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Knowledge Sharing and Value Creation in Online Communities. Lesson from the crowd-powered case of Hyperloop Transportation Technologies

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Abstract

Online communities (OCs) represent a space where the sharing of knowledge is able to travel smoothly and rapidly among participants. This is due to its fluid and dynamic nature that has evolved exponentially parallelly with the development of new digital technologies. The fluidity in the exchange of knowledge, allows not only to interact in an environment with abundant levels of knowledge, but guarantees participants to generate new knowledge, bringing added value to all the members who gravitate around virtual communities' spaces. These characteristics have become an extremely interesting aspect also for organizations, which in recent years have increasingly focused on integrating external knowledge within their strategies, in order to acquire value and competitive advantage. Crowd sourcing approaches, represent some of the strategies adopted by organizations in this context. These approaches have undoubtedly revolutionized the entire system of organizational structures, redesigning procedures and schemes for organizations. Among these, the example brought by the HyperloopTT case is emblematic. HyperloopTT, not only consider external crowds as an important source, but they are almost completely powered by them. The work argues that in addition to offering a significant space to add value in terms of ideas, innovation and development, online communities could represent the new engine for organizations and for the entire market of the future. HyperloopTT is not only a promoter of a crowd-based approaches but is in the right direction of being disruptor of the entire organizational structures and for the entire industry. By adopting practices to enforce participation and interaction, they are changing the rules of the game and becoming a "catalyst organization". In this sense, the development of new technologies, such as blockchain technology, can further provide support for the expansion of the role of these within the dynamics of development and innovation.

Ai miei genitori, a mio fratello, a Valeria,
e a tutte le persone care che non smettono mai di credere in me.

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Introduction

In last decades, the role of online communities as sources of knowledge has become extremely relevant. The exponential development of information technologies (IT), together with the expansion of the digital world, lead online communities not only to expanded broadly but also to become an increasingly important space for the exchange of knowledge and the creation of value. Online communities are defined as a group of people, individuals or organizations that interact through technology or electronic tools regarding common interests or needs. These communities have evolved in tandem with the evolution of the Internet and information and communication technologies (ICT). In this sense, the expansion of the digital world has allowed the interaction of increasingly numerous groups of individuals or organizations within online communities. The most interesting aspect of online communities is undoubtedly the degree of knowledge they can share and generate, representing a fundamental element in their existence. In this regard, it is of great interest to understand how these allow collaboration and sharing of knowledge beyond the already existing limits present in face-to-face communities. The work aims to analyze the current literature on this topic, seeking to describe in detail the factors that influence the exchange of knowledge within the online communities, the dynamics that arise within them and subsequently depict what are the approaches endorsed by organizations to integrate these knowledge exchange systems within their structure, in order to promote development and innovation. In order to do this, this work highlights some evidence, coming from tangible examples of integration of online communities within the organization. These examples represent the success in terms of knowledge sharing and value creation for organizations, among all the case the essay has the objective to emphasizes the case of HyperloopTT.

The work is divided into three parts. The first part is dedicated to the definition of online communities, their history and the general introduction on the dynamics that involve members in contributing to the creation of value. The second part, on the other hand, aims to explain in detail what are the factors that impact the exchange of knowledge within the OCs and to illustrate further the dynamics involved in the processes of knowledge sharing and value creation. Finally, the third party aims to describe the integration of the mentioned dynamics of knowledge sharing and knowledge creation gravitating around OCs, within the company's practices and strategies. In particular, this part provides examples from crowdsourcing

approaches and value creation's evidence from the HyperloopTT case. The final part of the third chapter, aims to trace the future direction in which knowledge-sharing practices are directed, highlighting two examples that use blockchain technology as a means to strengthen the creation and sharing of knowledge within OCs.

As previously mentioned, the first chapter provides a historical digression that starts from the etymology of communities and then explains the development of online communities (OCs) in the last 50 years. Once analyzed the raise and development of OCs, the first chapter aims to identify online communities, or rather aims to identify the types of online communities according to the needs and interests of their members. After exposing the 3 types of existing online communities (1. Communities of interest; 2. Communities of relationship; 3. Communities of transaction), it is relevant to understand how these communities operate, what are the reasons why members contribute into these and what is the kind of contribution they provide. The first chapter furnishes a first general response regarding these issues, also touching on the points of digital sociality, different from the face-to-face communities, that bring benefits in terms of knowledge sharing.

The second chapter instead, starting from the definition and distinction between implicit and explicit knowledge, describes, basing on the existing literature, what are the most important factors that impact the exchange of knowledge within online communities. First, the organizational structure and utilization of IT systems play a fundamental role in making the exchange of knowledge within OCs as fluid as possible. As for the structural organization, it is undoubtedly true that an "open" structure characterized by porous boundaries, makes the share of knowledge more fluid thanks to the integration of internal and external resources, compared to traditional structures with rigidly delineated boundaries. At the same time, the utilization of IT is equally important, in fact this allows a high exchange of ideas, information and knowledge, both explicit and implicit. Secondly, among the factors that impact the exchange of knowledge, the construct of trust and the sense of belonging to the community are identified as the others two factors. The construct of trust starts from the concept that for effective communication between several parties there is a need of common ground of trust. When dealing with online communities, unlike in physical ones, trust cannot be based on the social identification, emotions or status of other parties; in fact, trust in digital spaces is granted more quickly by creating the so-called "swift trust", thanks to the greater number of interactions present in online spaces, that accelerate the process of giving trust to others.

Subsequently, the second chapter focuses also on the dynamics that lead to the creation and transformation of knowledge. Based on the work of Faraj (2016), the processes of

transformation of knowledge from explicit to implicit and vice versa, from implicit to implicit and from explicit to explicit are exposed.

The last chapter aims to bring to light the practices currently widely used by organizations to integrate online communities within their structures and strategies. In particular, reference is made to crowd-sourcing practices that today represent a key element in the success of numerous and well-known organizations. In detail, the chapter starts first from the definitions of crowd sourcing and its areas of expertise. Crowd sourcing is defined as a function that was traditionally performed within organizational boundaries but is now outsourced outside the boundaries. The involvement of the crowd outside the company, takes place through initiatives or contests provided by the organization itself to the external crowd. This practice has been found to bring numerous benefits, in terms of reducing costs for R&D and developing new ideas and innovations. One of the most interesting reasons is the creation of an environment called "coopetition" (Bengtsson & Kock, 200) in which the members of the crowd operate by relying on both collaboration and competition between them, strongly stimulating the development of new ideas at highly rates.

Subsequently, the tensions that impact the contribution in the contexts of crowd sourcing and online communities are highlighted. Faraj (2011), mentions 5 main tensions: (1) passion; (2) time; (3) social ambiguity; (4) decontextualization of ideas; (5) convergence.

After explaining the reasons and dynamics that impact collaboration, the chapter presents practical examples of adoption of these approaches by well-known organizations (e.g. Lego, Uber, Airbnb and HyperloopTT). Among the various examples, the most particular is the one related to HyperloopTT. HTT defines itself as being not only an organization that uses crowd sourcing practices, but a totally crowd powered company. In fact, most of the individuals who contribute to the development of ideas and projects of the organization, are not employees but are contributors who work part-time or full-time voluntarily, or in exchange for some stock options. HyperloopTT is a company that aspires not only to revolutionize the transport industry, designing a highly sustainable vehicle that travels at a maximum speed of 760mph (1223.1 Km/h), but also aims to revolutionize the whole organizational structures system, proposing a structure called "onion structure" where, with the exception of the core team, most of the contributors are not employees of the company. The structural model devised by HyperloopTT integrates existing practices in online communities and crowd-sourcing approaches with little-used practices, such as assigning tasks to the external community or to the 6 teams divisions without a well-defined final scope, but with the sole purpose of sharing ideas, exchanging knowledge and creating something new with brainstorming.

The final part of the third chapter aims to introduce blockchain technology as an additional factor that in the future can become central to the promotion of knowledge sharing among online communities. In particular, this last part gives two examples. The first example is related to Moyee Coffee, a company operating in the coffee industry, which uses the blockchain to ensure a transparent and fluid exchange of information on production and distribution between consumers. The second example highlights the case of Steemit, a social platform that deals with the creation and care of digital content, which uses blockchain technology to stimulate the creation of knowledge and ideas, using incentives based on the token economy.

The aim of this work, finally, is to convey the importance of the integration of knowledge coming from the digital contexts where the OCs operate. These, in fact, as it is widely described, are a real forge of knowledge, characterized by an abundance of ideas and information. In the same way, it is essential to understand what are the dynamics that characterize the OCs, in order to integrate them in the best way within organizational strategies and structures.

Chapter 1 - Online Communities

This first chapter aims to retrace the existing literature gravitating around online communities, starting from the etymology of the of the term community and continuing with the history behind these communities with the objective to understand in which terms we can define a digital community operating in the online space. It is undoubtedly true that the exacerbation of Internet and the technological development realized in the last 50 years paved the floor to the rising of new dynamics occurring in the digital world and, as a subsequence, new types of sociality growing between individuals. Once explained the history that forms the actual communities, it results fundamental to define the different types of online communities existing and which are the factors that define them. With this purpose the work exposes the classification models elaborated by previous research, highlighting the importance of information within digital interactions, but also of interests and needs that nudge individual to be part of online communities. In the last part, three main questions are addressed. These questions mainly gravitate around the motivations that lead individuals to contribute within online communities, the level of contribution and the relevance of information's fluidity.

1.1 Origins and Etymology of Online Communities

The term community comes from the Latin word "communis", which indicated something common, public and shared by all, so the term "*communitatem"* indicated belonging to a group of people who shared something in common. To date, the term "community" indicates a group of people united by geographical origin, demographic or simply by interests and needs.

The term, subsequently, has increasingly assumed a fundamental role in literature, especially within the contexts of social interactions related to geographical area and common interests. There is no doubt that the term has taken on an important value in the literatures of business management regarding the environments in which companies work that are composed of communities of practice, intended as groups of people who share a concern or a passion for something they learn on how to do it better as they interact regularly (Wenger, 1998) [1].

[1] Wenger, E. (1998). Communities of practice: Learning, meaning and identity. Cambridge University Press.

The concept of online community develops its roots in different areas of interest. The first one can be identified in the development of Electronic Data Interchange (EDI), that is, a data exchange system external to the companies, that allowed them to capture and exchange data from the external environment. On this basis lies the definition provided by Cash about Inter Organizational Systems intended as 'an automated information system shared by two or more companies' (James I. Cash, 1985) [2], both of which led to the concept of data and information exchange within a 'business community' (Preece *et al.*, 2003) [3].

With the passing of time online communities started building connections with different tools and purposes. Email, one of the first and still the most frequently used communication tool on the Internet was developed in 1971, bringing to the second information revolution, enhancing both productivity and efficiency (Sproull & Kiesler, 1991)[4]. Listservers, invented in 1975, allow to send several messages to all the subscribers. The change brought by this technology was tangible in the increase of email readers. As today, Listserv is a widely used software server useful for creation and automatic management of mailing list, newsletters, forum and discussion blog. Is easy to understand that these small technological developments all together were paving the floor to the rising of online communities.

Another tool developed in those years and still largely used by companies are the bulletin boards. These are designed based on the metaphor of a physical bulletin board. People post messages to the board, and they are displayed in various ways. Usually, the messages are threaded which means that messages on the same topic are associated with each other. During the last five years, systems have appeared that offer many fine enhancements: search engines enable users to search on topics, username, date; emoticons; private conversation spaces; links to email, user profiles and web pages; and graphical two-dimensional pictures and avatars (Preece, 2003) [5]. Usenet News, like a bulletin board, provides open areas for discussion of topics clustered in hierarchies. Moderated newsgroups were introduced on Usenet in 1984.

All these innovations together, enhance the communication between Internet users, making information easier to find, faster and asynchronous, meaning that the partners do not have to be

[2] James I. Cash, J. (1985). Interorganizational systems: An Information society opportunity or threat? . The information Society, 199-228.

[3] Preece, J., Maloney-Krichmar, & Diane Abras, C. (2003). History of emergence of online communities. *Encyclopedia of Community*.

[4] Sproull, L., & Kiesler, S. (1991). Connections: New Ways of Working in the Networked Organization. *Administrative Science Quarterly*.

[5] Preece. (2003). History of emergence of online communities.

co-present when the information is sent. The most famous and first widely recognized non-technical online community, The Whole Earth 'Lectronic Link (WELL)[6] was established in 1985 (Rheingold, 1993)[7].

A further fundamental development in the history of online communities were the establishment of instant messaging and the whole chat system. First successful examples of chat system are provided by ICQ and AOL Instant Messenger. These systems were built to allow users not only to send instant messenger also to offline users, but also to send files, starting multi-user chats and playing game. This kind of technologies guaranteed a higher level of information interchange, and furthermore led many users to make their stay longer in the community, establishing real social relationships with other members. Nowadays there are hundreds of software providing instant messaging services and they constitute an integral part of all the social media's activity.

Another pivotal development in the history of online communities and more in general of Internet, was the release in 1989 of the World-Wide-Web (WWW), developed by Tim Berners-Lee together with the CERN (European Organization for Nuclear Research). The invention of the world wide web has opened the door to hundreds of further technological innovations that are still in progress and in complete development. This event has certainly facilitated the process of more web pages creation and additional communication spaces differentiated according to the area of interest, simultaneously favoring the development of numerous online communities that begin to identify themselves according to their affects or needs.

The birth of these online communities over the years has undoubtedly also allowed the companies themselves to focus businesses according to the needs of larger communities. A striking example is the music business and the invention of MP3s, which designed to facilitate the distribution and sharing of music, have met the needs and interests of numerous members of the communities in the music environment, becoming a pillar of the technological revolution.

In this sense, technology has made big steps to provide machines and software at hand of users. This process I also know as 'ubiquitous computing', meaning that computers adapted to users' needs and migrated to all places such as clothing, music, phones, services. This once

[6] The WELL is a platform for conversation and discussion; it is known as the primordial ooze where the online community was born and where Rheingold coined the term 'virtual community'. Source: https://www.well.com/about-2/

[7] Rheingold, H. (1993). *The Virtual Community: Homestanding on the Electronic Froniter.* Addison-Wesley.

again made the access to information easier for users and allowed them to build communities attached to any specific area.

In light of this development, we can informally define an online community as a collective group of entities, individuals or organizations that come together either temporarily or permanently through an electronic medium to interact in a common problem or interest space. An online community is a virtual form of a community whose evolution has closely paralleled the developments in the worldwide Internet revolution (Tapscott & Williams, 2006)[8].

As mentioned before, the exacerbations and developments of Internet together with the telecommunications systems allowed fast interaction between individuals, together with more interchanging of information. Starting from the late 90s, after the deregulation of Internet in 1995, the use of Internet increased sharply in all the world, according to the Pew Research Center reports of 2001 on usage of Internet, in 2000 people accessing to Internet counted on 104 million individuals. This numbers were just the beginning of the Internet phenomena, nowadays, according to the World Bank Data of 2020, 60% of world's population is using the Internet[9].

The real change was not only in the number of people using Internet but also on who start using this technology to join online communities. We have proof of earlier online communities in several areas such as education, office communities, sports communities and so on and so forth. People creating the online population become ever more similar to offline population and at the same time also digital social interactions become similar to physical social interaction. "The increase in online access by all kinds of American highlights the fact that the Internet population looks more and more like the overall population of the United States" (Packel & Rainie, 2001)[10].

Sociology studies for long time studied the ability of Internet to expand individual's social interaction even beyond their local space. Wellman defines this phenomena "glocalization" as they creation of social networks "sparsely knit but with clusters, linking households both locally

[8] Tapscott, D., & Williams, A. (2006). *Wikinomics: How Mass Collaboration Changes Everything.* New York.
[9] Source: World Bank Data & International Telecommunication Union (TU) World Telecommunication/ICT Indicators Database. https://data.worldbank.org/indicator/IT.NET.USER.ZS
[10] Packel, D., & Rainie, L. (2001, February 18). More Online, Doing More. *Pew Research Center*.

and globally" (Wellmann, 2002)[11]. In this sense, the evolution of Internet was the key and the tool that allowed individuals to engage with peers and build connections around several specific areas. The so-called communities of practices foster new approaches to problems and to create solutions thanks to high interchange of information, changing the way in which people work, learn, and share resources.

1.2 Identifying Online Communities

The identification of online communities is a largely debated topic, indeed, considering their continue evolution make difficult to assess unanimously how to identify them, which are their behaviors and their structures. There is a lot of emerging research around online communities from different disciplines such as sociology, psychology, communication studies, organizational studies, information systems studied and cyber studies. All the previous research are useful to identify on which basis are founded online communities, how they behave and how they allow an increasingly knowledge sharing and value creation through digital interactions.

Online communities lie on the basis of several factors deeply analyzed by previous literature, which provided different classification models. The very first factors founding online communities are information. Information represents the pivotal role in most of digital interaction occurring in online communities. One of the first author referring to information computer systems collecting information from several sources as a fundamental aspect in companies' business was Kaufman[12] (1966). He pushed companies to interact with "extra-corporate systems", mainly referring to computer systems, able to accelerate information sharing, in his article on data system to enhance their productivity. Almost 20 years later Cash & Konsynski[13] (1985), deepened the analysis made by their colleague. In particular, the two authors pointed out that the exacerbation of computer system has made possible significant development in the Information System (IS). The increasingly uses of information systems technologies made possible high levels of interaction inside and outside organizations, which

[11] Wellmann, B. (2002). Little Boxes, Glocalization, and Networked Individualism. In M. Tanabe , P. van den Besselaar, & T. Ishida, *Digital Cities II: Computational and Sociological Approaches* (pp. 10-25). Berlin: Springer.

[12] Kaufman, F. (1966). Data Systems That Cross Company Boundaries. *Harvard Business Review*, 141.

[13] Cash, J., & Konsynski, R. (1985). IS Redraws Competitive Boundaries. *Harvard Business Review*.

consequently allow the companies to increase productivity and acquire competitive advantage thanks to the fluidity of information's exchange. According to their article, these was clear also by looking to the discrepancies in productivity between companies using the IS and company not using it. They referred particularly to the utility of airline reservation systems, which allowed companies adopting it to monitor loading factors of competitors and then using the system to either lower prices or broadcast special messages to travel agents.

The Information Systems are the technological tools that allowed to collect, store, process data and provide information and knowledge. These systems not only are largely used by firms to produce their business, in terms of operations management, customer relations and building strategies, but they are also the founding reason that paved the floor to rising online communities.

As online communities expand with the passing of time, research studies have sought to identify the online spaces in which they operate as new business models. In this regard, 3 areas were identified by Hagel and Armstrong[14] (1999) to define the contexts in which information, knowledge and value are created and shared by virtual communities intended as new business models.

Starting from the concept that virtual communities are defined by bringing people together with a common set of needs or interests they identified 3 types of virtual communities: (1) Community of interest (such as Motley Fool[15]); (2) Community of relationship; (3) Communities of transaction.

In the first case communities are built around a specific area which unite individuals according to their interest. One clear example of community of interest is Motley Fool which has the intent to bring together people interested in stock investments. Indeed, the first element of the definition of value proposition is a distinctive focus that brings together people with a common set of needs. The second type of community is based on demography and geography and therefore on the interactions between members based on the demographic/geographic space. One example presented by the authors is the website Boston.com, which bring together people interested in events happening in a specific geographic location, in this case in Boston area. The last type is intended as business-to-business or business-to-consumer virtual

[14] Hagel, J. & Armstrong, A. (1999). Net Gain: Expanding Markets through Virtual Communities. *Journal of Interactive Marketing*, p.58.

[15] Motley Fool is a consultant firm founded in 1993, providing investing insights and financial advice and investment guides to their community. See: https://www.fool.com/

communities. This space is mainly used for sharing information and knowledge around a specific business and it can be used both by members doing the same job to share information about their activity and by business to target consumers. In their argument the second element is the nature of the content integrated with discussion forums, with the passing of time the discussion areas will increase the number of members involved and as consequence also the flows of knowledge and value creation within the community. If you could bring together a group of people who have experience and expertise in an area and provide environments where they can be accessed on demand with targeted questions, that is an infinitely deeper information environment than simply bringing together published content (Hagel & Armstrong., 1999)[16].

