at CTO Pathology
ESGP	The project was born to improve the management of energy consumption. Area: Residential buildings in Canavese
SORRISO	SORRISO was born to improve the energy efficiency in the school buildings equipped with photovoltaic panels. Area: Municipality of Bruino, Istituto Comprensivo; Higher School "G. Vallauri" of Fossano; Residential users Piemonte
LEO	The project improves the energy efficiency in public administration. Area: Municipalities of Collegno and Rubiana.
CIRCE	CIRCE allows the management of meteorological and hydrogeological data (real-time and historical). Area: Hills and mountains, rural areas, riverine environment of Valle Alpina, Provinces of Turin, Cuneo, Biella, Asti e Alessandria.
LIBRARE	The project allows to improve the management of books and libraries. Torino Rete Libri schools.
QUADRANTE	The project provides the information on pollutant materials. Area: Ivrea City, in Via Jervis, Municipality of Turin and Corso Vercelli.
ELISE	ELISE has the aim to active an ecosystem on environment issues. Area: 6kmX7,2km area in Turin and three sensors on Istituto Tecnico Industria "Avogadro, Istituto Tecnico Commerciale "Sommelier", Higher School "Valentino Bosso - Augusto Monti".

Source: Our elaboration on www.smartdatanet.it/

The selection process has been conducted according to: i) scientific interest; (ii) reducing the risk of the examples redundancy; and ii) availability of information.

Data Collection and Analysis

We gathered data mainly through non participant observation. From January to March 2017, we have been interacting on Yucca platform and gathered observation data to obtain information and frame the relationship among actors and objects. According to this study's goal of developing a deeper understanding of complex interaction in a smart environment, we believed it was necessary to develop a holistic perspective that represents the principles patterning the data as opposed to exclusively relying on simple aggregation. The information collected has been analyzed consistently with the theoretical construct of the study focusing on the following main unit of analysis: 1) Internet of Things; 2) Smart Community, and 3) Resources integration and value co-creation.

The Context of Investigation

Smartdatanet is the smart community turning to firm, public administration, research center and private subject who are interested in sharing the information and data to develop new applications and innovation ideas. It gives public access to data and enables exchange of information and integration with other data sources. Data are generated by the IoT (for example, webcam, traffic sensor or stations weather) and community (through tweet, app or blog).Things and people are interconnected and collaborate by sharing applications, devices, data, experiences by making them available to the entire Ecosystem and it is composed of (i) public and private subject who share the information, device, data, experience and infrastructure; (ii) Sensing Network and gateway; (iii) Yucca Platform; (iv) Marketplace (Smart Data Marketplace) of application for example, web application, mobile apps, business case e living labs. Smartdatanet can be used to improve the air quality or water quality through wireless low-cost device to collect the data in real-time in different cities; to aggregate the data in application; to manage the traffic flow, public illumination or waste collection. The heart of the system is Yucca, an open source platform for the acquisition, sharing and reuse of data resulting both from real-time and on-demand applications. Furthermore, it allows access to public data and the circularity of information, it connects things, people and systems and it facilitates to access at innovative technologies to create the end-to-end solution. Yucca platform allows to relate applications, social networks, distributed systems, and objects on the territory; to collect data and information; to provide an integrated map of the Smart Community; to enable the creation of end-to-end final solutions; to realize the statistical elaboration; to create, change, delete the Smart Object, Stream, Dataset.

The information can be collected and analyzed to inspect physical and social phenomena in "near-real-time". The access to user portal can take place in anonymous modality or with authentication through Facebook, Google or Yahoo, services national charter, Call IoT. Furthermore, on platform is possible to browse data and stream or to choose one domain in many sectors (Agriculture, Culture, Economy, Finance and Tax, Employment and Professional Training, Energy, Environment, Public Administration and Politics, Health, Population and Social Issues, Production, Education, Science, Technology and Innovation, Security, Smart Community, Territory, Tourism, Sport And Leisure, Trade and Transport). Table 3 shows the main indicators of Smartdatanet.

Table 3. *Data on the Platform*

What can you find in the platform	
Available measures	469,02 mln
Measures in March	13,58 mln
Organizations	83 (both public and private)
Active Smart Objects	373
Online streams	1576

Source: https://userportal.smartdatanet.it/userportal/#/home at 14/03/2017

Findings

IoT

The following table (4) shows the main evidences about the development of the Internet of Things in the 11 case studies.

