

The impact of human capital on service innovation: An analysis by the concept of collective intelligence.

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Abstract— For many companies, innovation is the key to create change and to have a competitive advantage. In this context, innovation in industrial enterprises is based on material aspects, and it doesn't present a problem, unlike innovation in services, which is very often misunderstood, mainly because of the intangible aspect of service activities. The aim of this research is to better understand the elements on which innovation in services activities is based, through an analysis by the concept of collective intelligence, as a tool for innovation. In addition, through this article, we seek to present the conditions for achieving this cause and effect relation between collective intelligence and services innovation.

Index Terms— Innovation, Services, Collective intelligence, conditions.

1 INTRODUCTION :

Since a few years, several elements caused the transformation of the environment in which companies operate. In reality, we attend a major acceleration of the competition under the influence of the multinational large companies today. In this context of hyper competition, companies can have a competitive advantage only by innovation (Rene Lopez, on 2015). Innovation represents the only tool to get rid of these constraints and to build a new competitive advantage. The competition caused an acceleration of the dynamism of the market, where it is impossible for a company to remain isolated of the innovation. It is clearly admitted that innovation in industrial companies is based on form, packaging and industrial design (Cova, 2004). But what about services ? What about the intangible by definition? How did the authors agree over time on the need for collective intelligence to innovate in services? Admittedly, many academic research places great importance on service innovation (Dotzel and al., 2013; Parasuraman and al., 2010), but the concept of service innovation is broad and requires much deeper development and exploration.

Defining service innovation is largely problematic, due to the specificities of services, such as intangibility (Hermel and al, 2008). Today, the use of collective intelligence has become essential (Venkat and al, 2018). Many researchers links "collec-

The aim of our research is to present the impact of human capital on service innovation, through an analysis by the concept of collective intelligence, while explaining the conditions for achieving this cause and effect relationship. In the first part we will consider a state of the art of research, beginning with defining the innovation in goods and services, then we will present it in the context of services, going from its initiation by Miles (1993), to its present state. Then we will present collective intelligence, and its impact on service innovation. After that, we will present the conditions for the realization of this causal relationship.

2. Services innovation:

Services are represented as processes and acts, not objects (Roubaud, 2004). Services are defined as a range of activities that have specific characteristics, such as their intangible aspect and the involvement of consumers in production (Roubaud, ibid). The service offer can be linked to a contract (insurance), or without a contract (restaurant). As well as it can be addressed to the person himself (medical services), of to the person's possessions (repair, maintenance), as mentioned by Lovelock (2008).

Before introducing innovation, in the context of services, it should be noted that the general concept of innovation belongs to Schumpeter (1942), who first presented innovation as " a creative destruction", which corresponds to the creation of new innovations, which lead to the destruction of old innovations, which brings about a change in the economy and give a monopoly position to its actor. Thus Schumpeter (1942) presented the innovation in five forms, which are as follows:

- The introduction of new goods (radically new or improved goods);
- The introduction of new production methods (new process-

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es);

- The conquest of new markets (whether the market has existed or not);
- The introduction of new raw materials (whether already existing or created by the company itself);
- The introduction of a new organization (monopoly situation on the market or on a given product).

The model represented by Schumpeter (1942) was taken up by Levitt and Leymarie (1969), which considered it relevant, for an application in large companies, as well as in small enterprises. However, the Schumpeter model (1942) has been widely criticized by others. The two main criticisms were that it is quite broad, and it does not deal sufficiently with service activities. According to Christian (1982), the five levels of analysis are quite broad, and some forms are forms underlying others, such as the first form of introduction of new goods consolidates the third form of introduction of new raw materials, and should not be separated from each other. In the same context, Dahmen (1984), stressed that the Schumpeter model (1942) was interested in industrial activities, more than service activities, and that specific activities had to be incorporated into services. Similarly, Miles (1993) presented a service innovation model in response to the Schumpeterian model. This author presented innovation in services under three categories: the first categorization is "organisational" innovation; it's related to the internal management of the company, the relationship between directors and their employees, and the general framework of work. The second categorization is related to "process" innovation; it is related to the means of production of the services, as well as the distribution channels. The third categorisation relates to innovation through "service offerings", in which case the organisation sets up or optimises its offerings of basic services, and peripheral services, associated with basic services. According to the same author, these three categories make it possible to distinguish innovation from goods and services, and they can be technological, technical, or material. This model, represented by Miles (1993), was the basis for several research projects, as it sparked a scientific debate between different researchers.