On the other hand, Lazar and Preece[17] (1998) classified online communities based upon: attributes, support software, relationship to physical communities and their boundlessness. With attributes they intend shared goal, shared activities, access to shared resources, social conventions or intense interactions. Looking to the attributes of an OC is helpful for determining the needs and interests of an online community. Some authors argued that the more an online community possess these attributes the more the community is positively attractive for new hypothetical members (Whittaker, Isaacs, & O'day, 1997)[18].

Furthermore, they can be classified by the software supporting the online community, this model is also supported by other authors such as (Jones, 1998)[19] who defined OC as a community that is formed by computer-mediated communication software. The software is the mean to support communication between members, they can take form of a newsgroup, bulletin or listserver for instance and can define the boundaries of the community. Furthermore, many OCs are based on physical communities and in particular on news, events, people and location in the physical world. These kinds of community are usually geographically based, one clear example made by Lazer and Preece[20] (1998) refers to Government services and to information accessible by citizens through official website, in this sense, governments, are creating an online community geographically based and strictly related to the physical community.

[16] Hagel, J. & Armstrong, A. (1999). Net Gain: Expanding Markets through Virtual Communities.

[17] Preece, J., & Lazar, J. (1998). Classification Scehma for Online Communities. *AMCIS*.

[18] Whittaker, S., Isaacs, E., & O'day, V. (1997). Widening the net: Workshop report on the theory and practice of physical and network communities. *ACM SIGCHI Bulletin*, p.2.

[19] Jones, S. (1998). *Cybersociety 2.0: Revisiting computer-mediated communication and community*. SAGE Publications.

[20] Preece, J., & Lazar, J. (1998). Classification Scehma for Online Communities.

The last classification made by Lazar and Preece (1998)[21] is based on boundedness, useful to define the types of online communities. The design, or community members actions determine the level of boundness. For instance, online community can be built depending on the type of job, geographic area, or being part of a specific population. Members of communities with restricted access are often more empathetic (Preece & Lazar, 1998)[22]. All the classification made by previous research are indeed fundamental in understanding the development of online communities and their behavior.

1.3 Contribution and Value Creation in OCs

Previous research on virtual communities and information systems has focused on 3 main aspects, such as: (1) the reasons why people participate in virtual communities and the motivations that push individuals to interact with people they do not know within them and above all to maintain a high level of interaction over time; (2) secondly on the amount of activities carried out by members within communities and the various levels of interaction and activities and (3) thirdly on the analysis of information and data circulating within or between different virtual communities.

Considering the classification on the types of the existing online communities, the previous research focused on the mentioned three aspects, trying to answer to three questions: how these communities work? What are the motivations that lead members to keep high levels of interactions over time? What is the value of the information that circulates within virtual communities? Based on these questions, three lines of research have developed over time.

As for the first macro-research group, the interaction within a virtual community is mainly based on the identification of an individual within this and his commitment based on different motivations. Engagement within online communities strongly depends on identification[23], intended as cognitive awareness of and emotional investment in group membership (Ashforth, Harrison, & Corley, 2008)[24]. Identification, according to (Tajfel, 1982)[25] is based on two main

[21] Ibidem.

[22] Ibidem.

[23] Social identification is based on social identity theory developed by Tajfel (1982). Social identity is a person's sense of belonging to a group. He refers to three mental processes involved in evaluating social identity. The first one is social categorization (assigning category to understand the social environment), the second is social identification (adoption of the identity of a group) and the last one is social comparison (the process of comparing the group in which a member is identified with other groups).

[24] Ashforth, B., Harrison, S., & Corley, K. (2008). Identification in Organizations: An examination of Four Fundamental Questions. *Journal of Management*, 325-374.

[25] Tajfel, H. (1982). Social psychology of intergroups relations. *Annual review of Psychology*, 33-39.

components: the first one is a cognitive one in the sense of awareness of membership and the second one is an evaluative one, in the sense that this awareness is connected to some values. These two components pave the way to a third one frequently associated with them that consist of emotional investment in the awareness and evaluations. As a subsequence, identification is something strictly linked to the individual's social identity. This is true because every form of identification in each community, especially in virtual ones, starts from the individual definition of identity, in which each individual is aware of his values, his needs and his affects and therefore the identification will take place mainly in communities similar to their social identity. Bateman *et al.* (2011)[26], offer interesting hypotheses about the reasons that push individuals to interact with a certain behavior within communities. These motivations, according to the authors, are based on (a) needs, (b) affects and (c) obligations. Each virtual community has a different impact on the way individuals interact, with a commitment "needed-based" predicting thread reading, "affect-based" commitment predicting reply posting and moderating behaviors and "obligation-based" commitment predicting only moderating behaviors (Bateman, Gray , & Butler, 2011)[27].

Secondly, much less is known about the activities of members, the inner workings of communities, or the processes and technologies that support them. Many of existing OCs are composed by a core team which contributes most to the community and members who engage sporadically according to their interests, needs and affects. One interesting example is provided by open-source software (OSS)[28], which indicates a system non limited by copyrights. OSS development represents a "private-collective" model of innovation where developers obtain private rewards from writing code for their own use, sharing their code, and collectively contributing to the development and improvement of software (Hippel & Krogh, 2003)[29]. The OSS system not only allowed developers from all over the world to work to the same project, but paved the way to the open content movement, where are totally the editorial content, instead of the code source. Wikipedia in this case represents the most famous example of open content. In this context, is easy to understand that most part of the work is made by developers, who

[26] Bateman, P., Gray , P., & Butler, B. (2011). Research note - The impace of community commitment on participation in online communities. *Information System Research*, 841-854.

[27] Ibidem

[28] Open-source software is non-proprietary software that allow developers to modify, contribute and collaborate among them (Hippel & Krogh, 2003).

[29] Hippel, E., & Krogh, G. (2003). Open Source Software Development and the Private-Collective Innovation Model: Issues for Organization Science. *Organization Science*.

represents the core team of online communities providing a public good that is not rival, i.e. users' utility are independent, and non-exclusive (Lerner & Tirole, 2002)[30] to all OC's members.

A third strand of research focused on data sets and analysis of information (Faraj *et al*,. 2016)[31]. This set of research do not describe why some dynamics emerge within online communities, it well describes the information that is being shared and the value of this information for networks. Indeed, thanks to IT artifacts that facilitate digital interaction, information technologies are the mean to create networks. Data and information used by platforms aim to increase digital interactions between users, it is understandable if we just think about algorithms of Amazon and Facebook, that aims at offering to user content that are aligned to their preferences[32], and thus they create several small networks within a large digital one. However, the presence of networks does not also imply the presence of an online community, as users in network are not inclined to interact with each other and to share information. For this reason, this strand of research hardly explains how certain dynamics emerge and give space to the creation of online communities.

The focal point that unites all the strands of research concerns the contribution that participants make within each online community and consequently their behavior in contributing, driven by motivational factors. Scholars have identified a diverse set of factors that drive contribution behavior ranging from economically driven extrinsic motives to psychologically based intrinsic motivation and sociologically driven pro-social motives (Faraj *et al*,. 2016)[33]. Indeed, intrinsic psychological identification in OC has been found as a key driver of contribution behavior that are crucial for the success of online communities. Identification in a specific community will enforce the voluntary contribution of members together with the community credibility. On the other hand, extrinsic economical motivation is another driver of contribution that does not necessarily replace the social reasons for participation in a community, indeed some studies show how the interaction between extrinsic and intrinsic motivations involves a greater voluntary contribution from members. In this

[30] Lerner, J., & Tirole, J. (2002). Some simple economics of open source. *Journal of Industrial Economics*, 197-234.

[31] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows. *Information Systems Research*.

[32] Digital environment provides several tools, as recommender systems, intelligent tracking, targeting methods, advertising, feedback tools and personalization techniques, to design and display contents according to users' preferences (Mirsch, Lehrer, & Jung, 2017).

[33] Faraj *et al.* (2016). Online Community as Space for Knowledge Flows.

context, members of an online community are not only driven by an economic motivation to interact and create added value in the short term, but at the same time they are driven by a social identification to learn, to relate to peers and to bring added value to the community, and therefore to maintain high levels of interaction for a longer period of time. Therefore, the interaction between intrinsic and extrinsic motivations not only leads to a long life for OCs but also to a higher rate of knowledge creation, sharing and capture, and this is even more true if we think how companies are increasingly supporting social software for knowledge management practices (von Krogh, 2012)[34].

Another fundamental aspect to analyze is understanding how the exchange and creation of knowledge is the basis of online communities, is that the high level of interactions and contribution by members leads to the creation of social structures where, as in any social structure, there are different roles among members in accordance with their social status, for example, being a graduate or not can play an important role, or being highly specialized in a craft will have its meaning within the social hierarchy. Social practices and interactions seem to evolve at a much faster pace in the dynamic spaces of online communities due to the fluidity that distinguishes them. Fluidity is in fact present in terms of organizational form, boundaries, norms, participation, technology (Faraj *et al.*, 2011)[35] this allows not only a high degree of sociality within the communities but allows them to evolve and shape continuously.

Having ascertained the growing presence of online communities within the digital space, facilitated by the power of social software and considering in depth the structure and nature of online communities, we can define these as social aggregators determined by the factors that nudge members to be part of it, such as interests, needs and socially intrinsic and economically extrinsic motivations, characterized by fluid and evolving social interactions that ease the exchange of knowledge. In this regard, one of the aims of the next chapter is to describe how the fluidity that characterizes online communities are able to generate knowledge.

[34] von Krogh, G. (2012). How does social software change knowledge management? Toward a strategic agenda. *The Journal of Strategic Information Systems*, 154-164.

[35] Faraj, S., Jarvenpaa, S., & Majchrzak, A. (2011). Knowledge collaboration in Online communities. *Journal of Organization Science*, 1224-1239.

1.4 Digital Sociality

Although someone can argue that interactions in the digital space are limited by the distance between individuals, or that those digital interactions between individuals are less effective than physical one. In reality, this view is adjusted by the great ability they have in generating new types of interaction, sharing knowledge and information at levels not sustainable by offline communities. In addition, with the passing of time the substantial difference between offline and online communities is slowly dissolving in many areas of activity. Furthermore, two major limitations are present in the existing research on online social interactions, (1) the conflation between the enabling technologies known as social media with the more social phenomena of the OC, (2) the reduction of OCs to the underlying digital platform (Faraj *et al.*, 2016)[36]. The first limitation involves the role of social media, conceived as the main tool for social connectivity, but it represents just a mean used by Online Communities to connect but they are not constituted by them. Social media facilitate the interactions between users, but as mentioned by Faraj (2016)[37] they focus more on individual networks not on building a community, any social media's members can build their own network and change it whenever they want. The other limitation regards digital platform, they offer a unique to build networks, they are able to connect large amount of individual and make them able to interact between each other. Some authors define digital platform as inherently generative[38] because they create value by linking the technologies to the needs of users. However, neither social media nor digital platform can be considered generative, in fact they are the means used by users to connect and interact easily, but the generation of value and knowledge are built by the evolving vibrant sociality put in place by members on these tools.

Regarding the creation of knowledge, as briefly anticipated before, it is developed in OCs due to their unique patterns, characterized by the ability to quickly connect people who are geographically dispersed but who are linked by different factors and motivations (i.e. interests,

[36] Faraj *et al.* (2016). Online Community as Space for Knowledge Flows.

[37] Ibidem.

[38] Generativity of digital platform is also conceived as "technology overall capacity to produced change drive by large, varied and uncoordinated audiences" (Zittrain, 2006), so it refers to the ability to generate new structures beyond the original intentions of creators, therefore is a fundamental aspect for innovation (Henfridsson & Bygstad, 2013).

needs, intrinsic and extrinsic motivation). In particular, the unique affability of OCs is reflected in three aspects: fluidity, swift trust[39] and mutual learning (Jin *et al.*, 2021)[40].

If we consider OCs as dynamic and adaptive systems, which are able to morph and evolve over time, with porous boundaries changing together with members and interactions, it seems understandable that fluidity plays a pivotal role, making knowledge sharing and creation possible. Fluidity is firstly reflected in the participation of members, in the sense that barriers to entry or exit are porous as the boundaries, therefore is difficult to estimate who is inside or outside the OC, members enter and exit at any time. Secondly, fluidity also defines the rapid changes in resources and their dynamics. Resources can flow both from outside and internally generated by members of OCs. Faraj *et al*. (2011)[41] argue that resource can have both positive and negative consequence for knowledge collaboration, creating tension on how to manage these consequences and are precisely these tensions that provide the catalyst for knowledge collaboration. Thus, the dynamic involving these tensions are the reason why knowledge collaboration is spread within OCs, rather than the presence of fluid resources itself. As a matter of fact, these kind of tensions and fluidity in resources is completely different from the ones rising in traditional organizational structures, and subsequently also the knowledge collaboration would be different from the one produced by traditional structures. Indeed, in traditional organization, knowledge collaboration is sticked to organizational goals, such as efficiency for instance. Employees are normally limited in the choice of decisions to be made or in which activities to participate, their behavior is dictated by the needs of the company for which they work and the individual or company objectives to be achieved. This not only involves a different level of knowledge creation, but often when individual goals are at stake, it becomes difficult to get employees to share their tacit knowledge. This aspect in the OC is replaced by epistemic orientation and mutual learning, which will be addressed later also bringing to light references from the Hyperloop case, a striking example of voluntary participation for the creation and sharing of knowledge.

Unlike traditional organizations, in the OCs the tasks and objectives are autonomously designed by the members who voluntarily contribute to finding solutions, deepening the

[39] Swift trust may evolve into a form of sociality, in the sense of rapidly engaging into social interactions and collective action. A swift form of sociality seems to take hold based on repeat interaction, shared goals and passion, and belonging (Faraj *et al.*, 2016).

[40] Jin, Y., Lee, H., Ba, S., & Stallaert, J. (2021). Winning by Learning? Effect of Knowledge sharing in crowdsourcing contexts. *Information Systems Research*.

[41] Faraj, S., Majchrzak, A., & Jervenpaa, S. (2011). Knowledge Collaboration in Online Communities.

knowledge of a certain topic, or sharing their experiences. In this context, roles are also created by the community itself, so there is no external authority that divides roles and tasks, the autonomous selection of roles, says Lahkani (2016)[42], represents the key factor for fluidity in the OCs, as it represents the authentic will to participate and collaborate on a given topic. Therefore, the OCs, thanks to their fluid structure, become an aggregator of skills and interests of the members allowing a rapid integration of the participants themselves within its dynamics.

[42] Lahkani, K. (2016). *Managing communities and contests to innovate with crowds. Revolutionizing Innovation: Users, Communities, and Open Innovation.* Massasuchets, London: The MIT Press Cambridge.

Chapter 2 - Knowledge and Value Creation in OCs

The aim of this chapter is to explain, first of all, the distinction between explicit and implicit knowledge. Consequently, the focus is to describe what are the factors that influence the exchange of knowledge, both implicit and explicit, within online communities. Among these, thanks to the existing literature, 4 are highlighted: (1) the organizational structure; (2) the use of IT systems; (3) the trust construct; and finally (4) the sense of community. All these 4 factors play a fundamental role in understanding the fluidity in the exchange of knowledge within virtual spaces. Once the factors that most impact the exchange of knowledge have been outlined, the chapter describes the dynamics that involve the processes of creating new knowledge starting from the sharing of implicit and explicit knowledge.

2.1 Knowledge: Definition and Difference between Explicit and Implicit Knowledge

It is undoubtedly true that knowledge became a key aspect in management and is well known as a critical organizational resource irrespective of the economic sector or type of organization (Stewart, Gayawali, & Grant, 1997; Davenport & Prusak,1998)[43] and furthermore the literature on management of knowledge points that knowledge is the mean to create value within the firm (Grant, 1996)[44]. In this context, the knowledge-based theory of firm clearly explains why knowledge plays a pivotal role in firm's productivity and efficiency. Grant[45] (1996), in his theory, introduced the concept of economy of knowledge (the knowledge of firm). He started from the production process of firms and coordination among firms. The basic idea of previous theory firm was that inputs were raw materials, and the outputs were another physical good, produced through raw materials. The main idea of the knowledge firm theory is that firm do not coordinate physical goods, but rather they coordinate knowledge, under the

[43] Stewart, A., Gayawali, D., & Grant, J. (1997). Creation and Utilization of Organizational Knowledge: An Empirical Study of the Roles of Organizational Learning on Strategic Decision Making. 16-20.
[44] Grant, R. (1996). Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal, Vol.17*, 109-122.
[45] Ibidem.

assumption that in the 'economy of knowledge' the most important resource, intended as input, is knowledge itself, and subsequently the output will still be knowledge.

According to Grant, company exist to coordinate knowledge, and the assumption is that they coordinate knowledge better than market, so that why firm exists. Considering the relevance of knowledge in firms' coordination, we can conceptualize knowledge as a good, as such it has the characteristics of a public good: - non excludability; - non rivalry. If we assumed knowledge as a public good, we cannot exclude people to use it and even if you use it also other people could use it and sell it.

As a public good that firms aim to coordinate in their productions process, it has come issues regarding transferability, capacity for aggregation, appropriability, acquisition. Transferability is one of the main aspects pointed out in the resource-based theory of firm (Barney, 1996)[46] as a critical determinant of firm's capacity to get competitive advantage. When it comes to knowledge, the issue of transferability requires a primary distinction between two types of knowledge: tacit knowledge and explicit knowledge. Tacit knowledge consists in "knowing how", while "knowing about" represent the explicit knowledge, where the latter is revealed by communication, while tacit knowledge is revealed through its application. If tacit knowledge cannot be codified and can only be observed through its application and acquired through practice, its transfer between people is slow, costly, and uncertain (Kogut & Zander, 1992)[47]. Codified (or explicit) knowledge is anything you can write on a paper, for instance. It is good because is easier to transmit it, circulate it, so, anybody can enjoy this codified knowledge, subsequently, it is not strategic for companies. On the other hand, tacit knowledge, is intuitive and is understandable in the context of experience, so, is what is learnt by interacting with people. Tacit knowledge is hard to communicate, to replicate and to imitate and subsequently strategic. In addition, it is sticky so, it is more likely to stay where it is generated. We will see later that the development of the Information System and the born of new interacting spaces, like online communities, allowed to circulate also the knowledge deriving from experiences. The efficiency with which knowledge can be transferred depends upon knowledge potential for aggregation (Grant, 1996). The transfer of knowledge involves both the transmission and receipt. The latter refers in the absorptive capacity of the recipient, while knowledge absorption depend on the ability to integrate new knowledge to existing one. Efficiency of knowledge

[46] Barney, J. (1996). The Resource-Based Theory of the Firm. *Organization Science*.

[47] Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities and the replication of technology. *Organization Studies*, 383-397.

aggregation is greatly enhanced when knowledge can be expressed in terms of common language, for instance statistics is a useful language to transfer explicit knowledge (Grant, 1996)[48]. Conversely information about, for instance, the capability of managers is idiosyncratic knowledge which cannot be aggregated at a single location, in that context we are talking about 'specific knowledge' (Hayek, 1945)[49].

Thirdly, if we consider knowledge as a public good from which everyone can benefit, and anyone can use it or sell it, it is arguable that knowledge suffers from problem of appropriability. The appropriability refers to the ability of the owner of a resource to receive a return equal to the value created by that resource (Teece, 1987)[50]. Even in this case, the two types of knowledge (tacit and explicit) present different appropriability issues. Tacit knowledge is not directly appropriable because it cannot be directly transferred; it only can be appropriated only through its application to productive activity. Explicit knowledge suffers from two key problems of appropriability: 1. as a public good, anyone who acquires it can resell without losing it; 2. the mere act of marketing knowledge makes it available to potential buyers (Grant, 1996)[51]. Usually, most of explicit and tacit knowledge is stored in the individuals and created within a firm, so it is firm specific. The main implications deriving from the problem of appropriability is the incentive in producing a good that do not provide a reward from the market. Companies acquire competitive advantage when knowledge is shared within the firm, adding value to the existing one. If we consider online communities as companies, the fact that are characterized by porous boundaries and dynamic structures, make sharing and creating knowledge faster and more fluid in respect to classic organization. Finally, following Simon's (1990)[52] principle of bounded rationality where fundamental is recognition that the human brain has limited capacity to acquire, store and process knowledge, the result is that efficiency in knowledge production requires that individuals specialize in particular areas of knowledge. Production involves the

[48] Grant, R. (1996). Toward a Knowledge-Based Theory of the Firm.

