

The Concept of the Virtuality in the Company: What Strategy for Change can Facilitate the Integration of this Concept?

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Abstract– Face to the technological development and to the race to the competitiveness that drives the search for total quality and the reduction of the cost in order to meet the needs of customers who have become more and more demanding. The world of organizations has evolved into a virtual world which removes the notions of dimension and of the time. One of the new forms of organization that information technology can withstand is the virtual enterprise. This new conception of the organization is in need of communication technologies to share information within the company or with partner companies. Thus, these new organizational forms such as the company are based on an intensive use of ICT (Information and Communication Technologies) and the integration of the Help Systems in the Cooperative Work (HSCW). The technological tools such as the Ethernet TCP/IP, Intranet or the Internet allow you to perform the sharing of information and resources in real time to meet the needs of customers. A well calculated approach to integration of these tools allows a successful management of change in order to install these new practices within the culture of the company. In this article, we will describe the strategy of the virtual enterprise, its characteristics, its forms, the technologies and methods to help the cooperative work contributing to this virtual environment while ensuring a successful approach for change for the case of a company that wants to change its old practices by the practices developed by this strategy.

Keywords– Virtual Enterprise, NICT, HSCW, Ethernet TCP/IP, Internet, Intranet and Management of Change

I. INTRODUCTION

After the intensive automation of production systems during the 1980s, and the emergence of the new products and services that have characterized the decade of the

1990s. Today, businesses have found themselves in a global market more complex and in continuous expansion. This has increased the global competition and thus, it becomes necessary to rapidly deliver products in response to a request extremely diversified on the part of an increasingly demanding customer. On the other hand, the production companies are no longer isolated units of production, but rather the central nodes of a complex infrastructure combining, the sub-contractors, suppliers, consumers, as well as the other services of the company. The advent of New Technologies of Information and Communication Technologies and the integration of the systems to help the cooperative work (HSCW) have helped to change the policy of the business: a business classic to a company of more and more virtual. In a first time, we will describe the strategy of the virtual enterprise. Then, the tools contributing to a virtual environment. Finally, we will define an approach to the management of change to accompany the evolution of the traditional firm to a company of virtual type.

II. THE VIRTUAL ENTERPRISES: CONCEPT AND DEFINITION

A. Introduction

The location of businesses in a market that is marked by a strong competition, flexibility, and adaptability, and the advent of the New Information and Communication Technologies (NICT), constitute the factors that lead firms to change their structures to a classic structure responds to a change of the rough market, the latter has been imposed by several factor of after PARK [28], globalization or the company is faced with an economy and world markets without borders and the strong competition, the competition and cooperation at the same time on different projects shared by the enterprises, technological innovation such as Tele-collaboration that make necessary and possible organizational units globally distributed.

The companies today are seeking to develop their conventional structures toward a structure more flexible and more flexible, this structure led to the establishment of the concept of the virtual enterprise, which is the basis of the networked economy, this concept is used to characterize the world supply of a product in an environment of dynamic groups of firms involved in various complex relationships. The virtual enterprises were in a prime time to allow for the

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deployment of distributed processes of business among the different partners, to increase the effectiveness of services provided, to reduce the cost for these services and to adapt to new changes in the market [26].

The virtual companies provide, the ability to share the process of case in a cost effective way and on the other hand, access to the capabilities, skills and resources offered by the different partners. This can reduce to shorten the development and the life cycles of products/services and by consequence, reduce the costs and expenses and allow a quick adaptability to the needs of the market.

In the following section we will introduce some definition in the literature on the virtual enterprises.

B. Definition

A first definition of the virtual enterprise of after PROBST [27]:

«A virtual enterprise is a temporary network of independent companies and individuals who unite their means, their skills and resources in order to achieve a common project that can exceed the capabilities of each unit considered separately, in order to exploit the opportunities of volatile matter, to access new markets and to share the costs and risks. This superstructure without significant organizational and taking advantage of the facilities provided by the new technologies of computing and telecommunications.»

The virtual enterprise is defined as:

« An association of the infrastructure networks, technology and the expertise that generates a form of company difficult to distinguish » [8].

