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Collective Intelligence: How Can Firms Benefit From It?

Antroula Ioannou

SUPERVISION NAME
Konstantinos Chatzimichael

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Antroula Ioannou

Supervisor

Konstantinos Chatzimichael

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Abstract

This thesis reviews the source of collective intelligence from when it was firstly implemented. The goal is to describe and understand collective intelligence as a concept but also to define its importance in firms and generally in society nowadays. Therefore, collective intelligence will be examined and how it is defined in general terms. Additionally, it was reviewed the application of collective intelligence in firms as a tool of innovation will be reviewed. Groups of individuals who work together are able to create groups of collective intelligence to provide solutions for a variety of tasks. As a result, the collective intelligence affects the firm's performance either negatively or positively. In a variety of studies, the results about collective intelligence can alter. Regarding some studies, it appears that a group of people will make more excellent decisions than an individual alone. On the other hand, there are other studies which support that groups can make terrible decisions as well. However, there are different factors that can contribute to this effect such as the social pressures, unclear goals, structure of the team, while their opinion may not be heard. Even though, the results may be disastrous for the firm, we can use a variety of methods and tools and be more cautious when applying it, in order to improve collective intelligence. Additionally, the process to create the knowledge and innovation for the benefit of the firms was analysed, as well as how the progress in technology can be used as a significant tool in collective intelligence to a higher degree. Examples of collective intelligence are pointed out in order to access the extent of possibilities that can be created. Next follows an investigation of whether collective intelligence can bring any changes in the way society works. In order to create a competitive advantage in the external environment we will study how to apply collective intelligence for the benefit of the firm. Moreover, the influence that the social and digital technologies have on collective intelligence are examined and how to use it correctly. Furthermore, some ways to mention how to overcome various challenges from the application of collective intelligence will be included. One key fact that arises from the research is that firms should treat and communicate with all employees equally. Additionally, a case study was contacted on Pfizer Inc. a drug manufacture that applied the "Idea Central Farm", creating a new form of collective intelligence.

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Chapter 1

Introduction

Collective intelligence is considered to be an everyday phrase. Many researchers in Animal Behavior, Artificial Intelligence, Psychology, Computer Science, and other have successfully studied collective intelligence. When you research the term “collective intelligence” million of results will appear either divisive terms such as “collective wisdom”, “community intelligence”, “group intelligence”, “collective IQ”, “crowdsourcing” or a variety of other names will provide similar data (Atlee, Por: 1).

It is believed that the term collective intelligence was first used in the 1800, although the first academic reference did not appear until the 1970 (Picton, Silverman, 2015: 6). Some common terms that were used for collective intelligence are, Hiltz and Turoff (1978) who said that “a collective decision capability (that is) at least as good as or better than any single member of the group” (Bernstein, Malone, 2015: 2). One more term was given by Smith (1994) saying that “a group of human beings (carrying) out a task if the group, itself are coherent and intelligent working with one mind, rather than a collection of independent agents” (Bernstein, Malone, 2015: 2). Levy (1994) indicated that it is “a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and result in the effective mobilization of skills” (Bernstein, Malone, 2015: 2), while Malone and Klein (2007) asserted that “collective intelligence is the synergist and cumulative channeling of the vast human and technical resource now available over the Internet” (Koudelkova, Svobodoval, 2011: 943). In addition, Kapetanios (2008) postulated that “collective intelligence is a human computer system in which machines enable the collection and harvesting of amounts of human generated knowledge” (Koudelkova, Svobodoval, 2011: 943).

Statistical collective intelligence is also name “wisdom of crowds” after a book with the same title from the British scientist Sir Francis Galton. In the book “wisdom of crowds” people acted to their own advantage by playing a game to win, and their decision keeps markets running in a self – organized way (Atlee, Por, 2008: 1). At a livestock exhibition in 1906 Galton witnessed a competition where people had to guess the weight of an ox. When all contestants gave their answers, Galton gathered all answers in order to calculate the average number. The participants’ estimation was 1,197 pounds and the ox’s actual weight was 1,198 which was approximately the correct answer. The act of the collection of information by a group of people was called by Galton collective wisdom of the crowd (Picton, Silverman, 2015: 7).

In this study collective intelligence is defined as a group of people who collaborate despite the type of the task assigned (Barlow, Dennis, 2016: 685). Collective intelligence consists of any intelligence that comes from a group and other collective living organizations (Chabris, et al, 2010: 17). Thus, a general understanding regarding the definition of collective intelligence in firms, is the collaborative activities between groups of people. Therefore, individuals cooperate in order to combine their knowledge and vision (Picton, Silverman, 2015: 6). The intelligence can be characterized with two main sources of information, either they come from the item or the contact with the customers that are using the item (Alag, 2009: 20).

Collective intelligence can be applied in a variety of places and with different forms of any kind activities (Picton, Silverman, 2015: 4). Specifically, indication of collective intelligence exists everywhere, even within our family interactions and our work environment. Collective intelligence is also part of the big picture for example the Congress, the Parliament, the groups of activist and not only. Ordinary people and generally every single person are a part of collective intelligence teams and will continue to be. In peoples’ daily life, there is interaction with other individuals and eventually we become part of a team that initiates different groups of intelligence. The collective intelligence team is also a major part of corporate life. It exists within

groups of employees, research groups, management groups, corporate meetings, discussions, and others. Thus, it is observed that collective intelligence has many uses within a variety of fields, even in technology. As a result, all groups that come together with the creation of an idea are effectively forming a collective intelligence team.

Nowadays, collective intelligence plays a significant role as the marketplace changes increasingly in areas such as technology, and industry. The industry requires a variety of tools in order to compete, survive and grow. Collective intelligence provides the answers for many of these problems while the methods are generally used by groups of people such as customers and employees, for the creation of ideas, discussions and solutions for their own benefit (Picton, Silverman, 2015: 4). As innovation is increasing, collective intelligence is even more essential, because firms have to deal with their competitors. When it comes to the growth of firms, they must produce innovative ideas and innovative thinking. Thus, collective intelligence provides this benefit. Firms can act faster and use more efficient solutions by using groups of people rather than individuals. In addition, collective intelligence plays a significant role for firms. Due to technological changes and uncertainty, it become even more difficult for firms to find new innovative ideas and methods to address the risk that they face.

It is becoming more and more important to understand the significance and extent of group performance worldwide (Chabris, et al, 2010: 686). Nowadays, no one works alone since teamwork has become a part of the industrial life (Guchaita, et al, 2016: 300). It is vital to examine the role of collective intelligence and understand the extent of the strengths that a firm can be provided with. Solutions can be found inside the problems of a firm and the productivity can be increased.

The results that collective intelligence can create for a firm are massive only if it is used correctly. The group of individual inside the company can be more effective and innovative than an individual by working alone. Furthermore, firms can increase their

profits and the company's reputation by creating groups of intelligence. With the use of collective intelligence, firms are creating a healthy environment among individuals while people communicate and solve social and environmental problems, or any other conflicts. The use of collective intelligence provides companies with a variety of ideas and creates inspiration and revolution between the groups. It is also a way to become more experienced and to help other members learn and improve their skills and culture.