[49] Hayek, F. (1945). The use of knowledge in society. *American Economic Review*, 519-532.

[50] Teece, D. (1987). Profiting from technological innovation: Implications for integration collaboration, licensing and oublic policy. In *The Competitve Challenge* (pp. 185-219). Ballinger, Cambridge.

[51] Grant, R. (1996). Toward a Knowledge-Based Theory of the Firm.

[52] Simon used this term to designate rational choice that takes into account the cognitive limitations of decision maker. He replaced the theory of economic rational man, that become economic manager man that is not hyper-rational and navigates uncertainty by building routines helping individual to take decisions. Simon, H. (1990). Bounded Rationality. In J. Eatwell, M. Milgate, & P. Newman, Utility and Probability. London: Palgrave Macmillan.

transformation of inputs into outputs. Fundamental to a knowledge-based theory of the firm is the assumption that the critical input in production and primary source of value is knowledge.

The knowledge-based theory make clear how relevant is the creation and coordination of knowledge for firms, thus knowledge represents a fundamental good to acquire competitive advantage. This is truer if we consider how intangible goods, deriving from knowledge, are becoming more and more important, while physical good less relevant in firms' life. If we look to companies' balance sheets today, we can observe how heavily firms are transforming both input and output in intangible goods, investing in Research & Development, copyrights or patents. Nowadays, firm coordinate knowledge and not merely transactions of tangible input and output. The fixed, tangible resources of the organization are no longer considered a sustainable source of competitive advantage. Such assets quickly become available to competitors. Knowledge, on the other hand, is far harder to replicate, it is unique amongst organizational resources in that no other resource increases in value through use (Probst, Raub, & Romhardt, 2000)[53].

The main essence of the knowledge-based theory, introduced by Grant, consist in the notion of the existence of the "firm as an institution for producing goods and services because they can create conditions under which individuals can integrate their specialist knowledge" (Grant, 1996)[54]. Grant's theory is based on the fact that companies, as a set of individuals with different levels of knowledge, may be able to coordinate the exchange of knowledge and consequently to coordinate the production better than markets. In fact, coordination between individuals makes it possible to exchange tacit knowledge, which would otherwise remain stuck within each individual. What allows tacit knowledge to be shared is interaction and communication with other individuals. In this perspective, it could be argued that today online communities represent a space, for the implicit and explicit transfer of knowledge. However, the debate that revolves around online communities is about the level of social interaction within them. Many scholars argue that digital interactions cannot benefit from some of the dynamics strictly present in offline interactions, but at the same time the countless new opportunities for sociality that online communities offer for the exchange and creation of knowledge are not considered.

[53] Probst, G., Raub, S., & Romhardt, K. (2000). Managing Knowledge: Building Blocks for Success. *John Wiley & Sons*.
[54] Grant, R. (1996). Toward a Knowledge-Based Theory of the Firm.

In order to better understand in what terms online communities can offer new forms of knowledge exchange, it is also important to analyse what are the factors that provoke the share of knowledge, and which of these fit perfectly with the dynamics of online communities.

2.2 Factors affecting Knowledge Sharing

As stated by Grant, sharing is a process whereby a resource is transferred by one party and absorbed by another, so the resource may pass from a source to the recipient. The term knowledge-sharing implies the giving and receiving of some information framed within the knowledge context of the initial source. However, there is a distinction between the knowledge given and the one received. This distinction is based on the source of the knowledge, and they cannot be identical since the one received is the result of subjective interpretation and internalization. Considering that knowledge sharing, implies the share of information, it results fundamental to understand the difference between information-sharing and knowledge-sharing. The sharing of information does not imply creation of knowledge when the information is shared, on the other hand knowledge-sharing entails the creation of new knowledge in the individual receiving it (Van Beveren, 2002)[55]. When talking about face-to-face interaction, the main effective systems to acquire knowledge is the interaction with another individual which may possess the knowledge required. This kind of interaction, lead to a conversation that will be likely to facilitate the transfer of knowledge from a member to another. Indeed, conversation may be the only effective means of sharing knowledge.

The conversation is established within a context built by the participants through communication and is made possible thanks to a common ground of understanding, dictated by the language and the shared perspective between the participants. This context facilitates and motivates the transfer of tacit knowledge that deeply within the participants. It is thus through conversation that we learn how to learn together.

However, there are also other factors affecting knowledge-sharing between individuals, whether they are members of an Online Community or part of an organization or. Rooting from existing literature, four main factors are identified as crucial aspects for the knowledge sharing and knowledge creation process. These factors are: (1) the organizational structure of OCs; (2)

[55] Van Beveren, J. (2002). A model of Knowledge Acquisition that Refocuses Knowledge Management. *Journal of Knowledge Management*, 18-22.

the Information Technology (IT) utilization; (3) the construct of trust; (4) the Sense of Community (SoC).

2.2.1 Organizational Structure

One of the first main argument in favour of OCs as spaces for enhanced knowledge creation and knowledge sharing, regards their organizational structure. Recent research on organizational studies, suggest that hierarchical organizational structures face several obstacles for knowledge creation. We can merge knowledge creation and knowledge sharing in knowledge management practices. Knowledge management practices involve all the managerial efforts in facilitating the generation, sharing, utilization, storing of knowledge within the firm's context. Specifically, knowledge management refers to the degree to which firms creates new knowledge from the existing one, shares knowledge resource across boundaries and apply this resource to the processes.

Organizational structure is categorized in three elements including formalization, centralization and integration (Mehdi, Roya, & Khalil, 2012)[56]. Companies with high levels of formalization, there are specific standardized procedures which interfere with the flexibility requested for internal innovation. It seems arguable to convey that less formalized structure allows employers to behave freely in accomplish their task, giving space to creativity and new ideas. Centralization means the degree to which decision are concentrated to the top managers of the company. High level of centralization allows company, and top managers, to define precisely the strategy and the behaviour of the firm. On the other hand, if decision-making process are only concentrated in the hands of top levels manager, the opportunity to see proactive behaviour in employers, for instance in solving problems, are very low. Integration means exactly what Grant referred to in the knowledge-based theory: coordination within the company. The degree of coordinated activities of separate employers in the organization represents the level of integration. Low level of integration implies lack of communication within the company, low level of knowledge sharing and slow innovation process.

So, to adjust and adapt to these elements, in recent times companies changed rapidly. The ever-changing environment led organizations to change rapidly overtime, together with routines

[56] Mehdi, M., Roya, M., & Khalil, S. (2012). How knowledge management is affected by organizational structure. *The Learning Organization*, 518-528.

and practices, that are the found of knowledge creation. In this context, companies heavily invested in R&D, in order to take advantage from the existing specialist knowledge to create new one. However, not all the companies have equal funds, so only large corporations could compete by doing R&D. Nowadays, more and more companies are switching their approach for knowledge creation to more open and less rigid approaches. Chesbrough (2003)[57] suggests the existence of a swift from a "Closed Innovation Model" to an "Open Innovation Model". The first model adhered to the concept that companies may generate knowledge inside the boundaries thanks to the existing specialist knowledge. In this way they could surely control the creation of new ideas, keep the tacit knowledge inside the company and possibly gain competitive advantage on the market. At the same time, this model implies two main negative consequences. Firstly, companies should have a solid financial position in order to invest massively on creating knowledge internally. Secondly, mobility of knowledge workers, who are the one that possess tacit knowledge and expertise, should affect the innovation process of the company.

On the other hand, the Open Innovation Model, is conceived in order to exploit all the knowledge gravitating in the market, both outside and inside the company. This model lies in the structure of all the companies' integrating resources, mainly resources coming from specialist knowledge, both inside and outside its boundaries. In this model, firms commercialize external and internal ideas by deploying outside and inside pathways to the market (Chesbrough, 2003)[58]. The Open Innovation model is based on the concept of exploit the abundant knowledge to provide value to the company that created it. However, the knowledge created should not be locked to its internal market pathways or only to bring internal knowledge to the market, companies can take profit from others' use of that knowledge or technology through frequent collaborations. At the same time, this model enhances the opportunity to find great ideas without blocking the ones that do not seems good from the very first moment. Nowadays, a lot of industries switched their focus from internal R&D to collaborations, arrangements, join ventures with outside organizations (i.e. start-ups, university, research centers).

[57] Chesbrough, H. (2003). The Era of Open Innovation. In *Top 10 Lessons on the New Business of Innovation* (pp. 35-41). MIT Sloan Management Review.
[58] Ibidem.

Summarizing, open innovation refers to a distributed innovation model that involves purposively managed inflows and outflows of knowledge across organizational boundaries, for pecuniary and non-pecuniary reasons, in line with the organization's business model.

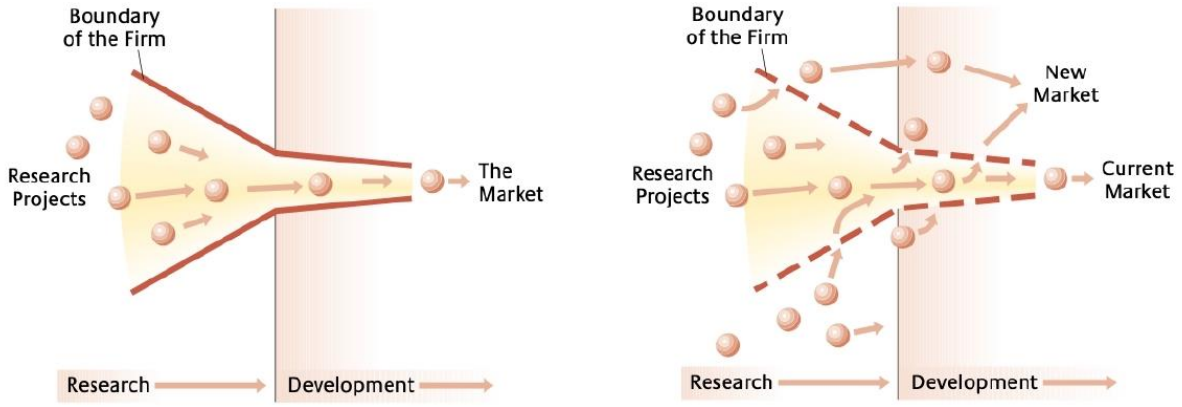

Figure 1: From Closed innovation model to Open innovation model. In the closed model companies develop and produce its own ideas and the commercialize it into the market. With the Open model, companies commercialize both its ideas as we as innovation from other firms, transforming its rigid boundaries in porous boundaries.
Source: Chesbrough H., "The Era of Open Innovation" (2003); MIT Sloan Management Review pp. 35-42.

Intuitively, open innovation is the antithesis of vertical integration approaches to innovation. Open innovation does not mean open source, indeed, university collaborations, start-up engagements and crowdsourcing are all practices fitted with the definition mentioned. This model is getting more and more relevant in companies' strategy, one clear example of the open innovation approach is presented by Amazon. Amazon, in fact, allows third party merchants their own tools to create Amazon web pages. The not only offers a fulfilment by the third party, but also billing and collection by Amazon, this creates consistent shopping experience for users.

Allowing third party to create its own tools is a clear example of open innovation, in addition consumer could know perfectly the details of the chosen merchants. This creates a virtue cycle, because consumer give experience's feedback and their feedback make more attraction for merchants to be as clear as possible.

This is an example of "outside in" open innovation. Amazon hosts other companies' web site, the logic was that the servers are expansive fit, so, it converts fixed server farms to variable costs for customers. This increases Amazon's utilization of its servers and lower Amazon's own costs as a result. Other interesting and curious cases of open innovation model are provided by the crowdsourcing approach, we will analyse later how this approach works and why it creates value to the company using it.

In conclusion, organizational structure seems to be a fundamental aspect to enhance knowledge creation, indeed if the boundaries between the company and its surrounding environment are porous and fluid, ideas, innovation and knowledge can move easily between the two parts, giving life to a virtuous cycle of knowledge creation. This suggest also that if the characteristics of organizational structure are less centralized, less formalized, more complicated and more integrated, the levels of knowledge management are enhanced (Mehdi *et al.* 2012)[59].

2.2.2 Information Technology (IT) Utilization

The second aspect influencing the flow of knowledge is the utilization of Information Technology (IT). In fact, IT evolution, transformed the transfer, encoding, storage and development of information a quick and easily manageable operation. Consequently, it also facilitated the exchange of both explicit and implicit knowledge between individuals.

As for what concern explicit knowledge, also called systematic knowledge, it refers to that type of knowledge that can be written on a document and sent to others (for example: rules, norms, data, copyrights, contracts, licenses etc.). Explicit expressed knowledge can be easily captured, encoded, shared and stored for a long period through IT systems. However, regarding explicit knowledge, which refers to experience, judgment, intuition, and which represents about 80% of knowledge within companies, it cannot be stored or encoded by IT systems (Jackson Grayson & O'Dell, 1993)[60].

The debate around the usefulness of IT in the exchange of explicit and implicit knowledge, led the literature to provide two different approaches of knowledge management and utilization of IT for companies, the first related to explicit knowledge and the second to implicit knowledge (Hansen, Nohria, & Tierney, 1999)[61]. As for what concern the first approach, called "people-to-documents", the focus of companies is to capture, encode and preserve documents, licenses, intellectual properties and rules in databases, making them easily reusable, thus investing heavily in the IT sector to cover these functions. In the second approach, however, the goal is to ensure a high exchange of tacit knowledge through people, to create networks (both digital

[59] Mehdi, M., Roya, M., & Khalil, S. (2012). How knowledge management is affected by organizational structure. *The Learning Organization*, 518-528.
[60] Jackson Grayson, C., & O'Dell, C. (1993). Mining Your Hidden Resources. *Across the Board*, 23-28.
[61] Hansen, M., Nohria, N., & Tierney, T. (1999). What's Your Strategy for Managing Knowledge? *Harvard Business Review*, 106-116.

and physical) between individuals and connect them as much as possible with each other. In this case, IT systems do not serve to capture knowledge, but offer tools that can facilitate communication, exchange of ideas, experiences, and the dissemination of global best practices. For example, a team, or a group of geographically dispersed colleagues, can use the functions of IT systems to share ideas or gain expertise informally.

The development of IT in the last 40 years provided several functionalities which enhanced further knowledge sharing and, possibly, knowledge creation. Functionalities as communication, coordination, storage, computation and information processing are now all shaped in the IT systems, giving to individuals tons of way to interact and share knowledge, by also making the quality of information higher. Quality of information is a determinants factor for the success of an online community, in fact when the information is clear, understandable, well-designed and without errors, users are more prompt to codify that information an develop new one to share.

There is also a group of research conducted by Meng Ma & Ritu Agarwal (2007) [62] suggesting the relation between IT-based features and knowledge contribution, basing the analysis on users' perceived identity verification. This group of research affirms that computer-mediated communication offers novel forms of self-presentation, where users are not biased by the face-to-face emotions, physical behaviour or social role of other users. IT artifacts make easier to users the communication process and the information exchange. The more the quality of information, the capability of IT, the more will be the motivation to use these IT systems to communicate and manage knowledge.

2.2.3 The Construct of Trust

A third factor impacting on knowledge sharing is the construct of trust. Trust is a fundamental aspect and incredible facilitator in communication in any kind of organizations or group of people. Knowledge arises from the process of communication between individual, if people do not cooperate there is no space for knowledge sharing and, in this sense, trust is one of the bases for cooperation. Some scholars (Kacperska & Lukasiewicz, 2020)[63] argue that trust

[62] Meng, M., & Ritu, A. (2007). Through a Glass Darkly: Information Technology Design, Identity Verification, and Knowledge Contribution in Online Communities Author(s). *Information Systems Research*, 42-67.

[63] Kacperska, E., & Lukasiewicz, K. (2020). The Importance of Trust in Knowledge Sharing and the Efficiency of Doing Business on the Example of Tourism. *Information*.

used in the organization can lead to good cooperation between colleagues. In particular, trust is even more important when dealing with transfer of tacit knowledge, which requires the willingness of individual to share their experiences, intuition or judgment. The sharing of silent knowledge is fostered by results-based trust and cognitive trust, while competence and confidence trust favours the reception and its transfer (Levin & Cross, 2004)[64]. Furthermore, the wise exchange of tacit knowledge is endorsed by results-based trust and cognitive trust (Skrzypek, 2015)[65]. Trust, both in organizations and communities, encourages participation in exchange or transactions, is a key factor for building connections between individual and plays a pivotal role in social cohesion. Trust is also risky, because it represents a prediction of future behaviour of other individuals, it refers to a situation where the likelihood of the other party taking specific actions is so high that the individual or group decides to cooperate (Gambetta, 2000)[66]. In organizational literature, trust is based on the fact that individuals of a specific group or companies are characterized by shared values. So organizational trust is based on reciprocity and lies on the organizational culture of the company, it allows cooperative behaviours, leading to transfer of knowledge. However, the process of building trust in companies is a long-term process which requires a lot of efforts and depends on several factors such as: organizational culture, communication systems efficiency, interpersonal relationship, sense of belonging, individual factors and factors depending on knowledge (type and quality of knowledge). All these factors help to build coordination, trust, communication and knowledge sharing in organizations. Furthermore, organizational trust is conceptualized according to three dimensions, clearly exposed by Mayer *et al.*[67] in their model (1995), perceived expertise-based trust, benevolence-based trust and integrity-based trust. The first dimension is related to competencies of an individual or a party that enable them to have influence in a specific area. Within a group of people, individual will be more prompt to trust the members with high degree of expertise, cooperate with them and share knowledge with them. For what concern the benevolence dimension, it is based on the relationship between individuals and implies the perception of future behaviour of trustor in the interests of trustees. The last dimension assumes

[64] Levin, D., & Cross, R. (2004). The Strenght of Weak Ties You Can Trust: The MEdiating Role of Trust in Effective Knowledge Transfer. *Management Science*.

[65] Skrzypek, E. (2015). Knowledge and trust management in the new economy. In J. Torun'ski, & M. Chrzas'cik, *Knowledge and Experience versus Contemporary Concepts and Tools of ORganization Management* (pp. 7-28).

[66] Gambetta, D. (2000). Can We Trust? In *Trust: Making and Breaking Cooperative Relations* (pp. 213-237). University of Oxford.

[67] Mayer, R., Roger, J., & Schoorman, F. (1995). An Integrative Model of Organizational Trust. *Academy of Management*, 709-734.

that values of other party are considered acceptable. This represents a fundamental dimension for sharing knowledge, indeed if the other party is considered reliable, honest, and committed, this would be like to motivate individuals to share their experiences and expertise with others.

When dealing with online communities, the construct of trust is another unique affordance with regard to knowledge sharing and knowledge creation. In particular, the unique aspect is given by the rapidity with which trust take form in online communities, this is why is said that there is a swift trust. Indeed, trust do not seem to decrease in absence of physical interaction. Faraj (2011)[68], affirms that trust development in OCs is related to the number of "like-minded" others available for share the objective of the community. The possibility to have access in any moment and in any space, attract higher number of members in respect to physical interaction. As a consequence, the presence of highly rapid interaction creates a sense of fast paced engagement in social relationships, accelerating the trust processes and share of knowledge. Another reason cited by Faraj *et al.* (2016)[69] explaining why swift trust seems to be gaining ground, may be the lack of organizational controls and hierarchies that limit informal interactions. This lack of hierarchies and formal interactions, play a fundamental role in the transfer of tacit knowledge. In this context, online communities seem to give rise to a new system of sociality, very common to digital natives, where trust processes are deeply different from those of organizations and are made easier by the speed of interactions and connections that take place in the digital space.