It is also defined as:

«A provisional alliance of companies, who want to share all their specialties, their core competencies and their resources to better respond to business opportunities and whose cooperation is sustained by networks of computers» [6].

According to these definitions, we note that there are two important elements in a virtual enterprise: the cooperation and the network, the virtual enterprise is described as a network of cooperating companies. Some companies or pre-existing organizations with common goals together form an interoperable network that acts as a single organization simple, without forming a new entity, or put in place a physical headquarters. In other words, the virtual enterprises are realized by the integration of skills and assets of different companies in a single business entity. This concept presented to the companies an innovation in regard to the improvement of their method of organization and management.

The businesses and more particularly, the SMES (small and medium-sized businesses) must unite their expertise and resources to be competitive in a market marked by a strong competition.

C. Form of organization in network

With a wide variety of forms of organization in network, the terminology of this field becomes confrontational.

Expressions such as the extended enterprise, the virtual organization, or the network organization, are sometimes

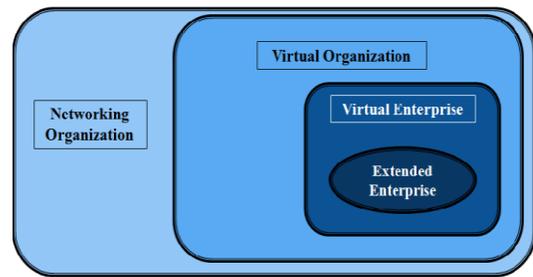


Fig. 1: Different forms of organization in network [5]

employed by some authors of indiscriminately, without concern for the differences and authentic meanings of these terms. Of this fact, these concepts are in need of a clarification rigorous to the distinguish; Figure 1 shows the different forms of network organizations [5]:

The extended enterprise is a company tailored to the organizations in which a dominant company extends its borders to contain all or some of its suppliers, subcontractors and same to competing companies.

The partners in the extended enterprise work in common, on at least one shared goal, all while enjoying mutually of skills and resources. It is a situation typically encountered in the automotive industry and in the supply chains stable.

Virtual Enterprise: Compared to the extended enterprise, the V.E. can be view as a more general concept including other types of organizations, namely a more democratic structure in which the cooperation between the different companies in network is the same. In this sense, we can see an extended enterprise, as a particular case of a virtual enterprise.

Virtual Organization: The virtual organization exceeds the limits of simple alliance of companies that is the case of virtual enterprises. It refers to any group of organizations connected by a network of computers, sharing the skills and resources, to achieve a common goal between the various participants. This type of organization is applied in the field of automobile. Virtual enterprise is therefore a special case of virtual organization.

Networking Organization: This is perhaps the most general term referring to any group of organizations connected by a network of computers, but without necessarily sharing the skills or resources, or with a common purpose. Organizations typically in network correspond to a type of very free organization.

D. Keys to success of a virtual enterprise

With the development of the New Information and Communication Technologies NICT, technologies for robotics and electronics, and the diversity of applications of consumers who have become more and more demanding, the organization must evolve to a structure type more mobile and more responsive.

To meet the needs of customers, the virtual enterprise must have the keys of success:

- be competitive
- be agile
- Optimize the resources

- Share in the risks
- Facilitate innovation
- Look for complementarities
- Expand the dimension

E. Operation of a virtual enterprise

The following example shows a scenario of operation of a virtual enterprise established between several providers of telecommunication services: the organization of telecommunications provides virtual private networks to its customers. In the case or a client requires a private network connection between two physical locations that belong to two different states.

For example; Morocco and Europe, the organization of telecommunications initial "Maroc Telecom" must make the connections of appropriate international lines leased by using the network infrastructure of another organization of telecommunications. This means that "Maroc Telecom" that represents the service company of initial communication in Morocco, must cooperate with the companies of the European union of telecommunications to provide the international leased line. The companies must cooperate and share resources and the process of business during this complex activity in order to provide this service to the customer. The supplied leased line is a service offered by several companies who are committed to serve this client for the full duration of the existence of the leased line. The final service is provided in a way that is transparent to the user.