Therefore, the purpose of this study is to examine if collective intelligence has positive or negative results inside the firm. This thesis also focuses on the correct way of applying collective intelligence in order to provide firms with a competitive advantage, whereas another subject of discussion will be intelligence gained through collective intelligence. It appears to be a new way which provides the ability to create a competitive advantage for firms. These points are going to be further examined. To better understand the use of collective intelligence we will review a pharmaceutical company named Pfizer Inc. which wanted to develop a smart, technology application that allows access to creative solutions. Thus, by analyzing this case study we can examine in practice the process of collective intelligence and the creation of new innovation and knowledge. In addition, we will study the positive or negative effects that collective intelligence can have in the performance of the firm.

Chapter 2

Collective Intelligence and Firm Performance: A Review of the Literature

The term collective intelligence regarding the type of the assignment involved is generally a description of the capacity of people that work together (Barlow, Dennis, 2016: 686). A group of people can be named as a team of collective intelligence only if within their collaboration they speak with terms such as “us” and “we” and not using the words “you” and “I” (Fridjhon, Rod 2016: 30). Then, they will be recognized as a collective intelligence team (Fridjhon, Rod, 2016: 30). In other words, collective intelligence is a number of heads combined in order to provide ideas for numerous types of problems and goals as well as to identify opportunities and any threats that may occur in the external environment. Collective intelligence helps to understand the capabilities which are available in the firm, the future direction in the market, the technologies, the environment that the organization is competing, and last, the implication from actions. Although, collective intelligence is not something that happens inside people brains, instead, it is something that you may take form and is developed as an idea and knowledge. Yet despite the growth of collective intelligence the research and generally most theory continues to be based on individuals. We still lack the documented evidence to comprehend and study collective intelligence and its effects on the industry. The primary purpose of this study is to take under consideration the current knowledge and try to find the effects that collective intelligence has on the firms. In addition, we are trying to find ways to improve collective intelligence.

2.1 The Link Between Collective Intelligence and Firm Performance

Collective intelligence reviews all the knowledge that can be taken by different sources even from the competitors. Then, it provides the firms with solutions, strategies, and tactics to various issues such as a product development. The impact of the collective intelligence team on a firm performance, depends on the solutions that a group will be provided with. Even before the solution is made, collective intelligence is an essential key for the firm's performance. It provides the company with the strategic planning while it also helps to find new opportunities. Additionally, collective intelligence can become an important tool for planning and competitive advantage of the firms (Adidam, et al, 2012: 249). As collective intelligence developing, it can be easier to positively affect the firms by making better decision with their strategic planning.

A certain environment is needed for a collective intelligence team to succeed. In many studies the findings indicate that when there were a healthy work environment, dedicated staff, higher collective intelligence budgets, variety of source of information and when the employees used collective intelligence more often the firms had higher benefits from collective intelligence than others. On the other hand, other studies were not certain that collective intelligence has the ability to increase a firms' profit. Subremanian and Ishak (1998) found that firms which had great profitability, they had advanced systems to monitor the market trends (Adidam, et al, 2012: 246).

New revolutionary idea is created by collective intelligence, which affects firms' performance in the market. However, it is believed that a better collective intelligence can be helpful in the area of firms performance with various ways, such as finding opportunities in markets, threats from competitors or any other form of a threat, providing intelligence estimates, externa and internal actions in the market, assessments, and foresights about the markets (Adidam, et al, 2012: 224). Therefore, firms that use collective intelligence repeatedly, they may achieve higher profitability

in the performance of the firm. On the other hand, they are some studies that believed this view is not correct and collective intelligence is creating vulnerability for the firm and advantage for the competitors’.

2.2 Why Should We Use Collective Intelligence

The world is growing and developing faster with the possibility of firms not to succeed. Thus, there is a need to adjust to environmental changes while different firms require a solution for the goals and the problems that are facing (Anne Rod, Marina Fridjhon, 2016: 3). There are firms which prefer to continue with strategies from the past than to explore new ways for finding solutions for their problems, in order to get the same results (Fridjton, Rod, 2016: 3). For the firm to exist, there is a need of staying ahead from the fast – moving marketplace and adjust to any future change. Therefore, a new approach should be implemented while the environment is changing, the firms should change with it and adapt accordingly. Firms must always permit new information to come in order for their system to develop. Thus, firms should discover different ways for this information to come into the firm and influence the process and the results to be able to adapt to the market accordingly.

However, nowadays it is impossible to find a solution as an individual. In order for an organization to expand and thrive, it should hold and manage a large amount of knowledge. But, it is impossible for any single person to have the ability of accessing and controlling all the knowledge that is required for the firm to succeed. The use of collective intelligence groups is an important factor since it has the ability to resolve difficulties efficiently in comparison with an individual member. Thus, it is generally believed that a team of a collective intelligence makes better decisions than any person alone.

When it comes to find solutions about the future, we should experiment with answers available to us today. A lot of members are needed to participate in the process as they are considered to be an extra advantage to the solution of the problem. Through collective intelligence a change has been embraced and innovation was developed.

Collective intelligence should be used to wider new ideas, learn to collaborate and to communicate with one another as well (Picton, Silverman, 2015: 17). By using collective intelligence, a firm can make better decisions.

This topic was also viewed as a powerful tool to drive a firm's innovation and growth. It consists to be an important piece that provides the firm with new ideas, innovation, answers and decisions for the future. Therefore, a large part of the organization success depends on the ability of teams of collective intelligence to work effectively. However, collective intelligence provides the means for effective growth and development of the firm that can outgrow the competitors' strategies. In addition, with the collaboration of individuals collective intelligence produces a new knowledge by analyzing and exploring different ideas that are being provided by different sources such as employees, customers, competitors, and technology. The information that have been collected then transformed into a new knowledge.

According to some findings, if the correct link was made between knowledge management and collective intelligence then a new innovation was going to be created and it will allow firms to expand further in the industry. The importance of the processes of innovation and performance in a new product and ideas, are usually pointed out in the existing studies. Firms should find ways to link the skills, knowledge, information and technology in order to support the procedure. The existing literature about collective intelligence is limited and focuses mainly on the effects that collective intelligence has on firms. In this study, we try to fill this gap by investigating how we can improve collective intelligence.

2.3 Collective Intelligence As A Tool For Innovation

It was previously, discussed as to how collective intelligence is linked to the performance of the firm and why it should be used to find solutions for the goals that it needs to achieve. Now we will refer to innovation, which is the result of collective intelligence. A simple term used for innovation may be the creation of a new method or a product. It is generally supported that it is a creation of a new idea in order to

achieve new goals, solve problems, attend to requirements, and needs. When it comes for the market, it can be defined as the successful use of ideas, products, and resources as well as the means of a business for marketability and financing, with the ultimate aim of profitability for the company. Therefore, innovation is a result that occurs from the collective intelligence.

Nowadays, innovation has a great importance since we all have an experience on how and when companies had the anxiety of an economic meltdown. To establish innovation and innovative thinking firms need to create a healthy environment and a healthy behavior between the employees, so the groups can work harmonized. The best and biggest innovations are created by the correct interaction in the internal environment of a firm – healthy collective intelligence team. Furthermore, as for the survival of the companies, they need to achieve creativity more than ever and to be able to stay competitive and have profit.

In order to find the knowledge to create the innovation, the firms need different sources. The most common way that firms are using to find solutions in order to accomplish innovation, is by making comparisons with already existing companies or products. Then, they produce different ideas of how to modify a solution by taking into account the new goals, needs and the changes in the environment (Boder, 2006: 86). As it gets more difficult to stand out and more creativity is needed to produce a new idea, firms need to find more innovative ways to win peoples' attention. Information can also be found within technology. Innovation in terms of business becomes more and more reliable on the development of modern information technology while the business success is mostly related to the innovation and development (Koudelkova, Svobodoval, 2011: 943).