2.2.4 Sense of Community

The last, but not least, factors affecting the process of knowledge sharing is the Sense of Community (SoC), meaning the sense of belonging to a specific group of people (organization or community) with which you can share your thoughts, ideas, interests, needs and experiences. Several research affirm that, among students, the higher is their sense of belonging to a group or a community and therefore of integration, the higher will be the motivation to participate and contribute more to the community itself. According to Rovaj (2002)[70], the Sense of Community (SoC) is determined by two main factors: connectedness and learning. The first represents the

[68] Faraj, S., Jarvenpaa, S., & Majchrzak, A. (2011). Knowledge collaboration in Online communities.

[69] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows.

[70] Rovaj, A. (2002). Building Sense of Community at a Distance. *International Review of Research in Open and Distance Learning*.

perception of being connected with other members of the community and implies factors as cohesion and trust in peers. The second one stand for the sense of being involved in creation of knowledge, in sharing values and trusting other members' expertise and knowledge. The more are higher the degree of these two factors, the more improved will be the Sense of Community.

A recent study[71] has analysed the correlation between knowledge sharing behaviours and the Sense of Community within university students' e-learning community. It was performed by using a social platform (Facebook in this case) as a tool to connect students and teachers of the same classroom. In particular they created a discussion group on Facebook with all the students of a specific course. In this space, every week students were able to provide and share information on weekly activities, videos, e-books and discuss further on them. In addition, to sharing knowledge on contents they contributed to reporting technical problems, announcements and news of several topics. In this sense, they all were adopting knowledge sharing behaviours through Facebook online community (Yilmaz, 2016)[72]. In the attempt to analyse quantitatively the correlation between SoC and KSB (Knowledge Sharing Behaviors), the research monitored behaviour of selected students and crossed the data to find the results. The structural model performed by the analysis showed that the sense of being part o f a community affects positively knowledge sharing behaviours. Particularly, the variable of learning resulted as the one with the highest impact on knowledge sharing. In fact, learning activities will contribute strongly to create a fast-learning space. Finally, the study carried out that a solid sense of community bolsters knowledge exchange, attachment to the group and willingness to contribute.

2.3 Knowledge Creation in Online Communities

In this part, basing on the existing literature around knowledge creation (Faraj et al. 2016; Nonaka, 1994, 1998, 2000, 2009)[73] will be explained the dynamics that lead to knowledge

[71] The participants were 316 students of Computer 1 course. The students were studying Physical Education and Sports, Recreation, Political Sciences and Public Administration and Turkish Literature. The data were collected through KSB Scale to identify the knowledge sharing behavior in the study. The Scale was composed of 21 items and was a five-point likert scale in which (1) represented 'strongly disagree and (5) 'strongly agree'. To identify the SoC was used a CC (classroom community) scale was built with two sub-scales: 'connectedness' and 'learning'. The research lasted 14 weeks.

[72] Yilmaz, R. (2016). Knowledge sharing behaviors in e-learning community: Exploring the role of academic self-efficacy and sense of community. *Comupters in Human Behavior*, 373-382.

[73] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows. Nonaka, I., & Konno, N. (1998). The concept of "Ba": Building a foundation for knowledge creation. *California Management Review*, 40-54; Nonaka, I., & von Krogh, G. (2009). Tacit knowledge and knowledge

creation in Online Communities. Knowledge creation is conceived as process in which participants internalize explicit knowledge, codify it, socialize to transfer tacit knowledge and transform one in another. Considering the unique patterns of socialization that take place in online communities, is considerable that OCs are a space where the flow of knowledge is facilitated. It is undoubtedly true that, explicit knowledge can be easily transferred through the IT systems and digital platform at disposal of participants, but at the same time OCs offer an environment that strengthens the flow of tacit knowledge. In this context, seems fundamental also to understand the dynamic behind the flow of the abundant knowledge present in online communities. These dynamics represents the triggers of knowledge flows, that in subsequence generate new knowledge. Starting from the research conducted by Faraj (2016)[74], this section aims to describe these very dynamics and how OCs constantly transform knowledge from explicit to implicit and vice versa and how the crystalize explicit or implicit knowledge in new knowledge.

2.3.1 From Explicit to Explicit

As we mentioned before, nowadays explicit knowledge can be easily captured, transferred, and stored through digital system and IT artifacts. In this context, OCs are suitable for a combination of knowledge in codified form (Nonaka 1994)[75]. Explicit knowledge is captured and shared through posts, FAQs, rules, documents and adjusted to the community's needs. Once created and stored this knowledge and resources can be easily re-used by new members but also by participants outside the community. This is even more true if we consider knowledge as a public good, characterized by non-rivalry and non-excludability[76], in the hands of community but at disposal of everyone who need it. Furthermore, technological development in IT systems and digital platforms, not only function as a support to store the explicit knowledge but allow create also faster paths to find interesting information or elements through research bars or several media for instance. This decrease heavily the "sharing cost", motivating people to share their knowledge. In addition, another fundamental aspect in the continuum from explicit to new

conversion: Controversy and advancement in organizational knowledge creation theory. *Organizationl Science*, 635-652; Nonaka, I., Toyama, R., & Konno, N. (2000). Ba and leadership: A unified model of dynamic knowledge creation. *Long Range Planning*, 5-34; Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organizational Science*, 14-37.

[74] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows.

[75] Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organizational Science*, 14-37.

[76] Grant (1996). Knowledge-based theory, cit p.18.

explicit knowledge, is given by the size of the knowledge existing in Online Communities. The broader participation and engagement in OCs in respect to face-to-face communities, determine abundant level of knowledge gravitating around OCs. This is mainly due to the fluid structure of online community reflected also in the fluidity of membership. Members can clearly take advantages from the abundant and diversity of knowledge present in these communities, to learn and create new knowledge. In this context, of fluidity and abundant knowledge, OCs tend to learn from the existing knowledge and use it as a source of inspiration to innovate it and create new knowledge.

2.3.2. From Tacit to Tacit

One of the most important aspects in this conversion is that tacit knowledge does not require language as an essential feature for the transfer, even if it still relevant especially in the digital space. Tacit knowledge can be acquired by observing or practicing, without communicating with the other party. However, when dealing with OCs, the communication pattern assumes a pivotal role in the transfer and conversation from tacit-to-tacit knowledge, even if it is mediated by digital systems. In the digital community's context, the transfer of tacit knowledge can occur due to the frequent and intense interactions between members. As mentioned before, the high fluidity of membership together with the great number of members and knowledge, create a space where the degree of engagement and interaction is soaring. The use of IT-artifacts and digital tools to easily present ideas, judgement, intuition or explain activities allow members to have a more profound understanding and to interact with questions, consideration and so on and so forth. This kind of sociality offers relevant advantages in the flows of tacit knowledge within communities. If on one hand, the digital space does not allow the embodied transfer of tacit knowledge, it offers new forms of opportunities based on interactions and discussion. Furthermore, the ability to keep the digital media always available to members, allows them to consult and examine several times the resource, to have a deeper understanding and make with the due of time their judgment and reasoning. Another interesting point is the high level of standards of knowledge flowing in the OCs. In particular in the excellence of the subsidiary knowledge of participants. Polanyi (1962)[77] in his work made a distinction between two kinds of tacit knowledge: the focal knowledge and the subsidiary knowledge, where the first

[77] Polanyi, M. (1962). Tacit Knowing: Its Bearing on Some Problems of Philosophy. *American Physical Society*.

represents the knowledge needed to accomplish the task, while the latter resides in how effectively contribute to the knowledge flow, so how to perform the task in order to make understandable by other parties. Talking in the context of OCs the subsidiary knowledge is the awareness of one individual to perform a task in a way from which the entire community can benefit from it. The fact that OCs may bring standard levels of excellence into the flow of knowledge among participants, especially for what concern the subsidiary knowledge, so they way in which the knowledge is delivered to OCs to maximize benefits. The participation of highest level of technical and scientific members contributing to the knowledge flow within OCs, is a sign of the standard of excellence present in OCs. This standard nudge participants with willingness to contribute, to provide elements that exceed these standards, thus creating a virtuous cycle of knowledge flow. The reason why top-notch participants contribute to the knowledge flow within OCs resides both in the individual motivation of contributors (i.e. individual interest or needs) and in the opportunity to work with other top-notch members in a context of unconstrained interaction, from which they can learn, build their reputation and evolve their technical and social skills (Faraj, 2016)[78]. Thus, OCs provide an environment in which transfer of tacit-to-tacit knowledge can be easily performed, due to the high level of interactions, the excellence standards of contribution among participants.

2.3.3 From Tacit to Explicit

This mode of conversion start from the assumption that tacit and explicit knowledge are complementary and involved in a process of mutual interaction (Nonaka, 1994)[79]. The process of conversion from tacit to explicit is also called "externalization". The externalization process, especially in OCs, take place through the language used by members. Majchrzak (2012)[80] suggests that a primary challenge for knowledge creation (both online and offline) is to overcome the differences among members with different experience, background, culture. In this context, the digital space offers a service that facilitates the conversion from tacit to explicit knowledge. It creates a new linguistic common to the entire collective allowing millions of members to converge on common terms of communication to perform activities, programming,

[78] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows.
[79] Nonaka, I. (1994). A dynamic theory of organizational knowledge creation.
[80] Majchrzak, A. (2012). Trascending Knowledge differences in corss-functional teams. *Organizational Science*, 951-970.

storing and contributing to the existing knowledge. New languages evolve also according to the needs of a specific OC, and often this specialized knowledge is a requirement for deeper knowledge interactions overcoming the language barriers or barriers based on experiences. The last factors facilitating the conversion of tacit knowledge into explicit knowledge is related to sociality in digital communities. OCs are social field and as in any social environment, there exists position of influence and power. The position of influence motivates members to find a way to share their expertise and tacit knowledge to strengthen and crystallize their social position. Finally, the conversation from tacit to explicit knowledge implies the utilization and creation of new forms of language that created a common ground of understanding among members. New forms of language are a means also to bolster deeper knowledge interactions. Furthermore, the position of influence plays a fundamental role in motivating expert members in sharing their knowledge and help new members, in order to become a landmark for other participants and solidify their social position.

2.3.4 From Explicit to Tacit

This mode of conversion is defined by Nonaka (1994)[81] as internalization or as the process of learning by doing. In digital contexts, this kind of conversion is highly widespread, in fact participants can interact with huge amounts of explicit knowledge made available by other members through digital technologies and IT-artifacts. All forms of explicit knowledge help members to formulate their own ideas, reasoning and transform them into tacit personal knowledge. The abundancy of explicit elements of knowledge is a key factor for members navigating OC systems, who are driven to carefully observe, select and incorporate the types of knowledge they deem relevant and evolve through social interactions. Social interactions, as also mentioned before, also play a fundamental role in the conversion from explicit to implicit knowledge. These interactions, in the form of Q&A, AMA or thread, allow all members to deepen their knowledge of a given topic. Moreover, since this kind of interactions are long-lasting, the members have the opportunity to integrate this knowledge into their mental schemes in order to convert it, therefore, into explicit knowledge. The last aspect that motivates this kind of conversion is the flexibility in choosing not only the kind of knowledge to be integrated, but also the moment in which to integrate it. Members have plenty of time to select, not only the

[81]Nonaka, I. (1994). A dynamic theory of organizational knowledge creation.

explicit knowledge needed, but also the time to convert this into tacit knowledge according to their needs.

In this section, we have therefore seen how the sharing and creating knowledge within online communities is a determinant factors of OCs success. Starting from the definition of knowledge, both implicit and explicit, the work traces the existing literature on the role of knowledge within organizations. In particular, Grant's (1996) knowledge-based theory offers a great spectrum to emphasize its importance for the efficiency in production and innovation of organizations. Subsequently, to understand the impact of the exchange and creation of knowledge within digital spaces, and in particular in online communities, the work describes and analyses the determining factors that positively affect the exchange of knowledge between members of online communities. From the analysis of the existing literature, it can be deduced that, in the first place, the organizational structure of online communities, characterized by a lack of hierarchies, porous boundaries that facilitate the fluidity of members, and the informal network basing digital interactions between members, allow a rapid and fluid exchange of knowledge. In this context, the analysis of the theory of Open Innovation offers a tool to understand the advantages of an open structure, in terms of innovation and knowledge creation. According to the Open Innovation model, the open structure permit to be adaptive, flexible and sensitive to the evolving environment. It also guarantees an intense exchange of knowledge both inside and outside the community, thus creating a context in which all the resource are exploited in the appropriate way. Secondly, we have seen how the use of IT is another facilitating factor for the exchange of knowledge both implicitly and explicitly. These, in fact, with regard to explicit knowledge, offer numerous cutting-edge tools to capture, encode, store and share explicit elements of knowledge. At the same time, when dealing with implicit knowledge, which cannot be stored through IT systems, these have the function of facilitating the transfer and creation of new tacit knowledge, a clear example is provided by the use of media, presentations, videos, etc., which offer interactive systems for sharing knowledge and experience. Third, the work exposed the role of the trust as a promoter in the exchange of knowledge. In fact, since OCs are characterized by a high participation of members and high levels of interaction, this system allows to develop a sense of trust faster than what occurs in face-to-face relationships. This is because, in order for effective communication to take place, there must be some sort of mutual trust between members. In physical relationships, subjects rely heavily on language, emotions or standing of the other party to assess the level of trust to be placed. Since it is not possible to rely on these systems in digital interactions, individuals

tend to trust faster the other party in order to initiate efficient communications. In this context, it is also clear that an individual's level of expertise plays an important role in the concept of swift trust. The more fundamental an individual's experience is considered, the higher the level of trust will be placed in these individuals.

Finally, among the factors that impact knowledge sharing, the SoC is highlighted. It represents a motivating factor in the transfer of knowledge. This statement comes mainly from studies carried out on university's students, which assessed that their level of knowledge exchange is higher when they interface and interact via social media within online communities. The informal interactions taking place in online communities allow members to collect information quickly and efficiently in respect to face-to-face formal interactions.

In the end, the work exposes the process of knowledge exchange within online communities, starting from the work done by Faraj (2016)[82]. There are 4 different processes of knowledge transfer: the conversion from tacit to tacit, implicit to implicit, from implicit to explicit and finally from explicit to implicit. In these conversion processes, it turns out that the factors indicated above (mainly IT utilization, digital social interaction, fluidity in membership and abundancy of knowledge) also play a fundamental role in all kinds of knowledge conversion.

[82] Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K. (2016). Online Community as Space for Knowledge Flows.

Chapter 3 - Knowledge Sharing in Crowd-based context: evidence from Hyperloop Transportation Technologies

From previous chapters we learned how organizations during the last decades adapted structures and management approaches to the constant evolution of the external environment. Traditionally, organizations are characterized by well-defined organizational structures, with rigorous boundaries, where it is easy to understand what the companies develop inside and what outside the boundaries. In recent times, with the advent of "openness", these companies adapted their structures, building porous and multiple boundaries, in order to constantly integrate, in a fluid way, external resources inside the company. This evolution also stems from the need to exploit the knowledge living outside the company and, at the same time, to make internal knowledge available to the market, building connections and networks with the external environment, typically considered as outside the company. With the process of "openness", companies do not operate in isolation, but exchange knowledge and expertise outside their boundaries. These extremely active system of cooperation, competition and contribution bring values to all the participants of the mentioned ecosystem. This is due to the fact that knowledge flows can run fluidly from the organization from the outside (inside out), or it can go on the other way around (outside in).

Another aspect that plays a fundamental role in the evolution of organizations is the fact that they are no longer totally populated by human beings, but computer systems, artificial intelligence and the digital world play a pivotal role in the flow of knowledge inside and outside companies. We have seen how the open system, of which online communities are part, offers significant advantages in terms of knowledge flow as these have unique characteristics that motivate members to contribute and implement existing knowledge by strongly pushing the processes deriving from innovation. This approach is also called interorganizational collaboration (IoC) (Giustiniano, Griffith, & Majchrzak, 2019)[83]. Interorganizational collaboration (IOC) is "a cooperative, interorganizational relationship that is negotiated in an

[83]Giustiniano, L., Griffith, T., & Majchrzak, A. (2019). Crowd-Open. and Crowd-Based Collaborations: Facilitating the Emergence of Organization Design. In J. Sydow, & H. Berneds, *Managing Interorganizational Collaborations - Process review.* Emerald Insight, Forthcoming.

ongoing communicative process, and which relies on neither market nor hierarchical mechanisms of control" (Hardy, Phillips, & Lawrence, 2003)[84]. In this context, information systems (IS) play a shaper role in the open innovation process, especially with regard to the crowd sourcing approach (Majchrzak & Malhotra, 2013)[85].

3.1 Definition of Crowdsourcing

The concept of crowdsourcing was firstly defined by Howe (2006)[86] as "function once performed by employees of an organization, now outsourced in an undefined network of people". Other academics provided deeper definition of crowd sourcing, defining it as "a type of online activity in which an individual, institution, non-profit organizations or company proposes to a group of individuals of varying knowledge via open call, the voluntary undertaking of a task". We can argue that crowd sourcing activities are any functions which implies the voluntary participations of a group of people or a community, that are non-employee, to undertake a specific task. In recent years, the crowdsourcing approach has also assumed an important role in academic research, in different areas of interest, passing from knowledge management to innovation or behavioral theories[87].

[84] It refers to collaboration among organizations, which not only help to transfers existing knowledge among them, but also facilitates the creation of new knowledge, thanks to the interactions with the external environment. Hardy, C., Phillips, N., & Lawrence, T. (2003). Resources, knowledge and influence: The organizational effects of interorganizational collaboration. Journal of Management Studies.

[85] Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation. *The Journal of Strategic Information Systems*, 257-268.

[86] Howe, J. (2006) The Rise of Crowdsourcing. Wired. 14

[87] Tab 1. shows how in the last 20 years the topic gravitating around crowdsourcing has become increasingly interesting for academic research in numerous areas and with a focus on different themes

Tab. 1 - Crowdsourcing research perspective

Author	Subject	Aspect discussed
Jeppesen & Lakhani (2010); Pénin & Burger-Helmchen (2011)	Knowledge management	Creating innovations, knowledge generation
Trompette P.; Chanal V.; Pellissier C. (2008); Chesbrough (2003, 2008)	Innovation theory	Creating innovations, knowledge generation
Afuah & Tucci (2012); Pénin & Burger-Helmchen (2011)	Behavioral theories	Problem solving
Hutter, K., Hautz, J., Fuller, J., Mueller, J., Matzler, K., (2011); Faraj, Jarvenpaa, Majchrzak (2011); Jin, Lee, Ba, Stallaert (2021);	Motivation theory	Motivation and participation in Online Communities and Crowdsourcing contests
Schlagwein & Bjorn-Andersen (2014)	Organizational learning	Generating knowledge from crowd contribution
Majchrzak A., Griffith T., Reetz D.K. (2018)	Organizational Design	Organizational performance and effectiveness

Source: Author's work based on crowdsourcing literature review

At the same time, crowd sourcing initiatives have acquired a fundamental role, both for companies and for institutions or non-profit organizations, in terms of innovation, ideas, acquisition of competitive advantage, cost reduction and knowledge sharing. The concept of crowdsourcing is closely linked to the concept of online community, and this confirms even more how these represent the ideal place to share and create new knowledge. The possibility of

operating and collaborating with actors outside the boundaries of the companies, means that organizational spaces defined as hybrid are created where the companies operate (Kim, Shin, & Jeong, 2016)[88]. The hybrid factor gives companies the opportunity to achieve unthinkable results by relying on traditional organizational systems. If we consider the networks with which crowdsourced organizations interface, as well as online communities, we realize that these benefit from the same characteristics such as the fluidity of the members, the exchange of interactions and exchange of knowledge. Therefore, in the same way, companies, institutions or non-profit organizations that embrace crowdsourcing practices will have a substantial fluidity in the change of tasks, members or market conditions. Nowadays there are different forms of collaboration with crowds (Giustiniano *et al.,* 2019)[89]: gig workers who work usually on short term (Uber, Gloovo, Justeat; see Barley, Bechky, & Milliken, 2017)[90]; non-profit organizations providing open source platform for OCs (i.e., Wikipedia and Linux projects; see O' Mahony & Ferraro, 2007)[91]; for-profit distributed innovation systems for the co-creation of products with innovation challenges for the crowd (i.e., Lego; see Majchrzak *et al.* 2018)[92]; competitive organizations developing complex technologies and systems for reinventing entire industries (i.e., HyerloopTT).