Several authors have taken up Miles' model (1993), such as (Edvardsson and al. (1996), Sundbo (1997), Gallouj and al. (1997)). These authors have grouped the innovation of services into three main fields: staff work, material support and clients. According to them, service innovation can be aimed at internal employees of the company, through the establishment of a new internal work system. Thus it can include the different interactions of the staff in contact with customers, when co-production of the service offering (Ex: the case of catering), and finally the innovation of the services can be related to the material support, such as: the equipment, the machinery and the interior architecture of the company. However, service innovation has created some debate among several researchers. For some, service innovation is relative to "the supply of ser-

vices" itself. For others, it is related to "processes", as will be presented below. While for other researchers, service innovation can incorporate both. For Den Hertog (2000), service innovation is linked to processes and services on four levels, namely: the renewal of service characteristics or the setting up of a radically new service. As well as the management of the "customer interface", which refers to the implementation of new methods of production of services, in the presence of customers. In addition to the "service delivery system", which incorporates new methods of service delivery, and finally the technological processes, which allow the company to produce a high-performance service. According to Menor and al (2002) associate service innovation with service processes, not final outcomes. Thus for Menor and al (2007), the choice of innovative processes is what allows the company to be efficient, and improve the final services delivered.

According to Droege and al., Service innovation is a process that is initiated by the invention of a new concept or its improvement. The latter is the result of an accumulation of reflections and ideas between collective groups. In this sense, these authors present service innovation as the fruit of collective work among employees through processes. All the same, for Baron and al (2009), innovation through the processes of production, distribution, or any other form of process, is that which makes it possible to optimize the delivered final service or to produce a new one. According to Toivonen and Tuominen (2009), service innovation is defined as the introduction of new services, or the renewal of existing services, and which brings additional benefits to the service enterprise. According to Damanpour and al (2011), service innovation concerns updating or setting up the basic services of the company, or peripheral services.

To summarize, we can say that Schumpeter's model (1942) represented a real basis for all researchers. Some have taken it back, while others have criticized it, mainly because of the lack of consideration of service activities. In this context, Miles (1993), presented his model dealing with innovation, in the context of services, and according to three levels: organizational innovation, process innovation and innovation by "the supply of services (basic and peripheral services). As well as the three forms can be material, technical or technological. What sparked a debate: According to some, service innovation is process-related. While for others, it concerns the final result of the service. Then for some others, innovation through processes, is a synonymous of innovation, since the newly developed processes give new service results.

The services innovation represents, an idea, a process, seen as new by the organizations. It may not be completely radical. However, it can be partial (Rogers, 1983). We will present below the different categorizations of the concept of service innovation.

2.1. The categorizations of the concept of service innovation:

Roger (1983) was among the first researchers to distinguish the degree of innovation in two typologies, which are: radical innovation and incremental innovation. According to this author, the radical innovation is the establishment of an entirely new offer. While for incremental innovation, these are small improvements made to the offer. According to the same author, innovation is not always associated with radical change, but improvements in supply are also considered to be innovation. We will distinguish the two types of innovations below.

2.1.1. Radical innovation:

For Sterbel (1995), it is the implementation of a new offer on the market, which changes the conditions of the game between competitors. Thus for Markides (1998), it is a fundamental redefinition of the organization's offer, which allows the organization to act differently on the market. For Hamel (2000), radical innovation is related to the creation of new concepts and models of organizations, in different ways. Christensen and al (2003) have stated that radical innovation is the one that allows the creation of new radical offers for the same customers, or for a new market. As for (Dahan (2005) ; Tarun and Parviz (2011)), radical innovation is presented as an entirely new, creative, and particularly different form of offers. According to Doran (2014), it is an innovation, which requires important skills, such as engineering, science, design. Margaret and al (2016) presented radical innovation as acquiring new knowledge, developing new offerings for new targets, or for the same target. According to Ghosh et al (2017), radical innovation represents change that make an end with the old offers. After presenting these multiple definitions, we notice that the same ideas are discussed. The purpose of radical innovation lies in the introduction of new offers, which are entirely new, whether for the same customers, or for a new market, which changes the position of firms, with respect to their competitors. This form of innovation allows organizations to take a new path, different from that of competitors.