Collective intelligence helps the organization to find faster innovative ideas and solutions to the problems that the firms are facing. If innovation is created, then the firm is provided with an advantage toward competitors. An innovative idea has the ability to revive the business and increase effectiveness, productivity, value and

competitiveness but to do so they must keep the firm on the market. It also provides the collective intelligence groups with solutions that may meet the new needs of the market, or even existing needs or even needs that are not yet created. Innovation may offer the tools that employees need in order to improve their work processes. More specific, it provides to the worker the source for creativity and by doing so it motivates and increases their job fulfillment.

Therefore, the knowledge received by different sources and a healthy collective intelligence team is used by the companies as a support for the creation of an innovative idea. As a result, the innovation that can be achieved will be more effective and the methods used could save the enterprises from time, and money (Koudelkova, Svobodoval, 2011: 942). In addition, collective intelligence will produce new knowledge and by doing so, the new innovation will be the solution of crucial problems (Boder, 2006: 90). Thus, collective intelligence can affect positive innovation. New sources for innovation are really needed in the fast – changing environments (Harmaakorpi, Salminen, 2012: 213) and with collective intelligence firms should be able to find innovations faster as such to affect positively the firm's performance.

2.4 How Can Collective Intelligence Affect Positively Firms

Most of the collective intelligence teams make perfectly good and decent things. From the past centuries, collective intelligence was the source that provided humans the means of survival and verbal speech. Steadily new forms of collective intelligence were developed with more complexity (Atlee, Por, 2008: 1) which provide a variety of advantages for the industry and the environment. As complexity and crises increases, corporations and people require more effective ways to support their best interest with collective intelligence whereas they have done amazing job to produce positive change or even to transform major failures and crises into evolutionary innovations (Atlee, Por, 2008: 1). Precisely, collective intelligence has the power to provide a future that keeps developing and growing.

Collective intelligence is building on the individuals' knowledge and by doing so a new innovation is created. We are now able to reveal new information with collective intelligence. By having a group of people submitting a variety of ideas it can result to a better quality of findings with more creativity and innovation. The greater the number of ideas that are submitted, the greater the possibility for the firm to find the solution that is needed. Thus, if you have a lot of people interacting and contributing in a task then it can be more friendly and accessible the use for example of Wikipedia. Therefore, collective intelligence by combining a number of ideas can develop new knowledge and innovation while trying to solve a variety of problems for the firm. The firms can have a system with a higher complexity and harmony, through different tools, such as variation and combination, or even competition and teamwork (Atlee, Por, 2008: 2). Collective intelligence creates for the firms' innovation, vision and inspires individuals and groups.

Furthermore, by using the procedure of collective intelligence in order to find opportunities and results for the tasks, it allows the team to change the way of thinking from an individual to a unified team that sees things with common interest. The idea of a team entity enables the team to have access to new and more complicate information that an individual member cannot predict what is needed for the solution of the task. It is believed that no individual has access alone in the amount of information that a group of people can have (Fridjhon, Rod, 2016: 3). Therefore, it helps the team to acquire and increase their collective behavior and awareness.

It could be also time consuming if a firm included a task worked by a group of people than an individual since it may have faster results to the solution of the problem. Furthermore, the greater the number of people that are providing ideas for the firm, then the results can be more accurate. Collecting different ideas, knowledge, and experience from the firms can have more accurate results. Specifically, by creating the best team for the task, the effectiveness and quality of the work increases. Collective

intelligence can be used for the prediction of future events (Picton, Silverman, 2015: 4).

Collective intelligence provides the firms with success in different kind of problems. It is in everyone's interest inside the firm, and generally all stakeholders, to provide the employees the means for limitless knowledge and creative possibilities (Atlee, Por, 2008: 2). This knowledge provides the opportunity to all the members to learn and improve. It also provides the opportunity to be heard. As a rule, collective intelligence supports that every opinion matters, while everyone has their own point of view which is right to some extent. This means that everyone from the group see only part a of the truth, but this it may have an important information for the solution of the task, while it should be received as equal as the rest opinions. However, it supports and strengthen society's believes and cultures. Collective intelligence is provided to people as a source for motivation. Moreover, it allows alertness to intensify, while it increases emotional development and creates abilities since it makes the team more intelligent, flexible and strong (Fridjhon, Rod, 2016: 34).

One more aspect that collective intelligence can provide is a profit of innovating ideas. Besides, the costs to hire a professional may be more expensive than making a collective intelligence team in the firm. Therefore, collective intelligence provides higher profit, production and innovation for the firms. The advantages through collective intelligence vary. One of them is that it provides the acknowledgement which helps the firms to succeed. Moving on, the team system that is used becomes more passionate during a task since their discussions have certain meaning and understanding. The employee's skills are increasing regarding the nature of the task as they acquire more knowledge that will benefit the firm. Moreover, the team will be heard and be acknowledged much more in order to be able to act. Collective intelligence increases the team's strength and resources and by doing so the firm is improving (Fridjhon, Rod, 2016: 41). Even, if there is a number of sources regarding the effects of collective intelligence still the current literature is insufficient. Collective

intelligence should be studied to a further extent. In addition, we will study how to improve collective intelligence.

Chapter 3

Strategies Toward Improving Collective Intelligence

In this chapter, we are going to discuss the strategies toward improving collective intelligence. In order to achieve the goals and find solutions in the problems that a firm is facing, it is required an application of different methods and tools for building the collective intelligence (Boder, 2006: 85). Firstly, it is important to promote a healthy environment in the company where the firm would respect and trust its employees (Koudelkova, Svobodoval, 2011: 942). It is extremely vital for the firm to take measures in order to provide the firms' employees with all the necessary knowledge. The problems and goals should be presented clearly in all the process. Lastly, actions should be used to ensure that the procedure of interaction between individuals is developing smoothly.

Therefore, the application of these actions it is required some vital tools. Here we will discuss the tools which are being used are such as visual discussion techniques to view the problem and goals of the firm. Technology through navigator across databases, network of expertise applications are important tools nowadays. Different types of problems need solving techniques to help innovation while create knowledge, too. In addition, mind mapping techniques will promote visual and synthetic representations while micro communities of practice will promote focused collective search. One more type is the questionnaires that will encourage the expression of information from all employees. Story – telling which provides contextual, emotional and metaphorical substance can be another type (Boder, 2006: 86). Clearly, there are a lot of different tools but all they have the same purpose which is to help people to collaborate, communicate, produce ideas, and many others.

These tools are important in helping collective intelligence in many ways to produce ideas. Collective intelligence tools are able to minimize difficult problems that can be made into simple tasks.

The creation of a knowledge starts from an individual with the collaboration between employees and the learning practices which are used by the company such as technology, and the internal and external knowledge and information which is increasing (Lean,2010: 9). However, collective intelligence is also provided with more effective means for a solution of a problem. Within this concept we can observe that techniques of collective intelligence are able to join people and technologies so as to create the added value (Chan, et al, 2015: 1). Therefore, by applying knowledge from an individual and technologies, the firms can be performed better and reach their goals effectively. With knowledge management and technology revolution there is now an unlimited amount of opportunities for collective intelligence.

Below, we will discuss knowledge management and new technologies which can be used as effective means toward enhancing collective intelligence. In addition, we discuss some examples of collective intelligence.