FISHER explained in Figure 2 the concept of the virtual enterprise, in which several companies meet their skills in a single virtual organization to achieve a common object.

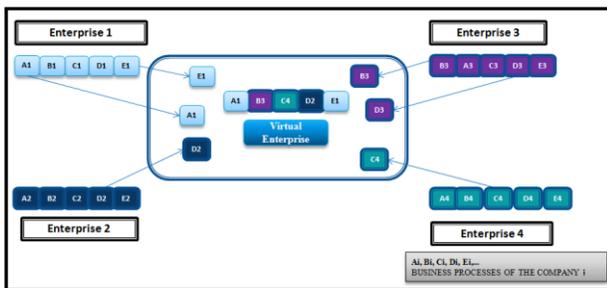


Fig. 2: Concept of a virtual enterprise [9]

F. Characteristic of a virtual enterprise

The virtual enterprise is a flexible organization; its different models have the characteristics of matter and common techniques illustrated in Figure 3 [7], [11]:

- The ignorance of borders and traditional boundaries: by providing a flexible collaboration by the union of fundamental skills and the combination of production methods.
- The complimentarity of the fundamental skills and the sharing of resources: in allowing you to deliver a product or to carry out a project through the collaboration and the sharing of resources.
- The geographical dispersion of participants: the partners are physically distributed and are connected between them

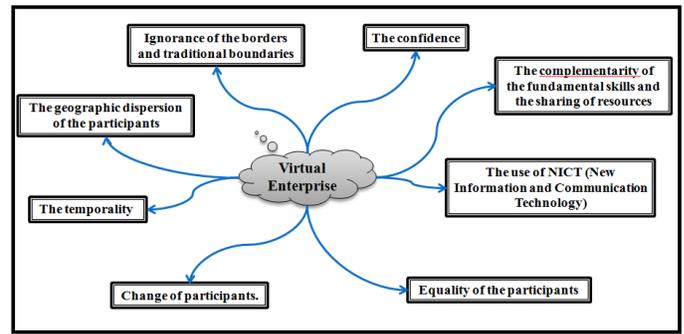


Fig. 3: The characteristics of a virtual enterprise [17]

with the tools of communication. It is therefore possible to communicate in a few seconds on a global scale.

- The confidence: plays an essential role in the virtual enterprise, this last is guaranteed by the procedures and contracts.
- Change of participants: the virtual enterprise can be composed differently every day. One day, such an undertaking may be part of the network, forming the virtual enterprise with other businesses. The next day, this company could be composed of other enterprises different from previous, which allows greater flexibility and greater adaptability.
- The temporality: the virtual enterprise has a fixed period of life following the time for completion of a project while it may have an indefinite period in the case where the participants find that their collaboration is advantageous.
- The integration of new information and communication technologies ICTS: The collaboration is based on the new information technologies and communication since the principle of the virtual enterprise must break with the concept of time, technologies such as: (e-mail, voice mail, the communication particularly video, etc.) give enough scope for the quick sharing of resources.
- The equality of participants: Each participant in this collaboration plays its own role; it contributed to the improvement of the finished product and forms a connection regardless of the location in the process of the virtual enterprise.

G. Categories of virtual enterprises

The virtual enterprise diverges into two types of company [16]:

- The virtual enterprise static.
- The virtual enterprise dynamic.
 - *The virtual enterprise static:*

It is said that a virtual enterprise is static when the partners are linked together in a way static and fixed. The business relationships between the partners are predetermined, strongly coupled, fixed and well-integrated and customized between the partners. There are two types of EV static: centralized and decentralized.

 - *The virtual enterprise dynamic:*

It is said that a virtual enterprise is dynamic when a set of partners is linked dynamically, on a request and according to

the requirements of the customers in deploying a virtual market. It is the reverse in the case of a virtual enterprise static. For this type of EV, there are two types: centralized and decentralized.