In our opinion, it is true that radical innovation allows the service company to take a new path, to differentiate itself from rivals, and to be well positioned in the market. However, this radical innovation is not always synonymous with success. If not accepted by the market, the organization can bear huge costs, since radical innovation is much more expensive than incremental innovation. We will present the latter below.

2.1.2. Incremental innovation:

According to Porter (1996), incremental innovation allows gradual improvement, and partial adaptation of the organization's offer. For Markides (1998), incremental innovation represents small improvements in the company's offer, and does not involve complicated operations. For Hamel (2000), incremental innovation is represented as an improvement in the internal management of the company, its processes, its concepts and its organizational models, without any general questioning. Thus according to Christensen and al (2003), it is innovation that does not allow a general redefinition of the of-

fers and processes of the organization, but in a minimal rectification. In the same vein, Benner and al (2003) presented incremental innovation as the improvement or readjustment of offers or processes proposed by the company. For (Dahan, 2005, Tarun and Parviz, 2011), incremental innovation is presented as being linked to creative change, but in a restrictive way, such as quality improvement. According to Doran (2014), incremental innovation is one that does not require significant skills, a general redefinition of the company's offerings, and its organizational model. However, it is an innovation that consists of modest improvements in supply, to better adapt to the targets. Thus, according to Lin and al (2013), incremental innovation optimizes an organization's offerings, in a limited and not total way. According to Lovelock and al (2014), incremental innovation is based on small changes. These allow firms several advantages, such as lower costs. Incremental innovation does not radically distinguish the organization from its rivals. However, the interest of the firm is to do better than competitors, offering more improved offers. In the same context, Geoffrey and al (2018) presented incremental innovation, as an improvement and addition process for an organization, so that the company can adjust its offers to the needs of its customers.

After presenting the different classifications of service innovation, we will present the relationship between collective intelligence and innovation in services.

3. The causal relation between collective intelligence and services innovation:

Certainly, the concept of collective intelligence has existed since human beings began to combine their efforts and work together for a better rendering. However, in principle, this concept was first introduced by Levy (1994), who has presented it as a means of impacting the profitability of the firm, instead of concentrating solely on the technical means of the firm. Several authors have been interested in this concept and associated it to innovation. We will present below the development of the concept of collective intelligence and its impact on general innovation, before specifying its impact on services. According to Levy (1994), collective intelligence is the combination of efforts of a group of individuals who act together to make things better. For Simon (1969), collective intelligence concerns phases of information seeking, explanation and creation of a collective vision. Thus for Glynn (1996), collective intelligence refers to the ability of a group of individuals to treat, coordinate, argue, generate new ideas and information, for a specific purpose, likewise, it allows the adaptation in a complex environment. Mack (1999) presents the collective intelligence, as the linking of knowledge, information, opinions, interrogations between groups of people, in order to realize a certain value relative to the ultimate result, superior to the independent work of each individual. According to Heurgon and al (2001), collective intelligence is a number of steps that allow some groups of people to understand all the facets of a

given situation in order to come up with a solution, a new method, or a new result. According to Zara (2004), collective intelligence refers to a tool that allows the generation of creativity, innovation, the responsibility of a company, and allows the implementation of new ideas. Noubel (2004) defines it as the power of a group of people to cooperate and interact to create their own future and succeed in complex situations. According to Giglio (2015), it is a tool that unleashes creativity, innovation and efficiency. As for Penalva and al., (2004), collective intelligence is represented as the ability of a group of people to interact together to achieve specific goals. Penalva and al., (2004) add that this concept is related to motivation, and to application. According to Devillard (2017), collective intelligence is a form of collaboration that requires finding solutions to tricky situations, which allows the culmination of innovation, through the exchange of knowledge between the teams of work, which improves the company's performance and encourages teams to come up with new ideas. Similarly, for Arnaud and al. (2017), collective intelligence refers to a collaborative working arrangement, where the ends are the same, but the different roles, and which lead to innovation in firms.