It may seem obvious that in addition to the structure of crowdsourcing, this approach depends heavily on the crowd itself. Being dependent on a vast crowd implies the value of knowledge diversity is high and this represent a theoretical fundament for crowdsourcing to be innovator. External knowledge is inevitably more diverse in experiences, ideas and expertise than internal knowledge or internal resources, with the high degree of diversity comes the possibility of a greater quantity and variety of ideas, ideally resulting in more innovative ideas (Bingham & Spradlin, 2012; Harris, 2014; Lin & LI, 2022; Gary & Nowland, 2017)[93]. Evidence

[88]Kim, T., Shin, D., & Jeong, Y. (2016). Inside the "hybrid" iron cage: Political origins of hybridization. *Organization Science*, 428-445.

[89] Giustiniano, L., Griffith, T., & Majchrzak, A. (2019). Crowd-Open. and Crowd-Based Collaborations: Facilitating the Emergence of Organization Design.

[90] Workers in these companies are completely independent from the company (meaning that they are not considered employees) and they decide autonomously when to join and work. Gig workers are indeed considered as "independent contractors", so they offer services to the public; this classification allow them to be not considered employees, but at the same time they do not have benefits and protection guaranteed to traditional employees. (Veena, 2019) (Jin, Kominers, & Shroff, 2021).

[91] O' Mahony, S., & Ferraro, F. (2007). The emergence of governance in an open source community. *Academy of Management Journal* , 1079-1106.

[92] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

[93] Bingham, A., & Spradlin, D. (2012). Diversity, Marginality and Serendipity. In A. Bingham, & D. Spradlin, *Open Innovation Marketplace: Creating value in the Challenge Driven Enterprise* (pp. 77-81).FT Press; Harris, E. (2014). The Impact of Board Diversity and Expertise on nonprofit Performance. *Nonprofit Management and*

is put in place by a number of studies which affirm that large diverse crowd perform better on certain tasks than small number of experts (Brabham, 2013)[94]. Therefore, the diversity of the individual composing the crowd and the vastity of the crowd, accompanied by high levels of social interactions, contribute to the creation of novel forms of knowledge, new ideas and subsequent innovation.

3.2 Effects of knowledge sharing in crowd-based context

As we have seen before, knowledge sharing is a fundamental aspect for new knowledge generation in online communities and open innovation approaches; when it comes to crowdsourcing contests, it not only allows to generation of new knowledge but also motivate collaboration among participants. Furthermore, some authors argue that the impact of knowledge sharing in crowdsourcing contest is even different from the impact of others online communities. The explanation resides in the fact that in crowdsourcing contests, the knowledge shared is strictly related to the task required to be performed, differently with other OCs where knowledge is shared only for the pleasure of doing it, or to satisfy the interests and needs of participants. These contests can on one hand bring more values in terms of innovation, due to the high level of collaboration and knowledge exchange during the contests, on the other hand participants may be stuck and anchored to the already shared solutions by other participants (Jin, Y. *et al.*, 2021)[95]. However, there are evidence suggesting that knowledge sharing in competitive crowdsourcing contest helps to create new knowledge and add value to the existing one. In crowdsourcing contests, users interact with digital platform seeking for a solution to the task provided in exchange to a reward prize. The competitive nature of these contests influences the participation to them (Bordeau, Helfat, Lakhani, & Menietti, 2016)[96], another influent aspect is the knowledge sharing features, defined interestingly by Jin, Y. *et al.* (2021), because it turns a pure competitive contest into a "coopetition" setting, describing cooperation between

Leadership, 113-130; Lin, C.-J., & LI, C.-R. (2022). Differential effects of team level expertise diversity and individual level expertise dissimilarity on creativity: the moderating role of member social skills and leader social behavior. *Current Psychology*, 2927-2937; Gary, S., & Nowland, J. (2017). The diversity of expertise on corporate boards in Australia. *Account Finance*, 429-463.

[94] Brabham, D. (2013). Crowdsourcing. *MIT Press*.

[95] Jin, Y., Lee, H., & Stallaert, J. (2021). Winning by Learning? Effect of Knowledge Sharing in Crowdsourcing Contests.

[96] Bordeau, K., Helfat, C., Lakhani, K., & Menietti, M. (2016). Performance responses to competition across skill-levels in rank order tournaments: field evidence and implications for tournament design. *Journal of Economics*, 140-165.

competing entities[97]. The "coopetition" setting requires each participant to have unique resources which can be best exploited in relation or in collaboration with the resources of the other parties. In crowdsourcing contest, the cooperation aspect can occur when setting up the project, sharing knowledge for the preparation steps for instance, such as sharing requirements or rules for the participation, or they can cooperate for the first tentative solutions. However, the final result of each participant should be unique and different in respect to other competitors. It is understandable that this kind of knowledge sharing is different from knowledge sharing of other OCs which fully collaborate and cooperate on any topics, while in crowdsourcing contests environment participants are tempted to keep secret the key resources. However, this kind of "coopetition" seems to provide better performance than where there is only competition or cooperation, because of the advantages provided by the two features combined.

Basically, crowdsourcing contests, operates by putting up an online community, where participants could communicate with each other, share information, answer to questions, make questions to contest holder and more generally sharing knowledge. Considering knowledge sharing as the one of the main aspects of collaboration, when it occurs in crowdsourcing contest, it helps to strengthen the so-called "coopetition" environment, where competitors are also nudged to cooperate and share knowledge. As it occurs in market that the "coopetition" setting can help to achieve competitive advantages, especially in innovation process[98], in the same way it helps participants of crowdsourcing contests to perform better.

Given the positive impact of knowledge sharing in crowdsourcing environment, it seems arguable, that sharing knowledge and the creation of new one, depends heavily on the participation of the crowd, as it occurs in any type of OCs. Reviewing the existing literature, we can identify 5 tensions (Faraj, *et al.*, 2011)[99] common to any OCs, that impact the contribution by members and subsequently, two different types of contribution in the crowdsourcing context: the process production and co-creation boundary management (Majchrzak & Malhotra, 2013)[100].

[97] The "coopetiton" definition comes from Bengtsson and Kock (2000), where two or more parties, benefit both from the cooperation and competition aspects of the relation. Each of them possesses unique resources that give competitive advantage, but these could be best utilized in combination with competitors' resources. Other authors like Hutter *et al.* (2011) refers to the same principle of competition and cooperation in communities with the term "communitition".

[98] (Chin, Boris, & Lam, 2008) They defined coopetition as a revolutionary and critical factor of success in Hong Kong manufacturing sector.

[99] Faraj, S., Jarvenpaa, S., & Majchrzak, A. (2011). Knowledge collaboration in Online communities.

[100] The author refers to participation architectures meaning sociotechnical systems design elements that embolden contribution made by individual to an open online source, making further distinction between production and co-

Faraj *et al.* (2011)[101] identify the fluidity of OCs in members and resources, the tensions that this fluidity creates and the way in which participants respond to these tensions, as a fundamental aspect of knowledge collaboration in OCs other than knowledge collaboration in traditional organizations. In his work, he identifies 5 tensions that influence the exchange of knowledge in OCs: (1) passion; (2) time; (3) socially ambiguous identity; (4) social disembodiment of ideas; (5) temporary convergence. Each of these 5 tensions has positive and negative consequences in the participation and collaboration in knowledge sharing within OCs.

3.3 Tensions impacting contribution in OCs

3.3.1 Passion

Passion is something that can be present both at the individual level and at group or collective levels, it motivates members to spent time and efforts in supporting and building the community. Members more passionate would be more willing to dedicate their time in the community. Passion has positive consequences in knowledge sharing since it motivates members to join the community and contribute in create new ideas and innovation. At the individual levels it represents a driver that motivate others to establish a common goal and collectively encourage the creation of knowledge. On the other hand, passion can create barriers to collaboration within OCs, in fact discrepancies between passionate individuals can lead to debate and interpersonal conflict, based on animosity and annoyance among parties. These kinds of conflicts, when are based on one-to-one incompatibility and not mitigate by third parties could become more difficult to solve it and often leading to a great probability of a win-lose situation, that typically implies the discontent of one party, rather than a win-win solution. Another negative consequence can occur when a group of passionate members ends up excluding and isolating new members which will eventually leave the community as they feel alienate from the rest of the community.

creation. Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation. *Journal of Strategic Information System*, 257-268.

[101] Faraj, S., Jarvenpaa, S., & Majchrzak, A. (2011). Knowledge collaboration in Online communities.

3.3.2 Time

The second tension, mentioned by Faraj *et al.* (2011), is time spent by members in contributing to the community. It seems arguable that knowledge sharing, and generation requires members to spent time and efforts in the community. The more time people spend interacting with other members, answering questions, responding to comments, evolving others' ideas, the more the knowledge can be created and shared. At the same time, dedicating a lot of time to the OC can implies negative consequences also. Indeed, individuals who spend more time in OCs in respect to others may influence excessively the knowledge sharing process, also prevailing those who spend less time to the OCs. This aspect is even more sensible if we consider the fluidity of membership of OCs. In fact, members can alternate period of intense contribution accompanied with a lot of time spend in contributing to the OCs, with period of low time spend in the OCs. This fluidity could have negative impact in the process of knowledge sharing and knowledge collaboration process.

3.3.3 Social ambiguity

The social ambiguous identity is another important aspect creating tensions between its positive and negative consequences in OCs. As OCs' boundaries are porous and permeable the identity of members and their contribution are likely to become separated. This separation leads to socially ambiguous identity (Faraj *et al.*, 2011). There are many positive consequences deriving from the ambiguous identity of participants. First of all, the lack of social identity identification by other members, reduces the bias deriving from stereotypes, status differences and social position, it is said that anonymity provides a "degree of liberation from social evaluation" (Pinssoneault & Heppel, 1997-1998)[102]. As a consequence, the context of anonymity in which members feel liberated from social evaluation, provides an environment in which they are more likely to have increased communication satisfaction and higher performance (Tanis & Postmes, 2007)[103]. Furthermore, ambiguity and anonymity encourage

[102] The authors referred to the concept of liberation from social evaluation as composed by 5 components: 1) lack of identification; 2) diffused responsibility among all the members; 3) proximity, indicating the degree to which people feel they are being observed by others; 4) knowledge of other members; 5) confidence group members have in the system. All these components compose the degree of anonymity and as a subsequence the degree to which individual feel liberated from social evaluation. Pinssoneault, A., & Heppel, N. (1997-1998). Anonymity in group support systems research: A new conceptualization, measure, and contingency framework. *Journal Management of Information Systems*, 89-108.

[103] The study was conducted with the participation of sixty-six undergraduate students at the University of Amsterdam. The participants were divided in two groups, in one group, members worked in presence of their personal information, while the other group worked in absence of cues of identity. They were stimulated to discuss

participation and encourages focus on merit and idea rather than on the social status of the contributors (Jessup, Connoly, & Tansik, 1990)[104], as one direct consequence of deindividuation[105]. On the other hand, the negative consequence is related to the construct of trust and accountability. The lack of social identification may be difficult to trust the other parties and therefore reduce knowledge contribution when the level of trustworthiness is low, basically because participants may be worried about not getting fair credit to their ideas or contribution. At the same time the negative consequences may push some members to build connections with other members, connect their ideas and align their positions, in order to feel more psychologically "safe" in the virtual community. With the passing of time, interactions and connections among members, would eventually help them to construct social identities of other members, reducing the social ambiguity. However, even in this case fluidity plays a pivotal role. Since membership is highly fluid in online communities, when new participants join the OC, the constructed social identity, based on contributions and ideas, of older members may return ambiguous to the new parties. As a consequence, these members may focus again on contributions and ideas to re-build their social identity.

3.3.4 Decontextualization

The fourth tension is related to process of unbundling and re-bundling of participants' ideas over the time. This process is defined as the "decontextualization" (Hughes & Lang, 2006)[106] of ideas or social disembodiment of members' ideas (Faraj *et al.*, 2011). The

a case through personal computers. The results shows that students that worked together without information describing the identity, performed better compared to those who had personal information of other members. Tanis, M., & Postmes, T. (2007). Two faces of anonymity: Paradocial effects of cues to identity in CMC. *Computer Human Behaviors* , 955-970.

[104] Jessup, L., Connoly, T., & Tansik, D. (1990). Toward a theory of automated group work: The deindividuating effects of anonymity. *Small Group Research*, 333-348.

[105] According to Festinger *et al* (1952), when individuals act as they are "submerged in the group", they stop thinking other members as individuals and feel that they cannot be singled out by others and that they cannot individually identified. The lack of inner restraints can bring a lot of positive consequences for groups; indeed, individual may be more prompt to propose new ideas, also risky ideas, reasoning on them and permits group members to reach solution that they cannot reach otherwise.

[106] The authors in their work, invoked the music industry as a tangible example of decontextualization of ideas. In particular they refer to the advent of digital tools such as iTunes, Movie player, and more recently Spotify. These tools offer the possibility to access to songs decontextualized from their original album for instance, with which users and communities can create their own playlists. Faraj *et al.* (2011) brought the example of ccMixter.org community, which created millions of music's pieces accessible to any members for remixing into new combinations. These new combinations than are shared once again with the community. Hughes, J., & Lang, K. (2006). Transmutability: Digital decontextualization, manipulation and recontextualization as a new source of value in the production and consumption of culture products. *39th Annual Hawaii International Conf. Systems*.

decontextualization happens because in digital environment, and especially in online communities, ideas can be independent from their authors and separate from the original context where they were created. The social disembodiment of ideas in any online communities, start from the assumption of knowledge as a public good, characterized by non-rivalry and non-excludability. All the members of an OC can pick ideas or contribution from other participants, elaborate and reformulate them, regardless of the provenience of those ideas, and then share them again with the community. There are significant positive consequences deriving from the disembodiment or decontextualization. Integration, reformulation and recombination of ideas are eased by the free access to others' ideas. On the other hand, the negative aspects refer to the lack of accountability of ideas and subsequent high possibility of misunderstanding or misapplying ideas and contribution, leading eventually to opportunistic risks (Faraj *et al.*, 2011)[107]. The tensions between these two consequences, related to disembodiment of ideas, on one hand can help to collaboration among members in order to integrate new ideas or innovate the existing ones, on the other hand the fluidity of OCs may dissipate the shared context over time, hurting collaboration that would come from new members who would have less comprehension of the contributions and may require more clarity around them.

3.3.5 Convergence

The last fundamental aspect impacting the contribution and fluidity of knowledge in OCs is the convergence. Convergence in groups work is a fundamental aspect to guarantee the success of the group's contribution. Indeed, a fair level of convergence around a goal, an objective, a purpose or an idea seems to be necessary to counterbalance all the divergences factors. When dealing with OCs, convergence is granted whenever knowledge collaboration occurs. However, considering the ability of OCs to evolve rapidly over time and given their fluid nature, also convergence is subjected to fluctuations over time, for this reason, it is considered temporary "incomplete" over time.

Indeed, in fluid OC, members are more prompted to have temporary interest and temporary convergence over general topics, collective interest, broad trend, rather than common goals. Referring to the work by Hughes & Lang (2006)[108], if we consider music communities, members will change their interests and subsequently convergence up to the music industry

[107] Faraj, S., Jarvenpaa, S., & Majchrzak, A. (2011). Knowledge collaboration in Online communities.

[108] Hughes, J., & Lang, K. (2006). Transmutability: Digital decontextualization, manipulation and recontextualization as a new source of value in the production and consumption of culture products.

trend and evolution. Temporary convergence, as the other factors of tension, has positive and negative consequences for OCs. Indeed, the absence of complete convergence allows knowledge and ideas, to evolve along different paths and directions. Ideas and contribution are therefore mutated and evolved by any member at any time he or she decide to participate. On the other hand, the incompleteness of convergence may interrupt the continuous of knowledge sharing and collaboration. Knowledge collaboration, as mentioned, occur any time which members of an OCs contribute to develop an idea by giving feedback, asking questions, providing answer and interacting with other members. However, when there is a lack of convergence, participants may have different criteria for evaluating an idea, different opinion that subsequently may slow or interrupt the process of collaboration.

Tab. 2 – Tensions impacting knowledge sharing and knowledge creation in OCs

Tension	Pros	Cons
Passion	Motivation in contribution	Barrier to collaboration in case of conflict
Time	The more the time spent by a member, the more the knowledge can be created	Discrepancies in time spent by different members can influence negatively the process of knowledge creation
Socially ambiguous identity	Reducing biases related to status differences, social position or stereotypes	Ambiguity may reduce the level of trustworthiness and accountability.
Social disembodiment of ideas	Integration, reformulation and recombination of ideas, generate new knowledge	Lack of shared context may bring to misunderstanding or misapplying of ideas
Temporary convergence	Ideas can evolve following different paths and directions.	Temporary interruption of collaboration process.

Figure 2: Based on Faraj, S., Majchrzak, A., & Jervenpaa, S. (2011). Knowledge Collaboration in Online Communities. Organization Science, 1224-1239.

3.4 Building contribution

The first aspect to consider before discussing about contribution in crowdsourcing context, is the distinction between two types of crowdsourcing, or better, two types of crowd-approach adopted by organization when they rely on crowdsourcing strategy.

We can distinguish two types of "crowd-openness" by organization. Indeed, an organization can be crowd-based, meaning that it cannot operate without the contribution of the crowd, so they are totally dependent on crowd. Some clear examples are Uber, Gloovo, Airbnb or Hyperloop (HTT)[109], most of these organization plays on both sides of the market, enabling intermediation between providers and customers. HTT is a different case because the design of the organization is totally in the hands of the crowd contributing to all the phases of the project from design to development and launch, indeed the HTT approach is also called as being "crowd-powered" rather than just crowd-based. The second type of organization's approach in crowdsourcing is to be crowd-open, meaning that they consist in traditional organizations involving crowd for develop new products or implement innovation to existing products as in the case of Lego explained below.

Contribution in online communities, open sources and crowdsourcing context heavily depends on the designed systems that are constructed to integrate the contribution and collaboration of all the participants, in order to reach innovation solutions. These systems are called participation architectures (O' Reilly, 2005; Wagner & Majchrzak, 2007; West & O'Mahony, 2008)[110], and implies any kind of open-source software or socio-technical framework established with the aim to strengthen communication and participation among

[109] This companies are heavily dependent on crowd, indeed without crowd they cannot exist. In particular in Uber and Gloovo, crowd involves customers but also employees that are considered as independent contractors. In this case the company build incentives systems to encourage independent contractors to work as much as possible. Airbnb is highly dependent on crowd, but it plays the role of intermediator between hosts and guests, it is a wide-used platform thanks to the high level of transparency given to all the parties involved. On the other hand we have HTT, which is totally powered by crowd, counting few employees composing the core team.

[110] The concept of "participation architectures" was introduced by O'Reilly (2005), who referred to this term as a mean to describe the nature of systems that are designed for user contribution. The author highlighted also that any systems designed around communication is designed for participation. Later on, other authors as (Bengtsson & Kock, 2000) introduced the technical architecture as socio-technical framework that enhance participation. O' Reilly, T. (2005). The open source paradigm shift. In J. Feller, B. Fitzgerald, S. Hissam, & K. Lakhani, *Perspectives on Free and Open Source Software* (pp. 461-482). Cambridge: MIT Press; Wagner, C., & Majchrzak, A. (2007). Enabling customer-centricity using wikis and the wiki Way. *Journal of Management Information Systems*, 17-43; West, J., & O'Mahony, S. (2008). The Role of Participation Architecture in Growing Sponsored Open Source Communities. *Industry and Innovation*, 145-168.

participants. Majchrzak & Malhotra, (2013)[111] identified two design dimensions of these architectures, that organizations consider when the seek to build an open-source communities: participation and co-contribution.