Table 4. *Internet of Things*

	Internet of Things
LIMPID	The project is based on Internet of Things-road Traffic over Internet. It focuses on network of smart vehicle and makes available different technologies for the collection data real-time on traffic. The data collected in IoT_|_ToI concern (i) Image processing with innovation algorithms; (ii) HMI for user-generated monitoring to support all reporting (for example considering voice recognition) The Things (linked) are: (i) drone that allows to capture the images and video without costs of installing; (ii) multiradio box to estimate traffic density; iii)smart black box to analysis of driving style, the consumption and other; electric-bike equipped of connectivity to improve the security and the communication of position; (iv) environmental sensors.
O.N.D.E	This Project uses the Big Data collected with equipment on refuse collection lorries. Data relate to the position, to empty the receptacles and the weight of the waste.

QUIES	The area of interest is densely populated; it in the historic centre of Turin where there are different historical buildings, cultural centres and gardens. There are 22 fixed stations equipped with a "marker" that has the real-time information.
SEeS@W	This project realizes innovation solutions by means of sensors to management and risk mitigation with the data sent by Internet such as wearable sensors (for example smart watches), smart environment, wellness (sensors of office or laboratory), RFID systems. The data are sent to platform thanks to the sensors installed in laboratories and it is able to management and decodes the information according to different protocols (wifi, Bluetooth or radio frequency).
ESGP	In ESGP use the installations of domotic system " MyVirtuoso Home" to analize behavior of habitual consumption. The data shared are relate to energy consumption of every user, humidity and temperature of the environments and electricity consumption of every smartobject.
SORRISO	The system is installed in a living lab that includes the school buildings and private buildings that already have the Energy@home. Energy@home involves household electrical appliances and smart device for the control of energy consumption. This system will enable to improve the energy efficiency thanks to a "load shifting" system, to use the energy preserved in the batteries and to provide the production and consumption of energy.
LEO	The system makes a control of ambient temperature and the public illumination through of the sensors to low economic investment. The sensors are installed indoor to improve the management of temperature and outdoor to oversee the public illumination and the environmental parameters.
CIRCE	The date are collected through monitoring stations to control of rainfall, temperature, humidity, hydrological data.
LIBRARE	The LIBRARE uses the Internet of Things (i) to collect the data on the movement of books present in libraries to individuate the habits of young; (ii) to change the books and places in smart social actors; (iii) to improve the skills on the digital tools between teachers and students. Furthermore, Internet of Things improves the interaction between the web activities and the activities carried out in class.
QUADRANTE	QUADRANTE involved the residential and commercial buildings, thermal power stations and vehicles in the interest area.
ELISE	The data are collected through a sensor network indoor and outdoor thanks the movable things with the collaboration of 150 voluntary students.

Source: www.smartdatanet.it/

Smart Community

The following table (5) shows our main results about the unit of analysis Smart Community. The content, the aim and the main working mechanism for each case study is described.

Table 5. *Smart Community*

	Smart Community
LIMPID	Things and person interact on a vehicular communication platform that allows to send voluntary reporting (social data collection) and the utility data on car of bike or other transport. Furthermore, it is possible to grasp information of traffic, transport, weather and atmospherical pollution.
O.N.D.E	O.N.D.E allows at the public administration and private to use and share the information on collection cycles and disruptions.
QUIES	People interact through an App and the platform of Android and iOS, messages, social network, tweet or blog. Furthermore, the people who access Yucca can visualize the information real-time.
SEeS@W	Maps are also fed by other data collected by people through questionnaires or interviews, online by App for smartphone or desktop.
ESGP	The user can link things through the platform to monitor of consumption.
SORRISO	Data of Energy@home are connected to other information that come from smartobject. Data available to user are electrical consumption, electricity production by renewable energy sources, production forecasts and solar radiation.
LEO	The information is shared on platform and are related to air quality, quantity of gas and particulate pollutant, the public illumination and other allow to limit the cost of public administration
CIRCE	Citizens and operators can cooperate for the creation of data through the inclusion of benchmarks and indicators or indicate in real-time the occurrence of phenomenon with tablet, smartphone or other.

LIBRARE	LIBRARE allows to trace the life and movement of books and have more information thanks the people and the community. The things, citizens, students and teachers work together to enhance the innovation process. The community can use different tools depending on the role of actors: • teachers use the App to register and identify of books in libraries. It allows (i) to photograph the cover or ISBN code to identify the book; (ii) to link the QR code to registration in the sever Librare platform and the next recognition; (iii) to read the QR code to identify the copy and to association at the proprietary; (iv) to have the suggestion on reading routes. • students use the App for sharing information and impressions on social platform, to integrate the information or to give advice. • users use FIRST LIFE, to share information about the position, the comment and opinion, the story of the books or create the virtual travel during storytelling.. • all the actors can use CBOOK app to read, to explore, to analyze and to make rich the books. It allows to explore the structure, the graphic or comment in social network, to add new contribution, to save new reading routes.
QUADRANTE	Thanks to Yucca is possible to understand the air quality and to exchange other information through the widget and the registration on the platform. The platform provides the data in graphic, historical series and tables.
ELISE	The information and data are available by web and Mobile application to answer to the need of citiziens, firm or public administration. Games and the apps allow to create the maps of perception and quality of life thanks the sharing the information by community.