3.1 Knowledge Management

A possible definition of knowledge management is the well – organized usage of managing information and resource in the firm. Furthermore, the owners of knowledge management are the employees of the firm who have the appropriate skills and knowledge (Koudelkova, Svobodoval, 2011: 942). However, the role of knowledge management is to provide the methods and tools to build up the intelligence of the system which is required to reach the business objectives (Boder, 2006: 85).

In most cases the knowledge occurs from the research of a solution. In the beginning the team of collective intelligence is sharing different ideas in the group. Later on, the initial ideas are developing in a single idea while the new knowledge comes as a result

of the development. However, if a knowledge is shared without creating and not being structured, then we talk about information sharing and not knowledge management.

In order to develop more the knowledge management, it needs to be a permanent part of a firm. A variety of methods promote the sharing of ideas for the employees in order to continue receiving knowledge through working sessions, “lesson learned” programs, networking, interactive training as well (Boder, 2006: 83).

Furthermore, a learning team is used to improve a team’s performance. Precisely, the definition of team learning could be the activities that a team receives in order to have the knowledge which will provide the opportunity for the firms to confront a problem or a goal (Bresman, 2007: 2). Teams are receiving learning from different sources such as:

- Internal learning and
- External learning.

To be more specific, internal learning is the experiential learning which internally focused within the firm. However, external learning can be found in two places. The first possible source of external learning is the process through one group which is affected by the experience of another. It is also called “vicarious learning” and it has been used in research areas such as psychology (e.g., Bandura and Walters, 1963; Bandura, 1977), sociology (e.g. Elder, 1971), and organizational behavior (e.g. Davis and Luthans, 1980) in reference to (Marz and Sims, jr., 1981) (Bresman, 2007: 2). Precisely, “vicarious learning” is learning a task from the experience of others (Bresman, 2007: 2). The second external learning named as “scouting” activities. According to Ancona and Caldwell’s (1992) are considered to be the activities “that involve general scanning for ideas and information about the competition, the market, or the technology” (Bresman, 2007: 2).

The purpose of knowledge management is to improve the creating, storing, sharing and use of knowledge in a form but to do so it should be improved the performance of the people working in the firm and the firm legal entity. It considered to be an activity that supports the firm either by contributing to cost reduction (by avoiding mistakes), time consumer (by avoiding redundant activities), improving quality (through better customized products), or yet, increasing sales (new business by investigating the customer's knowledge and need) (Boder, 2006: 82). Another positive characteristic of knowledge management is that it increases the profits, productivity, flexibility, and it provides the firm with more innovative ways (Koudelkova, Svobodoval, 2011: 944). Knowledge management also provides methods for the answers through expressing the existing internal and external knowledge (Boder, 2006: 83). In addition, knowledge management creates a new knowledge (Boder, 2006: 83). Thus, knowledge management helps innovation to be created (Boder, 2006: 83).

3.2 Technology and Collective Intelligence

Collective intelligence has developed even faster among people with the growth of social technologies that provide a variety of tools, systems, and platforms (Picton, Silverman, 2015: 11). In 1968, computer thinkers predicted the ability that computers will cooperate with people. Thus, a new form of collective intelligence had started to take shape due to social technologies by providing people the ability to solve specific problems and goals. Therefore, the rapid development of the Internet has provided great opportunities for larger scale communication in order to develop the use of social media, email, forums, chat, news sites, blogs and others (Gudelyt, Skarzauskien, 2015: 195). Nowadays, by using the information technology, access is provided to more information about customers and employees, so we can have more accurate understanding for our environment and the changes that are happening. Moreover, technology affects positively collective intelligence by providing more information to find solutions in creating innovative ideas.

Collective intelligence can be also characterized as a tool that connects people and technology which creates an intelligent system to bring the added value (Koudelkova, Svobodoval, 2011: 944). Various projects are related with the collaboration of an individual with a technology system. With the new information technologies, the collective intelligence applications need to center around existing data that can be recycled to support decision making, team building, or to improve the understanding of the world around us (Gregg, 2010: 134).

Generally technologies can provide more information and better understanding for the solutions that a firm can use as a team of collective intelligence. This permits the companies to leverage the combined brainpower of team by merging diverse ideas and opinions, insight and intuition (Rosenberg, 2015: article). Furthermore, technology focus on connecting the intelligence of groups of people in order to enable greater productivity and better decision than an individual that works alone (Gregg, 2010: 134). Information technology can also provide ideas, opinions, insights, intuition, and methods in an organization. As a result, they will accomplish a work which flows information by taking place in the course of a business activity (Boder, 2006: 83).

A remarkable change for technologies was made through Internet which provided people the opportunity to collaborate with the usage of internet (Lean, 2010: 11). The opportunities and progression that comes through this arena for collective intelligence are vast. Thus, collective intelligence can be achieved by the online groups of communications and interactions (Picton, Silverman, 2015: 4).

Therefore, with the rise of internet we have also been provided with new forms of collective intelligence. These new forms are considered to be search machines such as, Google, Wikipedia, the social networking sites such as Facebook, Instagram and LinkedIn as well. However, these machines depend on the collective intelligence in order to provide to the user the products that are required. These tools provide to people the ability to make online discussion of comments to a variety of issues or

even to have their own input, evaluate, explore, reply while they will bear in mind people's opinion. Tools such as forums, posts, comments section, voting, liking, rating, and not only, provide the ability to make conversations and post messages (Picton, Silverman, 2015: 11).

Nowadays, one more vital tool that everyone uses is the Wikipedia. It is considered to be the biggest encyclopedia that ever existed which was written by millions of people while new information is still adding as the days pass by (Picton, Silverman, 2015: 6). Precisely, great companies such as Ocean Basket or McDonalds, create a public forum or a Facebook page in order to answer relevant questions. Once more, with these activities we refer to a technique that firms' apply to create of collective intelligence. Technologies and mainly the internet are a collective intelligence team that is possible to connect a large number of people with different ways on a scale whereas in the past it was impossible. The information that is provided has numerous possibilities for provisioning ideas. Not only information provides many options for the procedure to create knowledge for finding the solutions and achieve the goals of a legal entity, but it also has the ability to take advantage from these opportunities in order to comprehend clearly the extent of opportunities that technology provides.

It is also vital to be informed for the possible disadvantages that may occur. Precisely, there are million people that can express their opinions about a subject and some opinions may be lost as they keep increasing in seconds, because it is impossible to keep track during the process every detail. Notwithstanding, we can also have the opposite of evaluating about a subject and not having the clear opinion of internet society. It can be also time consuming if the same answers are being repeated constantly (Picton, Silverman, 2015: 13).

Undoubtedly, collective intelligence is now more advanced because of technology. During the past centuries, it was more difficult for people to be organized into large groups. Nevertheless, technology systems are now able to arrange collection and examination of information and peoples' activities into a system. It was also

postulated that by using the technology and the groups of people combined they can act together in intelligent ways (Picton, Silverman, 2015: 4). However, now it is the beginning of being able to understand the possibilities that are provided through technologies and the contribution of people (Picton, Silverman, 2015: 6). Technology firms can also be a booster to improve collective intelligence. Specifically, firms can receive more information to find better solutions, through various applications. Watch seminars or have discussions that can be made through the computer anywhere and the individual does not need to be in his office or conference. By using the searching tools, we can see the shared knowledge, opinions and experiences from different people in a variety of issues. In the aspect of technology there are different platforms that can be helpful in the organization in order to save the records of the firm, different sources and allow the use of these information in numerous ways. However, firms can use technology in many ways in order to improve collective intelligence. Technology revolution with the applications, internet, different programs, that are connected with each other have provided an unlimited amount of opportunities for collective intelligence in the firms.