For what concern the production process in participation architectures, it enhances participation in crowdsourcing context by involving participants to a crowdsourcing web-based platform where all the instructions and rules on how to contribute are displayed. These practices are established with the aim to bring improvements and innovation into existing product for instance or to develop radical innovation with new service model or new solution to significant problems. One important example of this practice is presented by Lego. Lego was almost bankrupt in 2003 and with the advent of Internet, they decide to change their strategy and engage the crowd into their internal processes. The tangible example of their crowd-open strategy is available on their official site (lego.com). By opening their site, there is a section called "Lego ideas", with the voice "contest". In this section they provide challenges to the crowd related to their problem. This is a way through which a company operate over the boundaries and can open a window and declare the intentions of the next competitive challenge and they entered in the "customer-based ideas". In this case the positive consequence that the contributors know exactly what Lego is looking for, so there is a high level of convergence (or temporary convergence) to what the solution of the problem that the company has formulated. Participants are aligned with the proposal. The negative aspect is that all the competitors also know exactly what Lego is looking for. Subsequently, with this approach the organization lose ground on its strategic position, in other words they go from privacy to transparency, that allow them to have more ideas but also to lose competitive ground.

The second designed system for participation is the "co-creation boundary management" (Jarvenpaa, Lang, & Sirkka, 2011; Majchrzak & Malhotra, 2013)[112]. Co-creation boundary management refers to a system in which an organization decides to open its boundaries to the crowd, creating a bond of co-creation, with the peculiarity of providing a protocol or system that guarantees copyrights and possibly also an incentive system based on the contribution of the community members. When the incentives are of an intended as extrinsic, then participants

[111] Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation.

[112] Jarvenpaa, S., Lang, K., & Sirkka, L. (2011). Boundary management in online communities: case studies of the Nine Inch Nails and ccMixter Music Remix site. *Long Range Planning*, 440-457; Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation.

will contribute within contests, tournaments or competitions. However, Boudreau & Lakhani (2009)[113] reflects on the fact that incentives can also be intrinsic, for the satisfaction of seeing one's contribution and outcome developed by the company. Majchrzak *et al.* (2013) pointed out that incentives are not only based on members' outcomes but can also be based on contribution outcome. These incentives are dedicated for members who made more contribution by presenting more ideas, for instance. In the end, differently from other systems of crowdsourcing participation, in co-creation boundary management the organization providing the contexts owns all the copyrights deriving from all the entries[114].

3.4.1 Facilitator for contribution

In dealing with organization design as a continuous transformation, (Garud *et al.,* 2006)[115] highlights "the complementary roles that people, technologies, processes, and governance play". Giustiniano *et al* (2019)[116] in the context of organizations collaborating external crowds, consider opportunities for facilitation of this approach through: coordination technology; experimentation and equifinality. (1) The coordination technology aspect represents a facilitator when there is an interconnection between a given organization and the external crowd. This interconnection leads to interaction and contribution from generic link to complex exchange of knowledge (e.g. context or tasks to be solved or crowd-based complex products and systems; Hobday, 2000)[117]. When the level of guidance for emerging design is high, coordination technologies enact a limited scope of activities (e.g., sign-up for tasks). Alternatively, when the level of guidance[118] is low, contributors can propose new ideas and tasks, generating a demand for other coordination mechanisms (Giustiniano *et al.* 2019)[119]. (2) The experimentation by

[113] Boudreau, K., & Lakhani, K. (2009). How to manage outside innovation. *MIT Sloan Management Review*, 69-76.

[114] According to the authors, participants are previously informed, and basically, they give to the organization their intellectual property rights, in change of a chance to be rewarded. This implies that all the entries can be considered in future by the organization without providing any type of extrinsic reward to the participants.

[115] Garud, R., Kumaraswamy, A., & Sambamurthy, V. (2006). Emergent by design: Performance and transformation at Infosys Technologies. *Organization Science*, 277-286.

[116] Giustiniano, L., Griffith, T., & Majchrzak, A. (2019). Crowd-Open. and Crowd-Based Collaborations: Facilitating the Emergence of Organization Design.

[117] Hobday, M. (2000). The project-based organization: an ideal form for managing complex products and systems. *Research Policy*, 522-539.

[118] Guidance is intended as the level of guidance given by the organizations to design new emerging tasks and activities. Subsequently, in case of high level of guidance, the design of the scope is linked and strongly guided by the core of the organization. On the other hand, when the level of guidance is low, tasks and activities evolve and morphs over time and crowd and communities can play a role in designing them.

[119] Giustiniano, L., Griffith, T., & Majchrzak, A. (2019). Crowd-Open. and Crowd-Based Collaborations: Facilitating the Emergence of Organization Design.

participants, involves assignments, tasks that are pre-defined by the company (e.g. Lego crowd sourcing practices) or also experimentation without a clear explained scope related to the task (e.g. HyperloopTT)[120]. (3) Acceptance of equifinality. Equifinality is the possibility that in a dynamic, open system, the final observed state can be arrived at via different mechanisms and from different initial states[121] (von Bertalanffy, 1950[122]; von Bertalanffy, 1969[123]; von Bertalanffy, 1972[124]). Equifinality entails that a cultural system with different and multiple behaviors may have a high degree of convergence, even in absence of a shared common goal. In crowd-open organizations different routes (contributions) lead to the same end (Sarasvathy *et al.*, 2008)[125] bounded only by the challenge exposed to the crowd. In crowd-based contexts, given the extreme levels of uncertainty, when contributors participate by providing new ideas, solutions, and sharing different experiences, the magnitude of equifinality can become significant, facilitating the integration of their contributions (Garud *et al.*, 2008)[126].

3.5 The Hyperloop Transportation Technologies' (HTT) evidence

The case of Hyperloop Transportation Technologies is a large case that has become an emblematic example of the outsourcing of business activities through crowdsourcing processes. HTT consider the crowd, the OCs within the crowd and members participating in it, not only as a source of intellectual contribution but – much more extensively – as the real core of the business. Organization like HTT are trying not only to provide products but also to be disruptive for the entire existing organizational schemes. These organizations seem to take two exploratory risks at once: entering into an emerging market as well as using a previously untried organizational form that relies almost exclusively on outside contributors rather than employees. HTT, exploits their organization structure as an information processing mechanism

[120] HyperloopTT, as explained in the next paragraph, represent a tangible example where experimentation from members is not based on specific task-related scopes. This allows both the contributors (teams) and the external community to be not biased by a pre-announced scope, but to encourage share of ideas and knowledge from which generate innovation.

[121] Equifinality might suggest that multiple learning mechanisms are equally likely to lead to the same observed final frequencies of socially learned behaviors. Equifinality is something that occur is any open cultural systems (Barrett, 2019).

[122] von Bertalanffy, L. (1950). The theory of open systems in physics and biology. *Science*, 23-29.

[123] Idem. (1969). General Sysem Theory: Foundations, Development, Applications.

[124] Idem. (1972). The history and status of general system theory. 407-426.

[125] Sarasvathy, S., Dew, N., Read, S., & Wiltbank, R. (2008). Designing organizations that design environments: Lessons from entrepreneurial expertise. *Organization Studies*, 331-350.

[126] Garud, R., Jain, S., & Tuertscher, P. (2008). Incomplete by design and designing for incompleteness. *Organization Studies*, 351-371.

(Giustiniano *et al.*, 2019[127]; Jordan, 2017[128]; Galbraith, 1974[129]), and therefore uses information technology in a central coordination role for the actors operating at the edge of the organization. A goal is to minimize administrative work and coordinate crowd members such that contributing is as frictionless as possible. HTT new schema is designed to have external knowledge as the exclusive source of resources (Majchrzak *et al.,* 2018)[130], indeed together with the vision of revolutionize the transportation system, HTT is made unique by their organizational structure, with more than 50.000 members of the community involved in the development of the project, staffed by more than 800 part-time contributors (engineers, creatives, technologist in 52 multidisciplinary teams), 50 corporate and university partners and only 12 employees.

HTT was born from the minds of Ahlborn and Gresta[131], which were co-founder of JumpStarter.com. JumpStarter Inc. represents the key to understand their brilliant idea. JumpStarter Inc., founded in 2012, was a non-profit organization that aimed to create an online community, providing technology solution to enhance crowd contribution and collaboration to help entrepreneurs (Majchrzak *et al.,* 2018)[132]. The company then changed with the approval of "crowd-fund" by the Job Act of 2012, in a crowd-based organization playing the functions of an incubator where participants have the possibility to collaborate, share their ideas, projects and seek fund for their projects. In 2013, when Elon Musk firstly talked about hyperloop as the revolution of the transportation industry, Ahlborn posted a whitepaper on JumpStartFund.com asking opinion on the topic from the community. Lately Ahlborn established the new company Hyperloop Transportation Technologies, Inc.

[127] Giustiniano, L., Griffith, T., & Majchrzak, A. (2019). Crowd-Open. and Crowd-Based Collaborations: Facilitating the Emergence of Organization Design.

[128] Jordan, J. (2017). Challenges to large-scale digital organization: the case of Uber. *Journal of Organization Design*.

[129] Galbraith, J. (1974). Organization design: An information processing view. *Interfaces*, 28-36.

[130] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies. *Academy of Management Discovery*.

[131] Gresta is an Italian entrepreneur, he is the founder of Bibop S.p.A (a production and distribution company now owned for the 40% by Telecom Italia), co-founder of Digital Magics (startup incubators) and from 2013 co-founder of HyperloopTT. Ahlborn is a German entrepreneur, with past experiences in energy and design industries. He is co-founder and CEO of JumpStarter Inc. and co-founder of HyperloopTT.

[132] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

Hyperloop is a magnetically levitated capsule placed in a vacuum tube aiming to transport passenger for long distances at very high speed (Tavsanoglu *et al.*, 2021)[133]. The capsules are expected to be powered from lineal electromagnetic motors and would levitate in the vacuum through electromagnetics, creating a strong filed to lift them from the rails. In the HyperloopTT project, the low-pressure environment inside the tube is guaranteed by a vacuum unit, co-developed with Leybold GmbH[134]. The system is optimized to achieve and maintain low pressure in the tubes. The technology around levitation is a passive magnetic levitation system developed originally by Lawrence Livermore National Labs (LLNL)[135], allowing capsule levitation over an unpowered but conductive track.

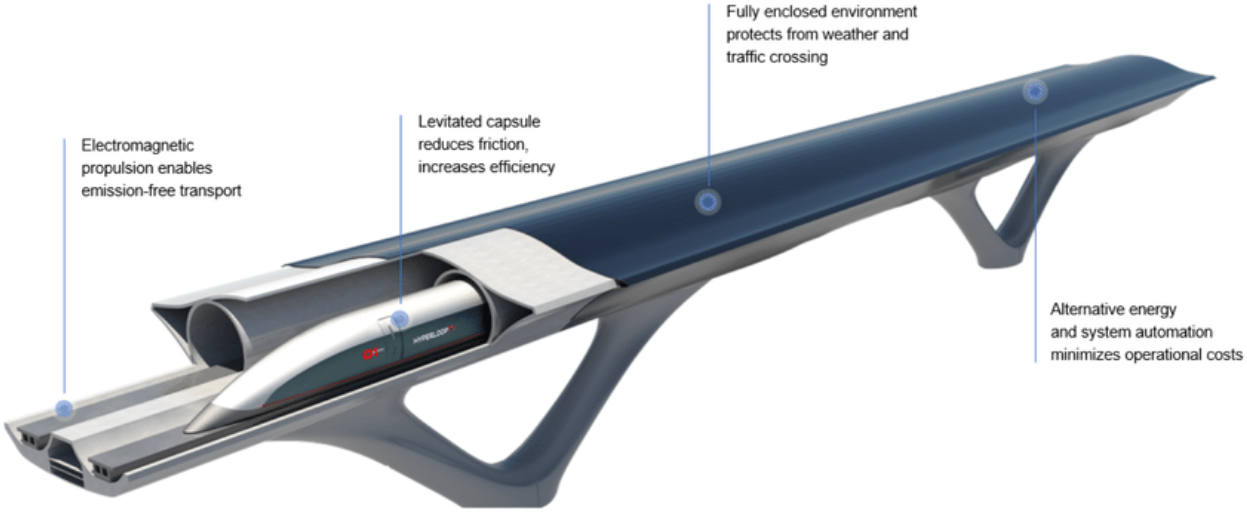

Figure 3: HyperloopTT system. Source: "Concepts of Hyperloop Wireless Communication at 1200 km/h: 5G, Wi-Fi, Propagation, Doppler and Handover"; Tavsanoglu et al. (2021)

With this new company, the aim of Ahlborn and Gresta was also to radically change the existing organizational structures, so they decided thanks to their experience with JumpStart, to adopt a crowd-powered approach and create a company completely relied on crowd. The very moment after the publishment of the white paper, Ahlborn and Gresta selected 100 top engineers and aerodynamics expert from around the world through the applications made on

[133] HyperloopTT (HTT) will have an average speed of 500 mph (804,672 km/h) with maximum speed at 760mph (1223,1 km/h). The actual capacity of capsules is now set to 30 passengers per capsule, while daily passengers will count more than 160.000. Source: https://www.hyperlooptt.com/technology/ . Tavsanoglu, Ali & Brisio, César & Carmena-Cabanillas, Diego & Arancibia, & Rafael. (2021). Concepts of Hyperloop Wireless Communication at 1200 km/h: 5g, Wi-Fi, Propagation, Doppler and Handover. *Energies*.

[134] Leybold GmbH is a company founded in 1950 producing Vacuum Pump Technology and systems for the generation of vacuum management engineering. Is now part of the Atlas Copco industry group.

[135] LLNL is laboratory research of Department of Energy of United States, operating in energy, defense, biosecurity, intelligence and science industries and managed by the University of California. https://www.llnl.gov/

JumpStartFund.com. These 100 specialists suspended their activities in their jobs to focus on dynamics and engineering of HyperloopTT project, in exchange of becoming stakeholders (Majchrzak *et al.* 2018)[136]. In 2016, they decided to hire a core team to work on strategy and provide governance in the new ecosystem. In 2018 after signing partnership with several innovative companies dispersed around the globe such as LLNL, C2i[137] and several agreements with private investors from Singapore, Abu Dhabi, UAE, India, USA and South Korea, they revealed for the first time the full-scale passenger's capsule. As for today they are developing feasibility study in Italy, Germany, South America, India, Singapore, South Korea and China[138].

As mentioned before, what makes unique this company is their organizational structure almost totally reliant on crowd and part-time contributors. The structure is called by Majchrzak *et al.* (2018)[139] a "onion structures" allows to a different level of intensity of knowledge sharing and contribution from all other organizations.

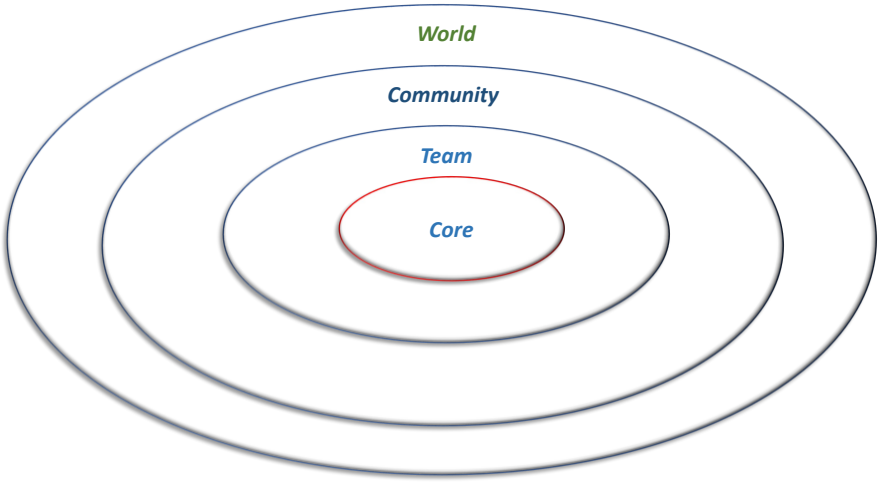

Figure 4: Formulated from company's documents, website and based Applegate et al. works (2017)

This structure enables also to define spheres of influence in decision-making process. At the very center of the structure, where the core leadership team lies, there is the greater degree of decision-making. In Fig. 2, the "core" counts 8 members corresponding to the Board of Directors, including CEO, Chairman and Chief Global Operations, and the Strategic and

[136] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

[137] Slovakian collaborator which engineers carbon fiber structures and helped HyperloopTT to build the skin material for capsule safety, called "Vibranium".

[138] Source: https://www.hyperlooptt.com/stories/

[139] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

Executive committee, where the higher degree of influence is concentrated, providing leadership and governance, even if they do not engage in day-to-day activities. The second sphere is composed by the teams, including employees, contributors, and independent contractors both full-time and part-time operating in several projects[140]. Each team is associated to a specific division between digital, engineering, marketing, legal, operations and finance, furthermore any division is conducted by one or more head specialists. The community involves all the members participating in the life of HyperloopTT, creating communities or movement on social media and it counts more than 50.000 individuals. The larger sphere includes all the external context, the potential sphere of influence, which comprises competitors, future talents, governments, and future consumers. This is perfectly in line with their vision to HyperloopTT is seeking to achieve the results by heavily using external knowledge that come at zero cost for the companies since all the participants, excepting for the core leadership team, work on voluntary basis. Adopting this structure, HTT is almost completely stacked into the relation to the crowd that gravitates around it. The presence of a core leading team, and teams divided into division aim to guarantee a good level solidity in maintaining the established vision together. However, as mentioned, given the guaranteed level of leadership, the crowd still plays a pivotal role in HTT's success, making the company almost completely dependent on them and dependent also on the dynamics present in the OCs. It turns, therefore, of extreme interest to understandhow the work is distributed among participants, how they contribute, how they are selected to be part of specific projects and how the high level of participation is conserved on the long run.

The recruitment process started in 2013 with the first 100 crowd members that expressed the willingness to work on a feasibility study for some week, in change of stock options. After these first 100 and with the completion of the studies, HyperloopTT enlarged the recruitment by making open call to the public to upload their application also with the initial support of JumpStarterFund. With the passing of time, they number of contributors increased sharply and exponentially, bringing more ideas and approach to recruit external knowledge. Among these, each team division with the supervision and approval of the head of division, provides the so-called "*talent pool"* or *"sprints"* to the external community (Majchrzak *et al.*, 2018)[141]. These two activities consist in context aiming to future talent in the community but also to share ideas

[140] Source: https://www.hyperlooptt.com/about/

[141] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

and knowledge with the external community. Teams propose micro-task, usually with short duration, considered as open-ended problems that members should solve, without any apparent scope. They also use task design systems aligned with the rapid evolution of crowds' dynamics, more particularly online communities' dynamics. By strongly suggesting to members to propose some tasks to be solved, for instance, allows that in case there is a new task aiming to solve a problem, this could be solved by members of the external community. Thanks to the dynamics of knowledge exchange and generation of ideas that are evident in the OCs, external can reason, share opinions, propose new approach and eventually solve the problem, without directly involving HTT. This practice not only leads to active collaboration by members outside the teams, but also creates an environment of "coopetition[142]", where also competition plays its crucial role. In fact, when in front of new tasks, two effective solutions to a problem, opposed to each other, are presented, multiple competing projects are created. Competition in this context naturally and instinctively increase the collaboration between the members of each project, even before, during or after the conclusion of the project. The condition that makes the system assembled by HyperloopTT even more interesting, is that none of the contributors nor teams of each division[143] are directed to perform a specific task's scope previously established by the core. Each team is free to provide any task, of any kind, to the community and in the same way contributors are required to create and solve micro-tasks in a completely autonomous way. Indeed, even members of the external community are enabled and encouraged to suggest tasks to solve at HTT, in order to integrate as much as possible their community, clearly composed of more and less experienced or talented people, thus creating a system of total openness, not only based on the crowd, but powered by crowd.

Beyond this amazing and extremely innovative system of division of labor, the duration of participation over time also plays an important role and therefore the system designed to manage incentives and the integration of contributions in the long run. First of all, it must be emphasized that the primary reason why contributors actively participate in the life of the community, interact with other members, contribute for the good of the project, is the common objective that unites them. Sharing the same interest and the same vision, of building something new, disruptive and possibly helpful for humanity, is the first factor that allow the convergence on basic ideas to remain solid and on high levels over time. This represents a clear example in which temporal convergence, in terms of ideas, has positive consequences on the community,

[142] See mentions at pages 5-6 and note n. 4

[143] Referring to the second sphere of influence presented in Fig. 1

as the project itself is born with the idea of evolving quickly over time following needs, interests and demands of future consumers. By operating in this environment, therefore, contributors are encouraged to interact with new ideas or new tasks, thus generating new ideas, which on their part need to evolve rapidly to keep up with the speed of ecosystem changes.