Source: www.smartdatanet.it/

Resources Integration and Value Co-creation.

Table 6 reports our main findings about the resource integration process and the value co-creation. In order to investigate such a process within the eleven case studies we consider the actors, both thinghs and humans, (Storbacka et al., 2016) involved in the process and the main activities through which actors exchange and integrate resources.

Table 6. *Resources Integration and Value Co-creation*

	Resources integration - Value co-creation
LIMPID	All data collected get integrated with data already available on Smartdatanet. The platform interacts with sources such as Google Maps (o similar), Bunet, Arpa Piemonte, The integration of resources/information aims to solve the problem of transport in the cities in order: • to create new data sources for monitoring traffic and transport with the users information derived; • to use data to create utility collection services and to improve a Decision Support System that allows to monitor the traffic dynamically; • to provide decision support for public administration. Furthermore, this application provides the data on the atmospheric pollution, the weather and traffic of public and private transport and alternative routesin cases of need.
O.N.D.E	It makes available data in real- time in order to: • help citizens in their car in the choice of fast way; • know the type and quantity of waste to improve separate collection if necessary; • allow the citizens to signalize the disruptions and to send this information in real time at the Municipal Police.
QUIES	The sharing of data and information between person and things allows to carry out an acoustic monitoring in real time. The information are sketched out on a map which configures the developments of noise. QUIES offers different types of visualization of data such as (i) cartesian plots with the time and level of noise, (ii) the interactive graphics for the representation of data.
SEeS@W	The cross-check of data is used to manage the risk in the context of safety at work; analyze the statistic on number and type of emergency, environment condition indoor and outdoor; train workers; estimate risk, in particular on the use of chemical agents and toxic. Furthermore, the maps can be used to coordinate the worker or people in different situation.
ESGP	The project considers two points of view: that of final consumer to management the energy consumption and the cost, and the energy provider interested to improve business model giving new services. The final aim is to bring to the reduction of energy consumer.
SORRISO	This system will enable to improve the energy efficiency thanks to a "load shifting" system, to use the energy preserved in the batteries and to provide the production and consumption of energy.
LEO	The integration of information in LEO has as its objective to improve the energy efficiency acting upon better management of the existing installations and allows to limit the cost of public administration.
CIRCE	CIRCE connects and circulates experiences and date from world of research and real life. This project creates an ecosystem in which the users allow to research the environment information of interest (real-time and historical data). The citizens and the operators can investigate the phenomenon subject of study and contribute to the observation.

LIBRARE	The data shared with ecosystem can be a virtual catalog of the books, map of places of reading and deployment of books, registration in entering and leaving, statistic data. In this project, the distinction of paper and digital has been exceeded of the interaction between people, things and Internet.
QUADRANTE	The project uses the data and information readily available on territory and shared of things. This data are unable to provide relevant information on air quality.
ELISE	The ecosystem activated of ELISE allows to calculate the environmental quality parameters on city-wide.

Source: www.smartdatanet.it/

Discussion and Main Conclusions

The study aimed to explorate the resource integration process. Specifically the analysis focused on the "Internet of Thing" (IoT) scenario illustrating the strong implications of the development interconnected and interoperable communications protocols in a context of smart communities where the ambition is the value co-creation. The analysis of case studies allowed to deepen the resource integration enhanced by the IoT in Smart Communities as an enabler to generate a new value for society (Li and Li, 2017).