3.3 Strategies That Can Be Used By Companies To Improve Collective Intelligence

Collective intelligence draws ideas mostly by technology and individuals. Although, the ultimate source of creating the idea is the human brain that is responsible for the understanding and arrangement of data in order to generate the solution (Hackman, Wolley, 2008: 2). In order to do so, we cannot put a group of people into a room and expect them to cooperate. Thus, a group of collective intelligence should include individuals that will be able to cooperate and synchronized together successfully (Bernstein, Malone, 2015: 143). By having a number of clever individuals may not be useful, and it is surely not enough in order to create a smart team in a smart organization (Bernstein, Malone, 2015: 143). Thus, we need to organize correctly the teams of collective intelligence that the firm has. However, there is a variety of types of collective intelligence teams such as self – managing work teams, management

teams, cross – functional teams, problem solving project teams, virtual teams (Chan, Entekin, Pearson, 2003: 174).

To begin with, the firm should state the number of people that will form the team. Any collective intelligence team needs to have a number of people that will be potential to provide enough information and ideas for the task. By having a good number of participants, it provides to the company the opportunity to have the best possible collective intelligence (Picton, Silverman, 2015: 16).

There are many types of collective intelligence teams whereas each one has a different goal. Teams of collective intelligence try to find the answer to these goals, but to accomplish this it is important to have a clear picture of the nature of the goal we need to answer for. This is a vital step that the firm should take in order to develop the team of collective intelligence. The firms should make sure that the task and the goal of the firms are appropriate to be assigned to the particular group (Bernstein, Malone, 2015: 143). While trying to implement collective intelligence, the employees of the firm must have a clear picture of the problem that they are asked to solve. The solutions that will be provided at a later stage should also be cleared and be presented with clarity. If anything is fussy for the employees they should ask, and their questions should be stated by all employees.

Therefore, the structure of how the activities are grouped and who has the decision – making power is an important part to improve the collective intelligence team (Bernstein, Malone, 2015: 143). Furthermore, in a firm everything must be described so all the employees of the firm will have a common understanding about what is the system and who does what. The right composition of people is a key factor for creating the intelligence teams. For the firm to create a team of collective intelligence with a high – performance relationship system, they need to have the right characteristics to complete the assignment successfully.

The type of task a team is assigned with has an important role for the group composition, encouragement, structure, and process (Bernstein, Malone, 2015: 146). Therefore, an important part team's performance is, plays the type of the task that the group will take. Even if one team executes successfully an assignment it is not necessary that the same group will do well on any other assignment provided, a team needs to have the correct characteristics. Managers should be careful while creating intelligence teams. According to the task that the firm is assigned, the necessary type of a team should be created. The organization is one of the most important problems in a group (Bernstein, Malone, 2015: 146). The firm should synchronize the team's activities according to their structure and timing.

Another important part for creating an intelligence team is differentiation and integration. A group of people that think differently. It is more important to have a group of people with different culture, opinion, gender than to have a group of people with high intelligence. According to studies, in a team it is also important to include people with social perception and sensitivity. A team should include people with knowledge, experience and understanding, but also people who are progressive thinkers or who can challenge the status – quo (Picton, Silverman, 2015: 16).

After the collection of the right people the team needs to be encouraged to share its knowledge and work with other members of the team. In the phase of group process there must be an exchange of information and activities between the people, technology and parts of the firm. No one has all the knowledge. As Levy detected in his early paper on collective intelligence "No one knows everything, everyone knows something (Levy and Bonomo, 1999) (Mashingaidze, 2014: 193). Within a team interaction they share information and with the right tools the firm can influence employees to research and evaluate the environment. Though collective teams, employees are searching for knowledge and information, and in return they share the information and knowledge they have that will benefit their team. Then, they comment and discuss the information they gathered to find solutions.

The biggest the number of ideas, the higher is the chance of producing an innovative and original solution for the problem and goals of the firm. The firm should encourage all ideas to be heard. Einstein once said, "If at first an idea does not sound absurd, then there is no hope for it" (Selekman, 2010: 109). With encouragement, all employees will feel free to start expressing their ideas and eventually they will start expressing also alternative ideas such as amusing, brave, strange, silly there the company can find the solution. Then, the firm can use those ideas to find solutions to its problems in the least expected moments. However, that means that the firm should make sure that every person express their thoughts using different ways for example asking everyone individually, questions for any ideas regarding the solution to the problem at hand.

Therefore, employees should be rewarded in order to be motivated. Every individual member of the team should be recognized for their work. All members must be heard, assigned difficult tasks, while the must understand that everyone has a common purpose in order to stay motivated and hard working. Other examples of motivation are vouchers, bonuses, money, or any other prizes (Picton, Silverman, 2015: 8). Subsequently, the team will have good reason to participate in the future in groups of collective intelligence (Picton, Silverman, 2015: 17).

The selection of people and the development of individual skills are needed in the firm (Bernstein, Malone, 2015: 158). In order for the team to develop and have high performance, it needs to be alert, reactive, responsible, and purposeful. Team learning should be used to improve the team performance (Chan, Entekin, Pearson, 2003: 175). Team learning is the activities that are used to help the team improve their knowledge. Important team learning behaviors include asking questions, seeking feedback, sharing information, experimenting and talking about errors. The team should also include people who are positive. Negative people tend to reduce the team's collective intelligence and the overall psychology. The members of the team should be people who have high social sensitivity and will collaborate and share with their coworkers.

3.4 Examples of Collective Intelligence

Collective intelligence in practice:

Collective intelligence is provided by technology, specifically by the internet, such as Google. Google offers millions of people all over the world, the chance to create their own web pages and in these websites one can also find links to other web pages that are connected with / to each other. Then, there is also this endless knowledge that Google can provide, for example, if we search for an answer, we will get an amazing amount of answers that can be called intelligent. (Chai, et al, 2018: 69).

Another example is Wikipedia, one of the most successful examples, also provided by technology. Since its incorporation it has become one of the most visited websites online and probably the only source that people have access. Wikipedia is a platform where millions of people all over the world have collectively created a very large and amazingly high quality product with no limits for knowledge. With this website the whole world and generally anyone can collaborate around a single idea. Wikipedia is improving day by day by each and every single person. Anyone can add information to an existing page or produce a new page. It also gives people the ability to create and edit information in everything. Additionally, pages have hyperlinks to other areas of the website that people have edited (Bonabeau, 2009: 48-50).

Another, platform that is being used by everyone nowadays is Youtube. It is considered to be a platform that provides people with art, media, music and other possibilities. Additionally, it is the world's largest video sharing tool. Youtube permits its users to watch and share videos. In that way, Youtube lets the people connect, inform and inspire others.