In addition to this, HTT uses semi-structured systems to incentivize collaboration and participation. One of these, mentioned before, is the talent pool that connects the contributors' group, or the teams to which the stock options are guaranteed, with the larger external community. From the latter ideas, suggestions and intuitions are taken through participation in micro-tasks without final purpose (Majchrzak *et al.,* 2018)[144]. As a result, it is the teams that must then put into action the contribution received from the external community, thus creating a social fabric in the online community built on the basis of the interactions and the networks they create, which acts for the success of the community. This is another aspect that consequently also enters the vision and culture of the company, according to which each contributor independently manages the degree of his contribution, without having a minimum or maximum of assigned tasks, and therefore acts for the pleasure of contributing to the vision of the community.

To sum up, HyperloopTT represents a tangible example of how the open approach aimed at including crowds and communities outside the traditional boundaries of companies, can bring numerous benefits in terms of costs for research and development, generation of innovation, new ideas and resolution of problems. This is due to the high level of interaction and exchange of knowledge that occur within the online communities, as extensively described in the previous chapters. Even more, HyperloopTT is not only a promoter of a crowd-based approaches but is in the right direction of being disruptor of the entire organizational structures and for the entire industry. By adopting practices to enforce participation and interaction, rarely used by other companies that operate closely with crowd-based contexts, they are changing the rules of the game and becoming a "catalyst organization" (Majchrzak *et al.*, 2018) [145]. One of the most interesting factors on a personal level, is that of not having tasks related to a specific purpose,

[144] Majchrzak, A., Griffith, T., & Reetz, D. (2018). Caralyst Organizations as a New Organization Deisgn for Innovation: The Case of Hyperloop Transportation Technologies.

[145] Ibidem. Authors refer to a new organizing model with low cost for relying on external knowledge, that are different for common collaborative community. They also define catalyst organization as an organizational form that (1) uses non-modular tasks division and allocation (HTT indeed uses tasks without a specific scope, often designed by the community itself); (2) integrate work in order to continuously push members to create new knowledge (integration between low and high level of specialists or new with old members help to develop new perspective and new ideas).

thus leaving both the teams and the external community free to freely design the tasks to be carried out, to think about any future problems and consequently also about possible solutions. This practice turns out to be even more convenient in terms of costs for interaction with the external community, already made low by the more "traditional" crowdsourcing systems. Subsequently, what makes the structure devised by HyperloopTT stable is the common vision shared by the members (whether they are contributors, teams or external communities), which creates a level of convergence, relative to common values, highly stable in the long term.

3.6 Future roots of knowledge sharing in blockchain-enabled OCs

We have seen how during the last decades, OCs have not only developed exponentially, but have become the basis of new cutting-edge organizational structures such as in the more general cases of crowd sourcing or the crowd powering case of HyperloopTT. This exponential growth is due to the extreme ability of OCs to create new knowledge, continuously exchanging ideas, opinions, judgments, reasoning and experiences, in highly dynamic and constantly evolving environments. These evolved from being spaces operating independently from organizations and sometimes only supplementary to them, to being totally integrated into their strategies. However, the organizational structures of new companies are destined to evolve and change further to adapt to the changes of the OCs themselves. For some years now, the role of blockchain has been taking an important position in the debates on the design of organizations and in the world economy. In fact, there is a growing recognition that blockchain technology can have a significant impact in changing organizations and the way individuals work and communicate, creating new scenarios hitherto unthinkable. At the base of this thought lies the possibility that this technology has to create new value for users, thanks to different factors such as security and transparency in communicating information and data. So, it is of great interest in this context to understand how blockchain technology can allow you to create added value to the community.

As we have seen previously, there are several factors that guarantee the success and exchange of knowledge, generating new values, within the OCs. Among these we have: the organizational structure, the use of IT and ICT, the sense of community and trust. To these factors must be added the technical factors of the blockchain that can impact the participation

of members within the community. Among these technical factors Zheng & Boh (2021)[146], identify 3 of them: (1) Token economy; (2) Accountability; (3) Security.

The token economy refers to an economic system closely linked to the blockchain. It can be an incentive value for all the miners who verify the transactions, which therefore verify the legitimacy in the creation of the new block deriving from the transactions to the chain and also can be created by the same companies to finance their own developments and can be traded by users, In return, investors holding the tokens can enjoy a set of rights afforded by the tokens, such as the ability to exchange the token for certain digital products or services (Adhami *et al.*, 2018)[147]. As for accountability, this is guaranteed by the decentralized nature of blockchains, thanks to the multiple nodes that are verified by multiple miners in the very moment when they are created. Accountability is closely linked to transparency, guaranteed by the possibility of being able to control every kind of transaction on the blockchain. In the context of OCs, this system also makes it possible to identify through a given transaction the behaviors of members of the community itself. In addition, any kind of transaction or block created on the chain, cannot be changed or modified in any way once generated, this in addition to transparency guarantees a high level of security to users of blockchain technology.

Therefore, these technical factors have an impact on the participation of members in OCs related to blockchain technology. But coming into practice, I would like to bring to light two practical examples of how blockchain technology can lead to an increase in knowledge sharing and value creation within the OCs themselves. The first example concerns the food industry, and the case of Moyee Coffee, a company operating in production and distribution of coffee, which has adopted blockchain technology to ensure transparency, accountability, and a high level of information exchange to all members of its community and to all consumers. The second example is Steemit, an online social platform that deals with the creation and care of digital content, which has built a token economy system to encourage the community to generate value and knowledge.

[146] Zheng, Y., & Boh, W. F. (2021). Value drivers of blockchain technology: A case study blockchain-enabled online community. *Telematics and Informatics*.

[147] Adhami, S., Giudici, G., & Martinazzi, S. (2018). Why do business go crypto? An empirical analysis of initial coin offerings. Journal of Economic Business, 64-75.

3.6.1 Moyee Coffee

Moyee Coffee is a Dutch coffee company, involved in production and distribution of coffee. It was born 9 years ago with the ambition to reinvent the coffee industry and share most of the revenues with coffee producing countries[148] with the new model called FairChain. Moyee Coffee, unlike others coffee producers, roasts their coffee beans where they are originally grown (Ethiopia). As a matter of fact, they are grown in their natural habitat, to avoid the destruction of the forests and the exploitation of fields. Moyee started to change the coffee industry, by developing the way in which coffee is grown, produced, distributed and sold. The dynamic innovation is the use of the Blockchain technology in their supply chain. Their primary objective is to achieve equity of 50-50 in value capture between producing and consuming countries with the aim of reducing inequalities. Moyee Coffee uses blockchain in order to design its own supply chain (called Fair chain) and provide a more transparent value chain, by recording data for any transaction.

The Moyee Coffee fair-chain is issuing mobile wallets, unique ID members for farmers and barcodes to ensure the transactions in order to pay their farmers digitally. With this technology they can geotag their farms and washing stations (in Africa) to ensure the location from which the coffee beans came from. And finally, they place QR codes onto their coffee bags. In this manner all consumers can verify the stages of the process, from where the coffee is produced, whom and how was paid and the carbon footprint, to show the impact on the environment too. This revolutionary supply chain brings a lot of advantages for the entire company. The utilization of the blockchain technology has brought positive impact in the business model with: (1) more transparency, indeed, customers who buys products of Moyee Coffee, through the use of an application and a QR code can verify all the steps from the production to the distribution. This transparency, heavily increase the knowledge share by consumers and members of the community on all the practice related to the coffee industry, but they can also verify the quality of their product. Another positive aspect is (2) traceability, in fact thanks to the use of FairChain every economic transaction along the supply chain is traced, from cultivation to roasting, up to the export and sale of coffee, and cannot be changed since it is locked to a block of the chain. So, the customer has the opportunity to know how much the farmer has been paid for his work, this is a great social benefit especially to the local population. Moyee Coffee in fact enhances

[148] Source: Moyee's Impact Report 2015. See: https://www.moyeecoffee.com/impact-2/?lang=en

the value of its coffee because it roasts directly in Etiopia, thus increasing the amount of money that remains in the producing countries.

3.6.2 Steemit

Steemit is a blockchain-based social media platform, involved in creating and curating digital content. The intriguing aspect of this platform is that it rewards members of the OC with platform token for posting and curating high quality content. It adopts a reputation voting mechanisms to identify content with higher quality. Steemit blockchain constantly mints[149] used to reward their members. Their challenge as exposed in their white paper[150] is to create an algorithm for scoring individual contributions as a fair assessment of the subjective value of each contribution. With their own cryptocurrency, they operate on the basis "one-STEEM, one-vote", with this model, individual that contributed most to the platform (measured on their account balance), have the most influence over how contributions are scored. In this context, STEEM is their currency that can be converted and exchange with other currencies but also can be swapped into "Steem Power" (SP) or "Steem Dollar" (SBD). SP is an access token that grants its holders the voting power, the more the SP one member have the more is his/her vote influent. While Steem Dollar is used to provide STEEM token as a stable coin designed to be pegged to USD1[151]. With tokens minted and distributed directly from Steemit blockchain, the OC provides more incentives for member to contribute (Zheng & Boh, 2021)[152].

In this context, is really important the role of the reputation ranking system that will determine how many tokens members will receive for their contribution. The peculiarity of Steemit, is that differently from any "traditional OC", where the ranking and reputation system is control and managed centrally by founders or moderators, in Steemit the system is automatically operated with smart contracts[153] on blockchain. Meanwhile, the token economy

[149] Minting is the process of creating or producing a new block, validating information of the new block and recording that information.

[150] Source: https://steem.com/SteemWhitePaper.pdf

[151] These kind of token or cryptocurrencies are also called 'stable coin', because their value is fixed and anchored to another asset. Stable coins track the chosen assets making their value pegged to the asset mentioned (Baur & Hang, 2021).

[152] Zheng, Y., & Boh, W. F. (2021). Value drivers of blockchain technology: A case study blockchain-enabled online community.

[153] Smart contracts are types of agreements embedded in blockchains that enable the contractual terms of such agreement to be enforce automatically without the intervention of a trusted third party or of a centralized system (Zheng, Z., et al., 2020).

enabled by blockchain also guarantees that members with high SP balance will not abuse the voting system because the reputation of the whole community is closely tied to the economic value of the tokens they hold. They may have more to lose if the economic value of tokens falls due to abuse than what they might gain by voting for themselves. As such, using blockchain technology as the basis for the reputation system enables online communities to ensure fairness and transparency. In conclusion, these two examples represent current and significant cases of value creation and knowledge exchange within OCs, which use the support of the blockchain to intensify contributions (Steemit) or to improve the quality of the information exchanged (Moyee Coffee). In this regard, looking at past experience and how quickly the environments in which CBs and organizational structures are involved evolve, it is important to direct future research towards new developments that these can have thanks to new technologies that are growing dramatically, such as blockchain technologies and web 3.0. The boundaries of more modern organizations that rely on OCs and blockchain technologies, have even more porous boundaries than those seen previously. It would therefore be interesting to understand the benefits they can bring in terms of knowledge exchange, transparent exchange of information, generation of ideas, innovation, collaboration between geographically dispersed members, but also transparent and secure cooperation and interaction between companies.

Conclusion

The aim of the work was to highlight the importance that online communities have in creating knowledge for upcoming and existing organizations. These, indeed, are characterized by a highly dynamic and constantly evolving environment, with a high level of interactions among participants, allowed by the advanced developments in the digital field of information technology (IT) systems and information and communication technologies (ICT). The environment surrounding online communities therefore represents a highly stimulating space for the exchange of knowledge, ideas, information and experiences among members, thus generating new values and new knowledge, with an ease and speed paced, not sustainable for traditional organization or physical communities.

One of the first factors analyzed in the work, refers to the new forms of digital sociality developed in online communities, which guarantee fluidity in their dynamics and in the exchange of knowledge. Sociality is certainly different from the kind of sociality that exists in face-to-face interaction, digital sociality, in fact, is characterized by faster interactions and rapidly evolving relationships. If we consider OCs as dynamic and adaptive systems, which are able to morph and evolve over time, with porous boundaries changing together with members and interactions, it seems understandable that fluidity plays a pivotal role, making knowledge sharing and creation possible. These rhythms at the same time are not sustainable by offline communities.

Beyond the type of sociality that guarantees a high level of interaction and fluidity in the exchange of knowledge, there are significant factors that impact the contribution of each participant. These include the sense of community (SoC) to a particular group and the construct of trust. These first two aspects are strongly linked to digital sociality. The sense of belonging to a specific community, is based on the needs and interests of the members of a given community who interact around a common interest. The second aspect, the construct of trust, is fundamental for any kind of collaboration between members and in the contexts in which online communities operate it seems to be an easily achievable goal by members. Trust in digital spaces is not based on emotions, social position of other parties or standing of interlocutor, but rather is shared rapidly by default in order to continue the collaboration. Indeed, the “swift trust” is a characteristic of online communities due to the rapid engagement in interactions. The last two fundamental aspects impacting collaboration in OCs, are the utilization of IT and the organizational structure. In fact, the use of IT is the main means that allows smooth and fast interaction between the members of online communities, but at the same time also the

organizational structure can largely impact collaboration and contribution. If we think of a structure with rigid and well-defined boundaries, it becomes difficult to imagine at the same time a space where online communities, characterized instead by fluid dynamics, can operate effectively.

In this regard, in recent decades there have been numerous examples of organizations that have changed their strategy and structure going in the direction of open approaches rather than pursuing traditional approaches, where the development of new ideas and innovations took place only within organizational boundaries. The open approach, also called "open innovation model" can take different configurations. In the work the model described is the one related to crowd sourcing strategies. These kinds of strategies involve an inevitable direct interaction with the external knowledge residing in consumers or members of certain online communities. In addition to the significant reduction of cost for research and development, the crowd source approach allows a high exchange of knowledge both from the external environment to the organization, in terms of ideas, and between the same members of the external environment. The effectiveness in generating knowledge and added value is so powerful that today there are organizations that are almost completely crowd powered. The most relevant example is represented by HyperloopTT which has thousands of contributors who work to the development of the project voluntarily. This happens due to the incredible organizational structure set up by HTT, that manages to exploit all the positive aspects characterizing the dynamics present in the OCs. Even more, HyperloopTT is not only a promoter of a crowd-based approaches but is in the right direction of being disruptor of the entire organizational structures and for the entire industry. By adopting practices to enforce participation and interaction, they are changing the rules of the game and becoming a “catalyst organization”. Leaving both the teams and the external community free to autonomously design the tasks to be performed, to think about any future problems and consequently also about possible solutions. This practice turns out to be even more convenient in terms of costs for interaction with the external community, already made low by the more "traditional" crowdsourcing systems. However, considering the high level of evolution that characterizes both digital environments, in general, and online communities, in particular, it is extremely important to ask what are the possible future approaches that can be endorsed to stimulate even more the exchange of knowledge and the generation of knowledge. In this sense, online communities based on blockchain technology seem to be increasingly gaining ground in the digital world, guaranteeing transparency, security and new incentive systems based on the token economy that are added to the already existing motivating factors for contribution in online communities. The benefit of blockchain

technologies have not yet been fully discovered. It is undoubtedly true, that blockchain technologies represent a new means useful to ensure high level of knowledge sharing between individuals. Therefore, this strand of research will undoubtedly assume importance in future research around organizational design, knowledge management and innovation management.

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Summary

In last decades, the role of online communities as sources of knowledge has become extremely relevant. The exponential development of information technologies (IT), together with the expansion of the digital world, lead online communities not only to expanded broadly but also to become an increasingly important space for the exchange of knowledge and the creation of value. The term community comes from the Latin word "*communis*", which indicated something common, public and shared by all, so the term "*communitatem"* indicated belonging to a group of people who shared something in common. To date, the term "community" indicates a group of people united by geographical origin, demographic or simply by interests and needs.

The concept of online community develops its roots in different areas of interest. The first one can be identified in the development of Electronic Data Interchange (EDI). With the passing of time online communities started building connections with different tools and purposes. Email system was developed in the beginning of 70s and was one of the first and still the most frequently used communication tool on the Internet. Another tool developed in those years and still largely used by companies are the bulletin boards. All these innovations together, enhanced the communication process between Internet users, making information easier to find, faster and asynchronous, meaning that the partners do not have to be co-present when the information is sent. Another pivotal development in the history of online communities and more in general of Internet, was the release, in 1989, of the World-Wide-Web (WWW). The invention of the world wide web has opened the door to hundreds of further technological innovations that are still in progress and in complete development. In light of these developments, we can informally define an online community as a collective group of entities, individuals or organizations that come together either temporarily or permanently through an electronic means to interact on a common problem or interest space. An online community is a virtual form of a community whose evolution has closely paralleled the developments in the worldwide Internet revolution (Tapscott & Williams, 2006).

The very first factors founding online communities are information, that lies also at the basis of communication process. The increasingly uses of information technologies systems made possible high levels of interaction inside and outside organizations, which consequently allow

the companies to increase productivity and acquire competitive advantage thanks to the fluidity of information's exchange. As online communities expand with the passing of time, research studies have sought to identify the online spaces in which they operate as new business models. In this regard, 3 areas were identified by Hagel and Armstrong (1999) to define the contexts in which information, knowledge and value are created and shared by virtual communities intended as new business models. Starting from the concept that virtual communities are defined by bringing people together with a common set of needs or interests they identified 3 types of virtual communities: (1) Community of interest; (2) Community of relationship; (3) Communities of transaction. In the first case communities are built around a specific area which unite individuals according to their interest. The second type of community is based on demography and geography and therefore on the interactions between members based on their demographic/geographic space. The last type is intended as business-to-business or business-to-consumer virtual communities. This space is mainly used for sharing information and knowledge around a specific business and it can be used both by members doing the same job to share information about their activity and by business to target consumers. Furthermore, online communities are classified upon other factors as: attributes, support software, relationship to physical communities and their boundlessness. Attributes involve shared goals, shared activities, access to shared resources or intense interaction. Classifying communities on support software means distinguish different OCs according to the software they use as a mean to support communication, that can take form of newsgroup, bulletin, listservers, social media and so on and so forth. Furthermore, many OCs are based on physical communities and in particular on news, events, people and location in the physical world. These kinds of community are usually geographically based. The last classification is based on boundedness. The design, or community members actions determine the level of boundness. For instance, online community can be built depending on the type of job, geographic area, or being part of a specific population.

Once defined the classification of online communities is therefore important to understand the basic motivation that led to contribution in OCs. The existing literature focuses mainly on 3 aspects: (1) the reasons why people participate in virtual communities and the motivations that push individuals to interact with people they do not know within them and above all to maintain a high level of interaction over time; (2) secondly on the amount of activities carried out by members within communities and the various levels of interaction and activities and (3)

thirdly on the analysis of information and data circulating within or between different virtual communities.

As for the first macro-research group, the interaction within a virtual community is mainly based on the identification of an individual within the selected group and his commitment based on different motivations. Engagement within online communities strongly depends on identification in a specific group of persons, intended as cognitive awareness of and emotional investment in group membership (Ashforth, Harrison, & Corley, 2008). Secondly, much less is known about the activities of members, the inner workings of communities, or the processes and technologies that support them. Many of existing OCs are composed by a core team which contributes most to the community and members who engage sporadically according to their interests, needs and affects. A third strand of research focused on data sets and analysis of information. it well describes the information that is being shared and the value of this information for networks. Indeed, thanks to IT artifacts that facilitate digital interaction, information technologies are the mean to create networks. Data and information used by platforms aim to increase digital interactions between users, however, the presence of networks does not also imply the presence of an online community, as users in network are not inclined to interact with each other and to share information.

The focal point that combines all the strands of research concerns the contribution that participants make within each online community and consequently their behavior in contributing, driven by motivational factors. Scholars have identified a diverse set of factors that drive contribution behavior ranging from economically driven extrinsic motives to psychologically based intrinsic motivation and sociologically driven pro-social motives. Indeed, intrinsic psychological identification in OC has been found as a key driver of contribution behavior that are crucial for the success of online communities. Identification in a specific community will enforce the voluntary contribution of members together with the community credibility. On the other hand, extrinsic economical motivation is another driver of contribution that does not necessarily replace the social reasons for participation in a community, indeed some studies show how the interaction between extrinsic and intrinsic motivations involves a greater voluntary contribution from members.