The following diagram illustrates the different categories of the virtual enterprise:

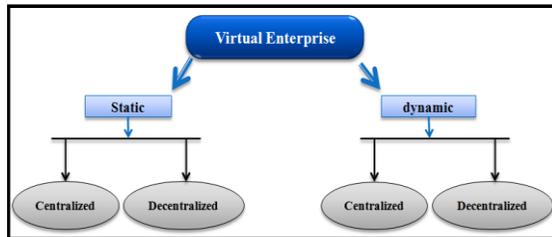


Fig. 4: The different categories of a virtual enterprise

H. Projects for the development of virtual enterprises

In this axis we will introduce the various projects and work in summary for the development of virtual enterprises (Table 1).

Table 1: Different work carried out for the development of V.E

| Projects | Specification | Reference |
|--|---|-----------|
| NIIP (National Industrial Information Infrastructure Protocols) | Project aims to address the problem of incompatibility to the inside of the virtual enterprises and enable organizations to collaborate with each other regardless of data structures, processes, or of IT environments. | [21] |
| PRODNET II | Project designed and conducted for the purpose of proposing an open infrastructure support for virtual enterprises industrial for the SMES (small and medium-sized businesses) | [5] |
| VIRTEC | A Brazil project aims to develop a framework (a space of modular work) of the virtual enterprise based on the concept of VGE (Global Virtual Enterprise). This workspace consists of three components: Broker (area of sharing) of the virtual enterprise, a cluster (storage unit) virtual to industry and the virtual enterprise. | [22] |
| Co-OPERATE | A European project designed to develop solutions for expanding the network of suppliers, for the collaborative planning and for the organization and the support of the network. (Mainly the phases: creation and operation of a Virtual Company.) | [23] |
| VEGA | A project intended to develop a platform for integration based on the tools of Groupware (system of cooperative work) and a distributed architecture to support the operations of matter techniques in virtual enterprises. | [24] |
| VIVE (Virtual Vertical Enterprises) | A project aims at the development of a general methodology that allows Smes to harness the opportunities to high competitiveness technologies offered by the co-operatives to distance. | [25] |

In the second axis, we will present the different tools participant and to achieve a virtual environment.

III. THE TOOLS CONTRIBUTING TO THE VIRTUAL ENTERPRISE

A. The information and communication technologies ICT

These are the technologies that affect the communication by computer, and the technologies of the information which may include conventional computer applications of information systems of enterprises and knowledge-based systems such as the Ethernet TCP/IP, the Internet, and the Intranet.

Ethernet TCP/IP

Ethernet:

It is a telecommunications network to high-speed based on the Ethernet protocol which is used primarily on the private local area networks of clients (businesses or other), it implements the physical layer of the OSI model (Open System Interconnection), and the principle of this protocol is to send messages in what was essentially a radio system [19]. The Figure 5 illustrates a connector for the Ethernet network:



Fig. 5: RJ45 Connector for Ethernet

TCP/IP Protocol:

TCP/IP is a network architecture that allows the transfer of data on the Internet, it is broken down into two protocols TCP (Transmission Control Protocol) and IP (Internet Protocol), and this architecture has four layers corresponding to the OSI model.

Figure 6 illustrates an overview of the TCP/IP model under the OSI model [9]:

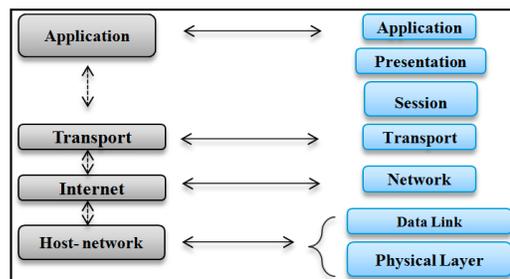


Fig. 6: TCP/IP Model under OSI model

The four layers of the TCP/IP model are:
 - Host-to-Network Layer: it combines the physical layer and the data link layer of the OSI model, the only constraint of this

layer is to allow a host (the server on which the user connects to access to the rest of a network) to send IP packets on the network.

- Internet Layer: it performs a interconnection of networks (heterogeneous) without remote connection, its role is to allow the injection of the packets in any network, and the delivery of these packets independently of each other up to destination.
- Transport Layer: it allows integers to sustain a conversation; she only has two implementation of the protocol TCP and UDP (User Datagram Protocol) which allow the routing of packets without error from a machine of an internet to another machine on the same internet.
- The Application Layer: it allows you to choose the transport protocol to use. It also represents the data for the user as well as encoding and dialog control.