NASA clickworkers is a project that uses thousands of people as volunteers to classify the size of craters on the surface of Mars. By doing so is saving NASA the expense of hiring highly trained planetary scientist (Bollier, 2007: 2). Another example, from

NASA is Apollo XIII crew at 14th of April 1970 “Houston.... We’ve had a problem”. The oxygen tank of the Apollo service module exploded as it was travelling to the Moon. The mission was a failure and they had to rescue the Apollo crew as soon as possible and to bring it safe back to earth. The possibilities where low as the crew did not have enough oxygen and for this reason they could not communicate. The return to Earth was impossible, so the crew decided to continue their journey to the Moon. As their chances decreased, NASA engineers amended an air filter in a record time that stopped the oxygen from escaping. The Apollo XIII crew was saved by the amazing creativity of the NASA team. Houston and the crew acted as a collective brain that came to life for the sole purpose of accomplishing the mission (Sirbey, 2017: article).

Football is another situation that makes collective intelligence evident. In a football team there are different kinds of players that come together to produce positive results for the team. There are players that are fast, others that are strong, others small, others that have brilliant strategical sense, others that motivate their team and so on. Individually, these may not provide the best results but together they make a team that can win the game (Sirbey, 2017: article).

There was a time when Harley Davidson was ready for bankruptcy in 1983. The management then allowed all employees to give ideas and then to discuss them. This method helped Harley Davidson and also led to the creating of the Harley Davidson club for the public. These clubs were only for a few thousand funders but the collaborators proposed that these clubs should also give access to the rest of the customers. Nowadays, Harley Davidson clubs have more than 2 million members in the world and are one of the reasons for the brand’s popularity. They also invented a new design for the Harley Davidson and a new and more effective system as well. With this innovation the company was again put back to business (Sirbey, 2017: article).

Chapter 4

Problems And Recommendations Regarding Collective Intelligence

This chapter studies a variety of problems that are caused by collective intelligence. In addition, recommendations regarding collective intelligence are revealed in order to create a healthy team of collective intelligence. Nowadays, if a careful investigation is contacted regarding the different kinds of problems in the world, we seldomly can find that the main source of a solution to a problem is an individual by himself (Atlee, Por, 2008: 2). Is more common to find groups of people such as families, organizations, nations, the world in general that create disasters, disagreements, harmony, and revolutions (Atlee, Por, 2008: 2).

Because we are surrounded by different groups of people, we are also provided with different results (negative or positive). Often, we are provided with good and sound intelligence that is positive for the environment and humans. However, occasionally they are negative consequences from collective intelligence (Atlee, Por, 2008: 2)

A number of people have also tried studying collective intelligence to measure how well groups can perform. Even psychologists have tried to measure the intelligence in groups. An example of such measurement is the statistical approach (Chabris, et al, 2010: 686).

4.1 Problems That Arise From Collective Intelligence

From the operation of many firms, markets and political systems, collective intelligence is not always wise. Under some situations, groups can also make the

wrong decisions. For different reasons such as pressure, preference, the group can be affected negatively in their decisions, and have disastrous results (Picton, Silverman, 2015: 14). There are many disadvantages when applying collective intelligence. Having a team of various intelligent people does not necessarily mean that this intelligent system provides positive results. These teams can also develop negative results. Simple tasks or tasks that benefit from high level of insight and coherence such as to create a work of art are often best done by a sole individual (Bernstein, Malone, 2015: 145).

A lot of people cannot wait to share their point of view or they may not be good at listening to other peoples' comments and opinions. Sometimes, these teams can result in a conflict of strong opinions, preventing the creation of a new solution. While in a group there can be opposite opinions at the solution of a task. The problem may increase as the discussion progresses and can make the group to fall further apart (Picton, Silverman, 2015: 15). In teams of collective intelligence, disagreement can occur easily, and when it happens that is a clue for the firm that something will need to happen or change (Fridjhon, Rod, 2016: 40). They can change teams since they will be given a different task but then again it would create instability between the group members. Furthermore, if a change is applied, the firms create instability and that is a negative factor for collective intelligence.

There are many times when we can identify in a crowd of people absence of cooperation with the rest of the members of the team. They may keep quiet so they can avoid any negative comments or disapproval and be isolated from the rest of the group. Or they may be competitive and can be difficult for them to cooperate with the rest of the members of the team.

If someone from the group does not contribute completely this will affect the resources and expression of the team negatively. If one person does not participate, the firm will fail to have a complete picture and this will impact negatively the team of collective intelligence (Fridjhon, Rod, 2016: 18). With the use of collective intelligence

most times is difficult to know from which member of the team comes the solution. In addition, a number of times the opinion or ideas of the participants will not be clear or with details. Therefore, the monitoring of the team should be careful but even that in many cases is very difficult.

Sometimes due to the groups' psychology they may present unreasonable or irrational solutions trying to correct individual mistakes, trying to find the best solution for the firm, but in that way they can increase the mistakes making it difficult to find the best solution for the task (Picton, Silverman, 2015: 14). It can be difficult and annoying to have to provide solutions and ideas within a period of time and it is obviously exhausting for the employees of the firm.

There is no warranty that the results to the solution will be positive and the quality will be high. If the team was created with the wrong people and the employees from the team have little or not at all knowledge or experience about the task, the firm would have negative results. From this and other factors the cost for the means to have the collective intelligence may be too high. In addition, by having a large number of employees working on a task might be too high than the profitability that will be created. The number of ideas that are provided are many and it is not easy to evaluate every idea, there is a danger that a good idea will be lost.

4.2 Recommendations Regarding Collective Intelligence

Collective intelligence can have different results from one team to another (Boder, 2006). It has little to do with how smart the group of people are in order for collective intelligence to have negative or positive results. A team can have very clever people and it can be collectively stupid (a phenomenon Irving L. Haris named "groupthink") there can be a group of very ordinary or even dull people, and under the right environment to produce real wisdom (Atlee, Por, 2008: 2). In addition, what will work for one firm does not necessary mean that it will work for the other. Therefore, when applying collective intelligence, we should be very cautious in order to increase the possibilities for a correct application of collective intelligence in the group. The task is

to find different ways for the application of collective intelligence in order to bring people's ideas and observations together and create positive results for the firm (Boder, 2006: 82). Therefore, to successfully lead the groups and organizations we need to apply the correct approach.

Before the team even begins it should be clear that everyone is able to understand the goals and everything is well defined. To ensure that there is a clear understanding of the purpose, the firm can ask questions and be as clear as possible. In addition, the results for the task need to be clear and fully comprehensive. The team should be provided with all kind of materials, links and background papers to complete the task. In order for this reciprocal integration to develop, the team will also need to have knowledge regarding the customers practice (Boder, 2006: 81). The firms should be able to provide all information available in order to inspire the employees to do a deeper research for the task assigned. Furthermore, the firm should confirm that all the meetings of the team will be inspiring and flexible.

The first step should be the meeting where the team comes together for whatever purpose. The meeting of the team should be scheduled so that the time they have is going to be used effectively. From the time that the meeting starts the time should not be wasted, so a program should be planned. Therefore, when the team comes together the time should be used correctly. An important part of the meeting is for the firm to make sure that in all the meetings that the team has there is a breathing space for a break, such as coffee. The meeting is providing the group with the opportunity to learn to act as a unified team and not as a separate individual.

The next step is to reveal the team's dynamics by understanding the potential that exist in the internal and external environment of the firm. The dynamics of the team and other related factors are expressed by signs such as their words, actions and / or deeds this is achieved by interacting with the discussion of opinions and ideas (Picton, Silverman, 2015: 8). The team can self – correct and adjust accordingly to the task, with the use of knowledge, creativity and reproduction of new ideas. There may be

disagreement and all views may not be the same, but all voices must be heard and be taken seriously. Though these disagreements, they may influence the results to find the best solution. Intelligent teams do not get into personal battles and disagreements to identify a winner. They just try to find the best possible solution for the task assigned.