Gianluca and al (2018), complete the definitions presented above, and present the collective intelligence, in two parts, the first stipulates that every person has an individual intelligence that should be stimulated. The second part states that the collective intelligence is able to surpass, the intelligence proper to each individual, since there is a combination of their knowledge and their specialized knowledge, in order to reach precise ends.

Through these definitions, the authors approach collective intelligence as a tool for exchange and interaction between a group of actors, and associate it to innovation. They show that there is a cause-and-effect relationship between collective intelligence and innovation. Firms that utilize collective intelligence are more innovative than others. Innovation no longer relies on the firm's offerings, but on skills and intangible resources. However, the impact of collective intelligence on services differs from its impact on goods, since services do not have a tangible form. Collective intelligence, applied to service activities, supports the innovation of the latter, and materializes the service offering, through the toolbox of collective intelligence. Cova (2004) highlighted the importance of mix-marketing in service innovation through collective intelligence. In the same vein, Hollins and al (2006) considered the process of collective intelligence, applied to service activities, as the construction of a value process, and the materialization of services, through the mix-marketing. In the same context, Holmlid (2007) presented the application of collective intelligence, in services, as a set of steps and tools, related to inspiration, ideation and implementation, and that can impact the marketing mix, to reduce the perception of uncertainty perceived by customers. According to Hachicha (2013), the process of collective intelligence, applied to service activities,

makes it possible to represent a resolution of the problem of immateriality, in particular by its intervention in the improvement of material support (interior architecture..). if the place of service is important, such as in restaurants, hotels. However, if the place of supply has less value, such as telephone services, and insurance services, service companies have to optimize their material supports, by improving their internal organization system between employees, by improving the quality of their services, and their staff, then also the marketing mix variables. More recently, according to Penin (2018), the process of collective intelligence, as a method of innovation, applied to services, makes it possible to materialize the supply of services, through the marketing mix, including interactive variables specific to "staff", "material support", and "processes".

To summarize, we can say that the majority of the authors consider that the collective intelligence, applied to the activities of services, makes it possible to impact the mix-marketing of these last, and this in order to materialize as much as possible the offer of the company.

After presenting the relationship between collective intelligence and innovation, especially in the context of services. We will present the conditions of realization of this causal relation. We presume that it is difficult to ignore the realization characteristics of this relationship, because the nature and degree of these characteristics may differ from case to case and impact the final result of this causal relationship.

4. The conditions for achieving the causal relation between collective intelligence and service innovation:

These characteristics relate to collaboration between work teams, and consist of the following determinants: relational commitment, relational trust, and relational communication. These concepts represent the main theoretical attributes of the realization of the causal relationship between collective intelligence and service innovation. We will present them below.

4.1. Relational trust:

The main contributions of the authors specify the important role of relational trust between employees. The authors are generally of the same opinion about its necessity, as a tool of coordination and interaction between teams. The concept itself is important in business and quite presented in managerial work. However, there is not a precise and common definition of relational trust, since it differs, depending on the field of application (sociology, etc.), or in the management sciences (marketing, finance, etc.), as explained below.

In management sciences, relational trust is defined as the accumulation of expectations that are created between people, and it is the result of a uniform, honest and collaborative conduct, based on some shared principles (Geindre, 2002). The human being trusts when he sees the interest and skills of the people he relies on and interacts with. He perceives in a positive way the qualities of his peers, to whom he assigns traits, such as honesty, the reliability of words (Geindre, 2002).

According to some researchers, such as (Mayer, 1995), it is represented as being a social means of improving interaction and coordination. This concept also refers to the notion of "dependence" of one person over another, because human beings are not in a relationship of equal authority (Ring, 1992).

Relational trust refers to the choice of cooperation between a group of individuals, having a relation of dependence, and having the same ends pursued, and that despite all the opportunity presented to one of them (Nooteboom, 1996).

In this context, employees trust each other, when they see their interest and their pursued benefits with the peers with whom they interact. They recognize in a positive way the qualities of their colleagues, such as transparency and reliability. According to (Sako, 1992), relational trust is a synonymous of loyalty, and employees who trust each other make a long-term profit.