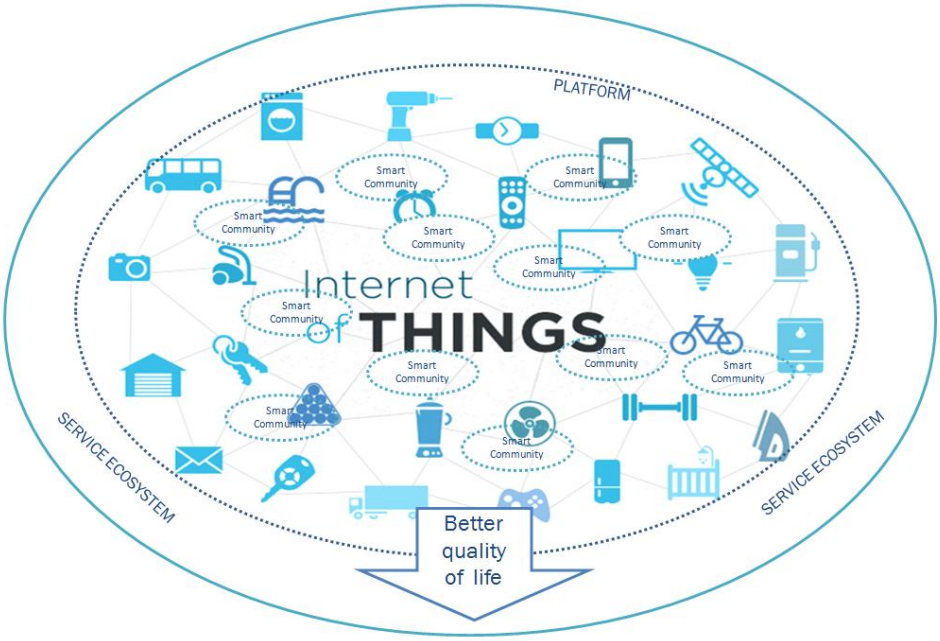
The new information generated through the integration of information who come from fixed and mobile sensors and of the community create value contributing to a better quality of life (Figure 1).

Citizens and operators can analyze the elements of interest and share in real-time data and images captured in the field by means of Tablet and Smartphone.

The final user is stimulated to change from mere beneficiary to protagonist of the study by creating a virtuous circle the exchange of information and experiences. The new information created by elaboration process enables to improve the life quality of people involved in the area of interest such as LIMPID or LIBRARE. LIMPID, for example, does not only provides information on levels of traffic but generate alternative routes. LIBRARE offers the possibility to interaction with things for better use and involved different age groups thanks to applications for all.

All information collected and redrafted in classes of interest improve the quality of life in terms of stress, health, urban decorum, consumption, also allow to limit the disruption or to know the pollution levels in the individual area of transit.

Figure1. *The Internet of Things as Resource Integration Enabler*



Source: Our elaboration

We argue that the IoT may play a crucial role in *resource integration* as "from a system-level perspective, the Internet-of-Things can be looked at as a highly dynamic and radically distributed networked system, composed of a very large number of smart objects producing and consuming information. The ability to interface with the physical realm is achieved through the presence of devices able to sense physical phenomena and translate them into a stream of information data (thereby providing information on the current context and/or environment), as well as through the presence of devices able to trigger actions having an impact on the physical realm (through suitable actuators)" (Miorandi et al., 2012, p.1498)

Value co-creation takes place when actors seek *to mobilize the best combination of resources for a particular situation* (Lusch and Nambisan, 2015) and implementing and managing apps, integrating resources and obtaining the most efficient and effective combinations (Lusch et al, 2010). The IoT plays the relevant role of operant resource (Vargo and Lusch, 2009) in the digital world where connectivity enables the exchange of billions data. Ability to get it in a secure environment, connecting industrial assets in complex data models, allows to manage data in industrial scale to meet high speed, high volume and high variety of data from industrial machines contributing to develop mechanisms of participation in which social and economic actors forge relationships (Boulos and Al-Shorbaji, 2014) for service exchange and supporting process for a shared worldview and for managing the conflicts among the actors in service ecosystem (Maglio and Spohrer, 2008; Akaka and Vargo, 2014).

Specifically we argue that the IoT works as "service platform" that is "a modular structure that consists of tangible and intangible components (resources) and facilitates the interaction of actors and resources (or resource bundles)" through clear protocols of exchange (Lusch and Nambisan, 2015, p.162): the service platform support the value co-creation process (Vargo and Lusch, 2004) enabling the resource integration. Furthermore, the IoT foster the logic of platform-as-service and provides the architecture of participation, that is a basic requirement to create and maintain a common set of rules and principles derived from the shared institutional logics and to coordinate service exchange through the service platform. Specifically the case studies showed that the platform are is the space for the connection and allows different process of value co-creation in relation to the objective, the information and resources of actors. These promote the integration of resources and actors that are a condition to start the value co-creation process. (Lusch and Nambisan, 2015).

The paper contributes to the theoretical debate on resource integration advancing knowledge about the way through which resources are integrated in practice (Kleinaltenkamp et al., 2012); furthermore, the paper frames the topic of the IoT in a marketing perspective adding new and fresh insights about a theme uncharted in marketing literature so far.

The study presents some limitations; the main depends on the selection of the case study from just only one platform (Smartdatanet).

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