There are some members in the team that may be ignored or be disregarded. That is why it is important to use as much time as possible and not force anyone in this state so all voices will be heard. Because all voices, even the unpopular ones, need to be heard for the benefit of the firm. For example, the team is like a jigsaw puzzle where every member has a piece of information (Fridjhon, Rod, 2016: 18). To create the whole picture all members' pieces of experience are needed (Fridhnon, Rod, 2016: 18). For the firm to have progress it needs to express its current reaction and vision. The employees can make suggestions, take the opinions of others on their suggestion and express their opinion to the other participants in the team (Picton, Silverman, 2015: 8). The team then will stay curious and active. If firms are remembering that all the team members are information carriers, then it will provide all individuals the opportunity to express something (Fridjhon, Rod, 2016: 18). Therefore, no one should take all the time, there must be time for all voices to be expressed to become an intelligent team. Leaving people to express fully their opinion without any interruptions or blames and without a break it can create a more effective team behavior. The discussions can be on – going or scheduled for a specific length of time (Picton, Silverman, 2015: 8). This can be the longest stage for collective intelligence (Fridjhon, Rod, 2016: 49).

At this stage the firm can apply the acronym SCARF to create a secure and positive motivated reaction between collective intelligence teams. Status – The firms should not make comparisons between the team members and by this to create conflict in the team. Certainty – To produce awareness of confidence, the use of transparency. Autonomy – The firm should give the team the freedom to create their own choices and plan their own work. Relatedness – In this stage there must be the production of

a sense that they are in the correct place where there is a feeling that they know each other and see shared aims. Fairness – The firm should act the same way with all the people in the firm and to share information, rewards and reductions the same (Fridjhon, Rod, 2016: 43). With these measures, the team will feel united and will express information and knowledge more freely.

When applying collective intelligence at this stage it is important for the member of the team to use all the tools available to them. The firm should encourage the team to accept change as a natural condition necessary for survival (Fridjhon, Rod, 2016: 24). Therefore, due to the constant change in the world the team needs to have all ideas and sources used to create new ideas that are predictions for the future. Together the team can look for areas that can create a common platform from which to explore further needs of the environment and the solutions for the task (Fridjhon, Rod, 2016: 20).

Later on, after all different kinds of solutions are found from the team the last stage should be applied. Thus, the last stage of collective intelligence is the creation of the new idea by finding how and on what ideas the team members can support and take action. The team needs to explore all the possibilities that are now available (Fridjhon, Rod, 2016: 78). At this stage the members of the team should search for the result that will provide the best possible alignment for the members (Fridjhon, Rod, 2016: 87). That will be for greatest interest and a guarantee to achieve the higher goal. After the alignment, comes the need for action that will push the team forward. The level of action depends on the team's willingness to share responsibility, whether or not they have a clear plan and if they are responsible to each other (Fridjhon, Rod, 2016: 81).

Through these stages it allows the team to learn to communicate and use correctly the information they have been provided with. If the team does not find a solution, then the above stages should repeat.

Chapter 5

Case Study

In this chapter we will review collective intelligence. We will study how collective intelligence is affecting an actual firm, what solution and what benefits provides the firm while collective intelligence is applied. The case company is Pfizer Inc. is an American drug manufacture with its headquarters in New York City. It is one of the world's largest pharmaceutical companies. Pfizer Inc. employed, for the year of 2016, over 96,000 people and received for the year 2017 revenues up to 52, 55 billion US Dollars. The company develops and produces medicines for a variety of medical solutions such as LIPITOR for lower blood cholesterol, Zihtomax antibiotic and others. It is considered as the second largest independent biotech company.

(<https://en.wikipedia.org/wiki/Pfizer>).

5.1 Possible Problems

Even companies that big and important face problems and they need to find solutions. The problems that the can face are numerus. For example, a drug can be copied by another competitor company and the company can lose a substantial amount of money (IBM Software Group, 2009: 2). Even, with the advantage of being a large company is still important to create innovations. That is why it needs to have modernized and innovative thinking to find channels that will help the creation of a new product and provide solutions for the problems that the company will face. This can be accomplished with collective intelligence faster and more efficiently.

Pfizer's open innovation experts were not able to locate the solution for different problems. However, they were aware that there was a variety of technological

opportunities for solving the challenge that they were facing at the time (Bagherzadeh, et al, 2017: 1).

5.2 Innovation

According to Pfizer Inc. webpage “Pfizer innovation strives for business innovation to make healthcare solution more affordable and accessible around the world. We deliver opportunities presented by mobile and internet connectivity, care convergence, behavior modification, and analytics hold exciting promise for healthcare. Our mission is to collaborate with leaders of innovation who deliver solutions....”

Dr. Robin Spencer, senior researcher at the company based on New York, says “Pfizer Inc. knows that the best solution to its business problems do not always come from the researches on the front lines. Often someone in another department or another country could hold the missing piece to a particular puzzle. That is why Pfizer wanted to figure out how to tap into the collective intelligence of its 86,000 employees to address its business challenges” (articles by Linda Rosencrance February 24, 2010).

The company Pfizer Inc. decided to use an open innovation contest as part of its problem solving strategy (Bagherzadeh, et al, 2017: 2). In this open innovating contest they participate all individuals and organizations from the internal and the external environment with the goal of reached to the best possible solution (Bagherzadeh, et al, 2017: 2).

5.3 Pfizer Idea Farm

Therefore, Pfizer Company uses one application called Idea Center, which is built on IBM Lotus Domino and developed by Boston based Imaginatik PLC (Koudelkova, Svobodoval, 2011: 994). Imaginatik PLC customized its Idea Central for Pfizer, which then named it the Pfizer Farm. The Software Idea Farm has over 50 different tools,

which can help with recording, management, procession and evaluation of ideas entered into it (Koudelkova, Svobodoval, 2011: 994).

It is a system which works on the Software – as – a – Services called SaaS. Software as a service (SaaS) is an idea that crops up at intervals, each time strengthened by technology that is better suitable to provide its features, technologists who have a better understanding of what customers need and what the market will require for their profit and success (Koudelkova, Svobodoval, 2011: 944). Software as a service (SaaS) has access to upgrades that are easy. Thus, the software alters accordingly to be user friendly. The software – as – a – platform gives Pfizer employees the means to download their ideas for an improvement or a new product (Koudelkova, Svobodoval, 2011: 944). The employees can easily upload their ideas for improving their business process and products or they often use the system to find the solution for every problem that they are facing (Koudelkova, Svobodoval, 2011: 944). It is an application that helps with the collaboration of a large group of people in order to find solutions to the firms' problems.

5.4 Procedure

Dr. Robin Spencer and his boss first looked and selected between different complicate problems that needed solution. Also, people from the business may come with different problems that they want to express. After a discussion of the problems they selected, they decided whether it is worth to pursue a problem and if it will benefit the firm. The problem is then described clearly for all members to understand and they are also provided with background documents, Web links and other sources of information for understanding of the problem. The program has no limits for the people that will participate. Pfizer Inc. then decides the number of people that will participate in finding solutions for the problem. Then the participants enter their suggestions in the system. The form is easy and fast to complete and have no restrictions regarding the size of the solution that will be competed. All employees can see the ideas that are been submitted and they can ask questions, and make comments. Also, there is a five star option that permits people to namelessly rate the

ideas (in addition, this feature can be deactivated in the Pfizer setup). Dr. Robin Spencer encourages sponsors and managers to not say anything for a couple of days and at a later stage they speak with neutral but inspiring remarks in order to inspire more the collaboration of the members. After a specified period of time the software contains over 50 features to help in the evaluation of the ideas provided. The ideas are also reviewed and analyzed, it is approximately a six-week process. There are recommendations and then they make the final decision. The program helps with the creation of ideas in a secure way and provides a review and evaluation of ideas with the minimum administrative supervision (IBM Software Group, 2009).