4.2. Relational commitment:

As for relational commitment has aroused the interest of several researchers, but they have not agreed on a common definition (Hunt, 1985). There is no complete definition of the concept, nor a model of the latter integrating all the points of view of the authors. However, the majority of researchers present the concept as an internal sensation, a belief or a combination of predispositions, which allows an employee to be strongly linked to his colleagues, and willing to stay there, despite all the external opportunities. Other authors (Porter and al, 1974) present the concept as a psychological attachment of an employee to his colleagues. According to Mowday and al. (1979), relational commitment is related to the feeling of belonging of an employee to a working group. Relational commitment helps to serve the collective interests (Achrol, 1997). According to other authors (Mohr and al, 1994), relational commitment is the desire of employees to make efforts to serve the collective interests. Relational commitment allows employees to work collaboratively. Bulhart (2002) completes this idea and defines relational commitment as the desire of a group of individuals to persist and to remain in a relation over the long term.

Allen and Meyer (1990) criticize the representations presented above. According to them, relational commitment is not always emotional and positive, it can take many forms, such as: emotional commitment and normative commitment. The first type relates to the emotions, affection and sense of belonging those employees feel towards their colleagues. As for the normative commitment, it comes down to the sense of obligation felt by the employees, to finish a project in progress with their team.

4.3. Relational communication:

For the majority of the authors, relational communication represents an exchange and a transmission of knowledge between members of the company, and which takes on many forms, from conversations to written tests.

The concept of relational communication comes from the field of management, and among the pioneers of this concept, there is Simon (1947), who presented relational communication as

useful for the proper functioning of the organization.

According to (Alain, 2001), relational communication represents the transmission of information between the members of a firm. For the same author, communication is perceived as a very important tool for the organizations.

Einsberg and al (1997) simplify the definition of relational communication in four theories, namely: a process of exchange information, a strategy of control, a way to achieve creativity and innovation and finally a platform for dialogue.

In this sense, relational communication is perceived as being a "channel" of information transfer between the parties, which allows the improvement of control, and consequently relational communication promotes innovation.

Relational communication is one of the indispensable relational bases of collective intelligence (Mohr and al, 1994). For some researchers, there are two essential criteria for the success of this communication: the quality of communication, and the transmission of information. The communication problems between the employees are the cause of the failure of the collective intelligence. The quality of the communication is relative to the precision, the reliability and the transparency in the transmission of the information. This reciprocity requires the transmission of information held in an accurate and reliable manner.

In our opinion, relational communication is certainly important for any organization. It conditions its success. However, a poor dissemination of information and misunderstanding that can take place between transmitters and receivers belonging to the firm can distort the information. However, it is useful for the transmitters to transmit the information in a fluid way and to ensure the correct interpretation of the information by the receivers.

Internal communication takes many forms: The creation of an internal company blog, employee coaching sessions, conference calls, online surveys, personalized phone calls, employee meetings and collaborative workshops (Bakker & Demerouti, 2008, Caesens et al., 2014, Durkin, 2007, Fearon et al., 2013).

5. Conclusion:

As a conclusion to this research, we can consider that collective intelligence is one of the subjects that attract the attention of several researchers, because of its efficiency and its benefits for the companies. Thus, innovation is the main advantage of collective intelligence, since it is represented as a competitive weapon, through which service companies stand out and face challenges in a competitive market. However, collective intelligence can move from a linear and an individualistic approach of innovation to a multi-stakeholder and a network approach. Innovation is not considered as an individual affair, but as a collective one.

The main purpose of this research was to explain the relationship between collective intelligence and innovation in services, by clarifying the conditions for achieving this cause-and-effect

relation. More specifically, we have focused on service companies, which typically provide intangible benefits, and which adopt some particular approaches to innovate. Indeed, to show the impact of collective intelligence on the services innovation, we presume that it is difficult to ignore the conditions of realization of this causal relation, because the nature and the degree of these characteristics may differ depending on the case. These conditions are of relational orders, and concern the engagement, the trust and the communication on the internal level of the company. Certainly, this research has made it possible to present the impact of human capital on the services innovation, through an analysis by the concept of collective intelligence. However, many researches remain to be done, because of the importance of the resulting benefits for service companies.

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