Complementarity between Ethernet & TCP/IP:

The computer networks are based on both the TCP/IP, and on the Ethernet, these two concepts are connected to an Ethernet network TCP/IP, or the Ethernet ensures communication between the computers connected to the same local network and the TCP ensures the communication at a distance, figure 7 shows the complementarity Ethernet and TCP/IP:

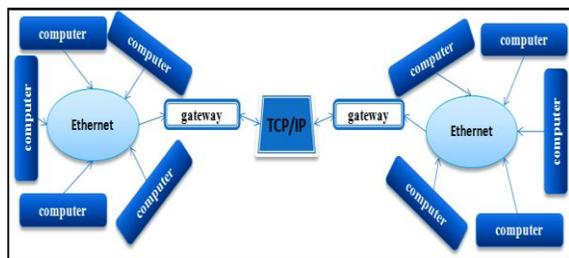


Fig. 7: The complementarity Ethernet-TCP/IP [19]

Ethernet is similar to a conversation in a room where everyone takes the floor when he has something to say, stopping in the event of a collision with another speaker; TCP/IP is (in faster) similar to sending a text, via the post, by successive pieces that he must classify to the arrival.

Internet:

The Internet has been designed to allow computers to communicate quickly and easily between them on of telecommunication lines to base of the TCP/IP. Internet offers a value-added fairly diversified. By using a few simple tools related to the Internet, companies have realized that they could significantly improve their productivity. Its characteristics as its physical size and the importance and diversity of its population of users make it the largest existing market. Its own speed and its low cost make potentially support the more interesting of the trade. The main benefit of the use of the Internet is to have access to large quantities of information in real time. Decisions can be made on the most recent data and the most extensive [3].

Most of the early contacts of businesses with Internet have held by the services of the email, useful primarily for individuals. The internal network is connected to the Internet

to enable employees to exchange electronic messages with their correspondents, search for information on a product, a technical assistance, and participate in discussions by report with their activities. It can also allow you to export the benefits of the cooperative work, possibly done remotely.

Figure 8 shows the concept of the Internet:

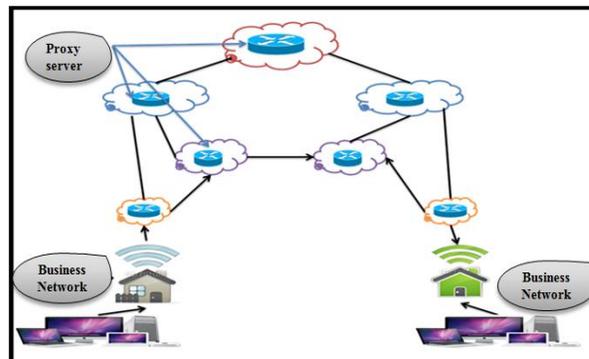


Fig. 8: Concept of the Internet

Intranet:

An Intranet is a private infrastructure of data transmission and a network intended, among other things, to the internal use of company. In addition, the Internet can be used as a private WAN. This use may be a connection between the offices or remote access, or the users constitute a community identified. One of the problems to achieve this work comes from the fact that the companies are asking for specific answers to their major concerns of security. It is obvious that the internal information to the company is not intended to be accessible from outside of the company. The Intranet is therefore a set composed of the Internet of the enterprise and security. The treatment the more simple is the use of firewalls. These security barriers to allow you to position a filtering between the outside, the Internet network open, and the internal network to the enterprise.

The users of the company have access to the public Internet, but in the other direction no machine; (except explicit authorization configured in the firewall) cannot access it. Nevertheless, the best security will simply be not to connect the internal network of the organization on the Internet.

The current firewalls are rather very reliable and should be sufficient in the majority of cases [1], [2].

In the following section, we introduce the systems the most frequently applied in the co-operative work.