According to Dr. Robin Spencer the application has saved the company 20 million dollars and also helped to find solutions for hundred business problems for Pfizer Inc. (article by Linda Rosencrance, February 24, 2010). In addition, Pfizer Inc. has received over a 100 million dollars in net present value by recording new markets (IBM Software Group, 2009: 6). The companies are interested in this application Software – As – A – Service because it provides quick organization and it reduces their organizational costs. From a vast list of solutions that are gathered only the best ideas are chosen. The implementation makes sure that the group of people reviews the best proposal and then they provide more ideas on how this concept can be put into action (Koudelkova, Svobodoval, 2011: 944).

Chapter 6

Conclusions

Concluding, from the above study of the company Pfizer Inc. and the study of collective intelligence we can verify the importance and the benefits that can be provided to the firm. Therefore, collective intelligence is a matter of building scenarios around a problem – solving situation (Boder, 2006: 85). There is a possibility that neither individual nor collective intelligence will be enough to solve the problems and goals of a firm, but if they are unified they can have more successful results. Many minds are better than one with collective intelligence applied. To be able to deal successfully with the different social and environmental challenges that requested a solution, it is needed to create more collective intelligence as a society industry, and global civilization and apply it with wisdom (Atlee, Por, 2008: 2). Therefore, collective intelligence can be viewed through a developmental perspective that suggests that it is possible to evolve towards greater wisdom (Atlee, Por, 2008: 3).

A major theoretical contribution of this study is the effects that collective intelligence is having on firms. To implement collective intelligence all the stages should be applied correctly and with wisdom. Every stage should be reviewed with great detail. If the group that has been created, works together as a united team that has been wisely created for the task to provide knowledge, ideas and vision, then collective intelligence can benefit the firm positively. If it is not the correct team for the firm, then they may have negative results. Therefore, we locate also ways toward improving collective intelligence.

6.1 The importance of collective intelligence

In this case study the firm Pfizer Inc. was looking for the best solution, an innovation. The findings from this study show that a system of collective intelligence was applied that offers the access to a variety of creative solutions. A mean that provides the best solutions “Pfizer Idea Farm” gathers new innovation and knowledge for the benefit of the Pfizer Inc. This is particular important for the performance of the firms.

According to the study, firms can use collective intelligence in many ways. Collective intelligence can create and increase skills, as well as predict the future. The task collective intelligence provides the team with the knowledge and experience to resolve their business issues. As the number of tools for collective intelligence are increasing, the firms can have answers even more easily to a variety of business challenges (Picton, Silverman, 2015: 19). After the crises, firms recognize the positive changes that come through collective intelligence and the revolution that it can provide. Nowadays, collective intelligence is vital for the firms.

As the world is becoming more and more complex and the need for new and different combinations of knowledge increases it becomes more important to discover new ways to collect, encourage, and connect the information and the intelligence available to us (Fridjhon, Rod, 2016: 4). Teams of collective intelligence are now competing at the highest international levels. With collective intelligence the firms are being provided with solutions for a long-term competitiveness.

In addition, collective intelligence creates a culture of people that thrive, excel, and reinvent themselves (Fridjhon, Rod, 2016: 5). Therefore, for firms to flourish, it needs their people to come as a united team. The same applies for employees, too. People have always had the need to collaborate and this increases their skills of collaboration and knowledge. In a successful company where everyone has contributed there is a strong sense of identity and pride (Fridjhon, Rod, 2016: 6). Line employees and managers are collaborating with one another and they are achieving the smooth operation of the firm, greater service quality, innovation and enhance profitability

(Fridjhon, Rod, 2016: 6). As the world is changing it will be more and more important for the firms to use collective intelligence to complete their projects.

6.2 Collective intelligence will it benefit firms

According to the study of Pfizer Inc. and as managers explained to the firm the program “Pfizer Idea Farm: provides “reduced costs, reduced time and also “free” prototype information” (Bagherzadeh, et al, 2017: 5). Pfizer with the use of an open innovation strategy had returns. Internal teams’ expectations such as creativity and technical feasibility were exceeded by the smart packaging design solution for per-filled syringes that came from the innovation contest (Bagherzadeh, et al, 2017: 5). In addition, prototype ideas were developed in this contest by exert teams that had not won the competition. These ideas can be found useful by Pfizer’s internal teams for developing new products or solving technical challenges. Finally, the firm achieved to work on a fixed-cost basis, using an intermediary. Pfizer succeeds the best results, better than if it had hired a designer to find the solution. (BagharzedeH, et al, 2017: 5)

The finding of this study contributes to the exploration of the effects that collective intelligence has on firms. Firms are now starting to understand the extent of the benefits that collective intelligence can provide (Picton, Silverman, 2015: 19). There are ways through collective intelligence for the firms to make smarter choices. Therefore, it is worth to understand and explore the benefits that collective intelligence can provide the firms with (Rosenberg, 2015: article).

If a correct way is applied with wisdom for the creation of collective intelligence, the firms can complete successfully their challenges and goals and have tremendous advantages for their profitability and their goals. Collective intelligence can create higher levels of creativity for the companies, create commitment and increase the overall performance. There are numerous examples of positive advantages that collective intelligence offers to the firms that had applied it (Picton, Silverman, 2015: 19).

Firms with collective intelligence where the members participate in the survival and profitability of the firm by thinking and not acting for their individual advantage but for the benefit of collectiveness they are now successful organizations (Fridjhon, Rod, 2016: 9). In fact, collective intelligence may be the only tool that can provide the firms with the means to overcome their challenges. When collective intelligence is applied in the firm the team starts to improve their interactions, optimize its intelligence and resources, and create brand-new innovation that ultimately leads to a higher performance for the benefit of the firm (Fridjhon, Rod, 2016: 13).

When the team of the collective intelligence comes together as a united power through thoughts, words and deeds its surrendering to a natural flow which makes it possible to achieve results that no individual could have done alone (Fridjhon, Rod, 2016: 34). The promise of collective intelligence is to build a system of knowledge. Knowledgeable and experienced employees and customers can improve the accuracy of prediction. With the correct use of intelligence firms can calculate the results of future events. This allows firms to make more accurate, evidence-based decisions for the benefit of the firms (Picton, Silverman, 2015: 10).

For the last few years, teams of collective intelligence increase as they can provide solutions for the firms and improve their productivity. With the application of groups, the firms can have better communication in order to succeed and complete the goals and problems that the groups faces and the employees are provided with the source to increase their abilities and knowledge. The use of teams allows managers to focus their attention on strategic issues than to supervise individuals (Chan, Entreking, Pearson, 2003: 174).

With collective intelligence through knowledge and technologies, the firms can have remarkable changes the next few years. Technology is providing, creating and maintaining information that previously was unavailable. Nowadays, collective intelligence can provide solutions for many problems for the firms.

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