As for what concern the creation of knowledge, it is developed in OCs due to their unique patterns, characterized by the ability to quickly connect people who are geographically dispersed but who are linked by different factors and motivations (i.e. interests, needs, intrinsic

and extrinsic motivation). In particular, the unique affability of OCs is reflected in the aspects of fluidity.

If we consider OCs as dynamic and adaptive systems, which are able to morph and evolve over time, with porous boundaries changing together with members and interactions, it seems understandable that fluidity plays a pivotal role, making knowledge sharing and creation possible. Fluidity is firstly reflected in the participation of members, in the sense that barriers to entry or exit are porous as the boundaries, therefore is difficult to estimate who is inside or outside the OC, members enter and exit at any time. Secondly, fluidity also defines the rapid changes in resources and their dynamics.

In the second chapter, the aim is to explain, first of all, the distinction between explicit and implicit knowledge. Consequently, the focus is to describe what are the factors that influence the share of knowledge, both implicit and explicit, in online communities. Among these, by reviewing the existing literature, four main factors are highlighted: (1) the organizational structure; (2) the utilization of IT systems; (3) the construct of trust; and finally (4) the Sense of Community. All these factors play a fundamental role in understanding the fluidity in the share of knowledge within virtual spaces. After outlining the factors that most impact the exchange of knowledge, the chapter defines the dynamics that involve the processes of creating new knowledge starting from the sharing of implicit and explicit knowledge.

In the last years, it is undoubtedly true that knowledge became a key aspect in management and a strategic organizational resource regardless of the economic sector, industry or type of organization and it also represent a mean to create new value for organizations. The first author to emphasize the importance of knowledge for organizations was Grant in his knowledge-based theory. He argued that knowledge is the most important input and output for organizations. In fact, each product is not more but the result of an internal knowledge input that culminate in new output created thanks to the modification and processing of the initial knowledge. The peculiarity of these inputs and outputs is that they are composed by knowledge, so they are composed by a public good; therefore, endowed with non-rivalry and non-excludability. The

view of knowledge as public good consequently brings problems related to transferability and capacity of aggregation.

The problem of transferability leads to a first major necessary distinction: the difference between implicit and explicit knowledge. The latter corresponds to "knowing about" and represents any type of knowledge that can be encoded or transcribed and transmitted to another individual. Implicit knowledge, on the other hand, cannot be encoded and can be transmitted only through application or interaction with people, so it is difficult to replicate and imitate. Therefore, this represents the most difficult type of knowledge to transfer and share and what ensures the exchange of implicit knowledge is the interaction and communication with other individuals. However, the sharing knowledge does not consist only in the sharing of information through communication but involves deep interactions between individuals and involves factors that significantly impact the process, especially in online communities.

For what concern the four main factors impacting knowledge sharing, the first one is the organizational structure. It is generally categorized into three elements, such as, formalization, centralization and integration. The level of each of these 3 elements defines the organizational structure. Organizations with high levels of formalization, there are specific standardized procedures which interfere with the flexibility requested for internal innovation. It seems arguable to convey that less formalized structure allows employers to behave freely in accomplish their task, giving space to creativity and new ideas. Centralization means the degree to which decision are concentrated to the top managers of the company. High level of centralization allows company, and top managers, to define precisely the strategy and the behaviour of the firm. On the other hand, if decision-making process are only concentrated in the hands of top levels manager, the opportunity to see proactive behaviour in employers, for instance in solving problems, are very low. Integration means exactly what Grant referred to in the knowledge-based theory: coordination within the company. The degree of coordinated activities of separate employers in the organization represents the level of integration. Low level of integration implies lack of communication within the company, low level of knowledge sharing and slow innovation process. To adapt to these 3 elements, organizations in recent times have adapted their approach, incorporating open models in order to integrate external and internal knowledge. This model is called the "Open Innovation Model" (Chesbrough, 2003). The Open Innovation model is based on the concept of exploit the abundant knowledge to provide value to the company that created it. However, the knowledge created should not be locked to its internal market pathways or only to bring internal knowledge to the market,

companies can take profit from others' use of that knowledge or technology through frequent collaborations. At the same time, this model enhances the opportunity to find great ideas without blocking the ones that do not seems good from the very first moment.

The second factor is the utilization of IT. The evolution of IT, transformed the storage, encoding, transfer and development of information a quick and easily manageable operation. Consequently, it also facilitated the exchange of both explicit and implicit knowledge between individuals. As for what concern explicit knowledge, also called systematic knowledge, it refers to that type of knowledge that can be written on a document and sent to others (for example: rules, norms, data, copyrights, contracts, licenses etc.). Explicit expressed knowledge can be easily captured, encoded, shared and stored for a long period through IT systems. For what concern, the implicit knowledge, that is easy to transfer, there is an ongoing debate around the usefulness of IT for this kind of knowledge. In this case, the main argument is that IT systems do not serve to capture knowledge as for explicit knowledge, but offer tools that can facilitate communication, exchange of ideas, experiences, and the dissemination of global best practices. For example, a team, or a group of geographically dispersed colleagues, can use the functions of IT systems to share ideas or gain expertise informally.

The construct of trust is a fundamental aspect and an incredible facilitator in communication in any kind of organizations or group of people. Knowledge arises from the process of communication between individual, if people do not cooperate there is no space for knowledge sharing and, in this sense, trust is one of the bases for cooperation. In particular, trust is even more important when dealing with transfer of tacit knowledge, which requires the willingness of individual to share their experiences, intuition or judgment. In organizational literature, trust is based on the fact that individuals of a specific group or companies are characterized by shared values. So organizational trust is based on reciprocity and lies on the organizational culture of the company, it allows cooperative behaviours, leading to transfer of knowledge. However, the process of building trust in companies is a long-term process which requires a lot of efforts and depends on several factors such as: organizational culture, communication systems efficiency, interpersonal relationship, sense of belonging, individual factors and factors depending on knowledge (type and quality of knowledge). When dealing with online communities, the construct of trust is another unique affordance regarding knowledge sharing and knowledge creation. In particular, the unique aspect is given by the rapidity with which trust take form in online communities, this is why is said that there is a swift trust. Indeed, trust do not seem to decrease in absence of physical interaction. The possibility to have access in any moment and

in any space, attract higher number of members in respect to physical interaction. As a consequence, the presence of highly rapid interaction creates a sense of fast paced engagement in social relationships, accelerating the trust processes and share of knowledge.

Last factor is the Sense of Community, meaning the sense of belonging to a specific group of people (organization or community) with which you can share your thoughts, ideas, interests, needs and experiences. The Sense of Community (SoC) is determined by two main factors: connectedness and learning. The first represents the perception of being connected with other members of the community and implies factors as cohesion and trust in peers. The second one stand for the sense of being involved in creation of knowledge, in sharing values and trusting other members' expertise and knowledge. The more are higher the degree of these two factors, the more improved will be the Sense of Community.

In the end, the second chapter exposes the process of knowledge exchange within online communities, starting from the work done by Faraj (2016). There are 4 different processes of knowledge transfer: the conversion from tacit to tacit, from implicit to implicit, from implicit to explicit and finally from explicit to implicit. In these conversion processes, it turns out that the factors indicated above (mainly IT utilization, digital social interaction, fluidity in membership and abundancy of knowledge) also play a fundamental role in all kinds of knowledge conversion.

Previous chapters depicted how organizations during the last decades adapted structures and management approaches to the constant evolution of the external environment. Traditionally, organizations are characterized by well-defined organizational structures, with rigorous boundaries, where it is easy to understand what the companies develop inside and what outside the boundaries. In recent times, with the advent of "openness", these companies adapted their structures, building porous and multiple boundaries, in order to constantly integrate, in a fluid way, external resources inside the company. This evolution also stems from the need to exploit the knowledge living outside the company and, at the same time, to make internal knowledge available to the market, building connections and networks with the external environment, typically considered as outside the company. With the process of "openness", companies do not operate in isolation, but exchange knowledge and expertise outside their boundaries. These

extremely active system of cooperation, competition and contribution bring values to all the participants of the mentioned ecosystem. This is due to the fact that knowledge flows can run fluidly from the organization from the outside (inside out), or it can go on the other way around (outside in). The last chapter aims to highlights the practices currently widely used by organizations to integrate online communities within their structures and strategies. In particular, reference is made to crowd-sourcing practices that today represent a key element in the success of numerous and well-known organizations. Crowd sourcing is defined as a function that was traditionally performed within organizational boundaries but is now outsourced outside the boundaries.

The concept of crowdsourcing is closely linked to the concept of online community, and this confirms even more how these represent the ideal place to share and create new knowledge. The possibility of operating and collaborating with actors outside the boundaries of the companies, means that companies have the opportunity to achieve results difficult to achieve by relying only on traditional organizational systems. Indeed, if we consider the networks with which crowdsourced organizations interface, as well as online communities, we realize that these benefit from the same characteristics such as the fluidity of the members, the exchange of interactions and exchange of knowledge. Therefore, in the same way, companies, institutions or non-profit organizations that embrace crowdsourcing practices will have a substantial fluidity in the change of tasks, members or market conditions.

For what concern knowledge sharing and knowledge creation in crowdsourcing contexts, their impact is different from the impact on general OCs. The explanation resides in the fact that in crowdsourcing contests, the knowledge shared is strictly related to the task required to be performed, differently with other OCs where knowledge is shared only for the pleasure of doing it, or to satisfy the interests and needs of participants. These contests can on one hand bring more values in terms of innovation, due to the high level of collaboration and knowledge exchange during the contests, on the other hand participants may be stuck and anchored to the already shared solutions by other participants (Jin *et al.*, 2021). However, there are evidence suggesting that knowledge sharing in competitive crowdsourcing contest helps to create new knowledge and add value to the existing one. In crowdsourcing contests, users interact with digital platform seeking for a solution to the task provided in exchange to a reward prize. The competitive aspect characterizing crowd sourcing contexts, represent a stimulus to create new knowledge and to innovate. This context turns in a so called “coopetition” environment, where cooperation and competition are both present. Indeed, cooperation occur when, for instance, a

project is launched and the members of the crowd share opinions, ideas and basic knowledge useful for start working on the project, and in the initial phase. Therefore, they are highly involved in cooperation in the first phases of the contest. Subsequently, each individual will use their unique knowledge to engage in the competition and be able to win the eventual contest. This kind of "coopetition" seems to provide better performance than where there is only competition or cooperation, because of the advantages provided by the two features combined. Basically, crowdsourcing contests, operates by putting up an online community, where participants could communicate with each other, share information, answer to questions, make questions to contest holder and more generally sharing knowledge. Considering knowledge sharing as the one of the main aspects of collaboration, when it occurs in crowdsourcing contest, it helps to strengthen the so-called "coopetition" environment, where competitors are also nudged to cooperate and share knowledge.

Given the positive impact of knowledge sharing within crowd sourcing contexts, it is equally interesting to comprehend what are the factors that lead to effective contribution. Faraj (2011), identifies 5 tensions that influence participation both in OCs and in crowd sourcing contexts: (1) passion; (2) time; (3) social ambiguity; (4) decontextualization of ideas; (5) convergence.

Passion is something that can be present both at the individual level and at group or collective levels, it motivates members to spent time and efforts in supporting and building the community. Members more passionate would be more willing to dedicate their time in the community. Passion has positive consequences in knowledge sharing since it motivates members to join the community and contribute in create new ideas and innovation. On the other hand, passion can create barriers to collaboration within OCs, in fact discrepancies between passionate individuals can lead to debate and interpersonal conflict, based on animosity and annoyance among parties.

The second tension is the time spent by members in contributing to the community. It seems arguable that knowledge sharing, and generation requires members to spent time and efforts in the community. The more time people spend interacting with other members, answering questions, responding to comments, evolving others' ideas, the more the knowledge can be created and shared. This aspect is even more sensible if we consider the fluidity of membership of OCs. In fact, members can alternate period of intense contribution accompanied with a lot of time spend in contributing to the OCs, with period of low time spend in the OCs. This fluidity

could have negative impact in the process of knowledge sharing and knowledge collaboration process.

As OCs' boundaries are porous and permeable the identity of members and their contribution are likely to become separated. This separation leads to socially ambiguous identity, the lack of social identity identification by other members, reduces the bias deriving from stereotypes, status differences and social position. At the same time, the lack of social identification may be difficult to trust the other parties and therefore reduce knowledge contribution when the level of trustworthiness is low, basically because participants may be worried about not getting fair credit to their ideas or contribution. At the same time the negative consequences may push some members to build connections with other members, connect their ideas and align their positions, in order to feel more psychologically "safe" in the virtual community.

The fourth tension is related to process of unbundling and re-bundling of participants' ideas over the time. The decontextualization happens because in digital environment, and especially in online communities, ideas can be independent from their authors and separate from the original context where they were created. The social disembodiment of ideas in any online communities, start from the assumption of knowledge as a public good, characterized by non-rivalry and non-excludability. There are significant positive consequences deriving from the disembodiment or decontextualization. Integration, reformulation and recombination of ideas are eased by the free access to others' ideas. On the other hand, the negative aspects refer to the lack of accountability of ideas and subsequent high possibility of misunderstanding or misapplying ideas and contribution.

The last fundamental aspect impacting the contribution and fluidity of knowledge in OCs is the convergence. Convergence in groups work is a fundamental aspect to guarantee the success of the group's contribution. When dealing with OCs, convergence is granted whenever knowledge collaboration occurs. However, considering the ability of OCs to evolve rapidly over time and given their fluid nature, also convergence is subjected to fluctuations over time, for this reason, it is considered temporary "incomplete" over time.

Contribution in online communities, open sources and crowdsourcing context heavily depends on the designed systems that are constructed to integrate the contribution and collaboration of all the participants, in order to reach innovation solutions. Majchrzak (2013) identified two

design dimensions of these architectures, that organizations consider when the seek to build an open-source communities: participation and co-contribution.

For what concern the production process in participation architectures, it enhances participation in crowdsourcing context by involving participants to a crowdsourcing web-based platform where all the instructions and rules on how to contribute are displayed. These practices are established with the aim to bring improvements and innovation into existing product for instance or to develop radical innovation with new service model or new solution to significant problems. One important example of this practice is presented by Lego. They provide challenges to the crowd related to their problem. This is a way through which a company operate over the boundaries and can open a window and declare the intentions of the next competitive challenge and they entered in the "customer-based ideas".

The second designed system for participation is the "co-creation boundary management". Co-creation boundary management refers to a system in which an organization decides to open its boundaries to the crowd, creating a bond of co-creation, with the peculiarity of providing a protocol or system that guarantees copyrights and possibly also an incentive system based on the contribution of the community members. When the incentives are of an intended as extrinsic, then participants will contribute within contests, tournaments or competitions.

Beyond all these examples and applications of crowd sourcing approaches to share knowledge and create new knowledge, there is an emblematic case of disruptive outsourcing activity that is revolutionizing the concept of crowd sourcing. Indeed, the HyperloopTT case is not just a case of crowd sourcing, but it represents a case of crowd powering, where the crowd is the major engine of the organization. Organization like HTT are trying not only to provide products but also to be disruptive for the entire existing organizational schemes. HTT seem to take two exploratory risks at once: entering into an emerging market as well as using a previously untried organizational form that relies almost exclusively on outside contributors rather than internal contributions.

HTT was born from the minds of Ahlborn and Gresta, which were co-founder of JumpStarter.com. JumpStarter is a non-profit organization that aimed to create an online community, providing technology solution to enhance crowd contribution to help entrepreneurs. HyperloopTT is a magnetically levitated capsule placed in a vacuum tube aiming to transport passenger for long distances at very high speed, with a maximum speed of 700mph (1223,1 km/h) with an average speed of 500mph (804,672 km/h). The capsules are expected

to be powered from lineal electromagnetic motors and would levitate in the vacuum through electromagnetics, creating a strong filed to lift them from the rails. In the HyperloopTT project, the low-pressure environment inside the tube is guaranteed by a vacuum unit. After the foundation of HyperloopTT, Ahlborn and Gresta selected 100 top engineers and aerodynamics expert from around the world through the applications made on JumpStartFund.com. These 100 specialists suspended their activities in their jobs to focus on dynamics and engineering of HyperloopTT project, in exchange of becoming stakeholders (Majchrzak *et al.* 2018).

What makes unique this company is their organizational structure almost totally reliant on crowd and part-time contributors. The structure is called a "onion structures" allows to a different level of intensity of knowledge sharing and contribution from all other organizations. This structure enables also to define spheres of influence in decision-making process. At the very center of the structure, where the core leadership team lies, there is the greater degree of decision-making. The core central part counts 8 members corresponding to the Board of Directors, including CEO, Chairman and Chief Global Operations, and the Strategic and Executive committee, where the higher degree of influence is concentrated, providing leadership and governance, even if they do not engage in day-to-day activities. The second sphere of the "onion" is composed by the teams, including employees, contributors, and independent contractors both full-time and part-time operating in several projects. Each team is associated to a specific division between digital, engineering, marketing, legal, operations and finance, furthermore any division is conducted by one or more head specialists. The community involves all the members participating in the life of HyperloopTT, creating communities or movement on social media and it counts more than 50.000 individuals. The larger sphere includes all the external context, the potential sphere of influence, which comprises competitors, future talents, governments, and future consumers.

HyperloopTT enlarged the recruitment by making open call to the public to upload their application also with the initial support of JumpStarterFund. With the passing of time, they number of contributors increased sharply and exponentially, bringing more ideas and approach to recruit external knowledge. Among these, each team division with the supervision and approval of the head of division, provides contests in the forms of the so-called "*talent pool"* or *"sprints"* to the external community. Teams propose micro-task, usually with short duration, considered as open-ended problems that members should solve, without any apparent scope. They also use task design systems aligned with the rapid evolution of crowds' dynamics, more particularly online communities' dynamics.

Thanks to the dynamics of knowledge exchange and generation of ideas that are evident in the OCs, external can reason, share opinions, propose new approach and eventually solve the problem, without directly involving HTT. This practice not only leads to active collaboration by members outside the teams, but also creates an environment of “coopetition”, where also competition plays its crucial role.

To sum up, HyperloopTT represents a tangible example of how the open approach aimed at including crowds and communities outside the traditional boundaries of companies, can bring numerous benefits in terms of costs for research and development, generation of innovation, new ideas and resolution of problems. This is due to the high level of interaction and exchange of knowledge that occur within the online communities, as extensively described in the previous chapters. Even more, HyperloopTT is not only a promoter of a crowd-based approaches but is in the right direction of being disruptor of the entire organizational structures and for the entire industry. By adopting practices to enforce participation and interaction, rarely used by other companies that operate closely with crowd-based contexts, they are changing the rules of the game and becoming a “catalyst organization”. One of the most interesting factors on a personal level, is that of not having tasks related to a specific purpose, thus leaving both the teams and the external community free to freely design the tasks to be carried out, to think about any future problems and consequently also about possible solutions. This practice turns out to be even more convenient in terms of costs for interaction with the external community, already made low by the more "traditional" crowdsourcing systems. Subsequently, what makes the structure devised by HyperloopTT stable is the common vision shared by the members (whether they are contributors, teams or external communities), which creates a level of convergence, relative to common values, highly stable in the long term.

The final paragraph, seek to highlights the future roots for knowledge sharing in blockchain-enabled OCs. In particular, this last part gives two examples. The first example is related to Moyee Coffee, a company operating in the coffee industry, which uses the blockchain to ensure a transparent and fluid exchange of information on production and distribution between consumers. The second example highlights the case of Steemit, a social platform that deals with the creation and care of digital content, which uses blockchain technology to stimulate the creation of knowledge and ideas, using incentives based on the token economy.

The aim of this work, finally, is to convey the importance of the integration of knowledge coming from the digital contexts where the OCs operate. These, in fact, as it is widely described, are a real forge of knowledge, characterized by an abundance of ideas and information. In the

same way, it is essential to understand what are the dynamics that characterize the OCs, in order to integrate them in the best way within organizational strategies and structures.