B. The help systems in the cooperative work (HSCW)

The HSCW (Help System to the cooperative work): provides technical and interactive devices to facilitate the cooperative work between individuals within a group. This will allow extending the analysis to a context-firm [4].

The HSCW presented a new discipline for the study of individual and collective mechanisms of group work and for the search in what the technologies of the information and communication can facilitate the work.

The GROUPEWARE:

The groupware or 'software to work in group' is a collection of applications (groupware) to facilitate the communication, coordination and collaboration among the members of a working group, that is to say, facilitate the cooperation and make effective the group work. In its broadest definition, the Groupware refers to any system that promotes the cooperative work. It is a technology that covers broad areas, such as the cooperation, the man-machine interaction and the interpersonal interaction via digital techniques [13].

Generally, a Groupware has the following features [4]:

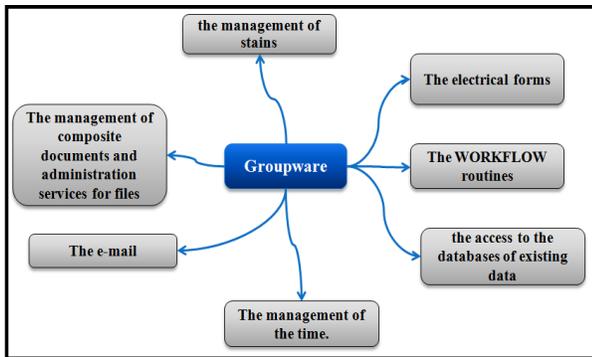


Fig. 9: Features of groupware

The WORKFLOW:

The WFCM [20] defines the workflow as: "The automation of all or part of a business process during which the information flows from one activity to another, which is to say a participant (or of a group of participants) to the other, for action based on a set of rules for management" [4].

Then, the workflow is a means of coordination of activities and management and automation of business processes. It is used as well, to improve the productivity of the company.

The workflow system is composed of a grouping of multiple technologies; the five components defined by the coalition are themselves the subject of standards as well as the interfaces between these components (Figure 10).

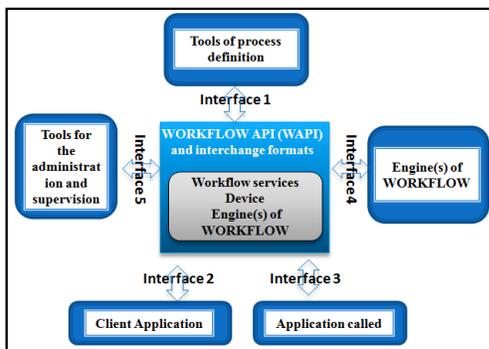


Fig. 10: The components of a system of WORKFLOW [13]

The messaging systems:

In contrast to the distributed systems based on the conventional components, which sought to tie closely of enterprise systems and the processes of different organizations in a simple virtual organization coordinated, the systems of management and execution of business processes cross-domain can be constructed by using the exchange of documents usually described in XML, for linking together several organizations [16].

There is a need to advocate a distributed system of messaging to support the exchange of messages between the various systems and components of business. Initially, the messaging systems have been deployed for reasons of interoperability and ease of integration between the applications intra-domain distributed.

However, with the success of object-oriented distributed systems, and with the emergence of concepts of virtual enterprises and dynamic systems of federated business (B2B: business to business).

In general, a messaging system provides the characteristics shown in Figure 11:

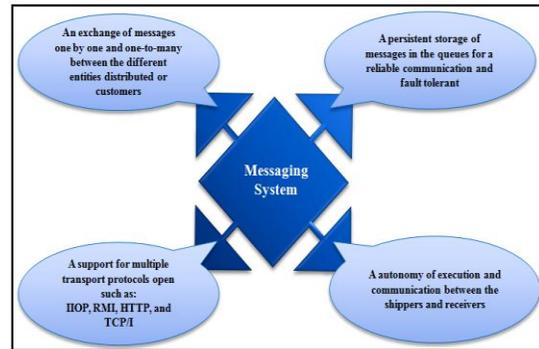


Fig.11: The characteristics of a messaging system

The integration of these tools will have an impact on the culture of the enterprise, so that such an approach will lead to a successful line of change in order to integrate its tools in the practices of the company.

In the next axis, we will focus our contribution on approaches which provide the change within the company who wants to develop its practices to the virtuality.

IV. MANAGEMENT OF CHANGE IN A TYPICAL ENTERPRISE

SPARGGON defines the change as being [18]: "complex process, non-linear that involves the passage from one state to another that is observable in the environment and which has a durable nature".

The NH (NEW HORIZONTAL), "Advisers in organizational development" considers the change as an integral process and global that takes into account not only the tactical components, procedural, and technological, but which includes aspects of the human impact and the transition that accompany the whole process of change [14].

The staff change is often one of the most stressful experiences of our lives and this is also true for the organizational changes, the change in this case is based on the systematic thought overall while maintaining a:

- The transparency of the communication between the people - the involvement of all key players
- A clear understanding of future wishes and agents of change - the accompaniment and the support of the people during the whole process of change
- An adaptation of the organizational culture willing and able to support and to strengthen the change.

The Figure 12 illustrates the visions which the change can be applied:



Fig. 12: The involvement of the change in the different vision

Most of the experienced people in transition to agile methods (virtual environment) adhere to the fact that it represents a cultural change for the businesses that engage on this track, it is not just to train the agile, but also to reach the hearts and minds of the people involved or affected by such a change and to ensure that these new behavior are installed in a short time. This change is integrated in the various departments of the company in two phases:

- The first is to put in place a change initiative successful.
- The second aims to make the agile in a positive context in order to ensure the change.

Figure13 shows the integration of management of change within an organization:

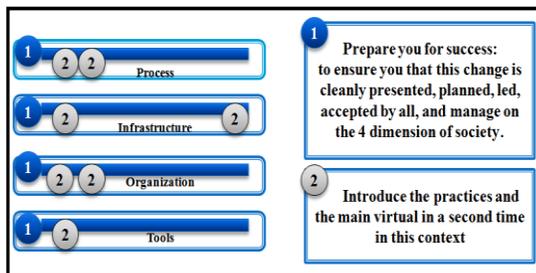


Fig.13: Concept of the change in the enterprise [10]

Most of the methods of organizational change are based on the concept of project management. We will introduce the more share of change methods described in the literature.

A. Method of KOTTER

Method of organizational change is based on eight steps, it begins with the creation of an emergency situation before embarking on a project of change, the formalization of a ruling coalition is the second phase which comes by the result, once the sense of urgency has been created, we need to mobilize a

team which will fill work on a project of change, this coalition will ensure the development of a vision and strategy for the phase which follows. In this phase, we note that it has two important points; the first is to distribute a vision by asking the question (or it will ?), and the second is to define a strategy (how we are to go ?), these two points will cause a communication process in order to study this change in recalling the emergency situation, offering a vision for remedy and proposing a plan to get there, once the phase of communication is complete, the step that follows seeks to empower the staff for a large-scale action. In effect, the actors in the implementation of the change must have the means to act, so that is a collective effort. Step six has for objective to filter and demonstrate the results in the short term, while locating the first signs of change, these results must consolidate and submit to accelerate the changes in the level of the step seven and in order to give the motivation needed to cause the various actors to the change. The end of this method is to anchor the new practices within the culture of the company while keeping the balance of these new practices integrated with the old. Figure 14 shows the method of KOTTER:



Fig. 14: The different steps of the method of KOTTER [12]

B. Method of OLIVER

It is a method inspired by the concept of KOTTER in the form of card game based on the method to help in a transition to the concept of CRUM (agile Method dedicated to the management of project); this method integrates the conduct of the change as a development project while making states of places of change. A first step of this method is to scan the entire set of maps to identify the current situation within the organization, once this phase is completed, we will have a global vision of the remaining work to be done (what exists and what remains to be done).

The Figure 15 presents the different phases of this method:



Fig. 15: Different steps of the method of OLIVER [15]

These steps are done with the help of the cards of different colors, each color defines a phase of the method of Kotter, and the fig.16 presents the design of this card:

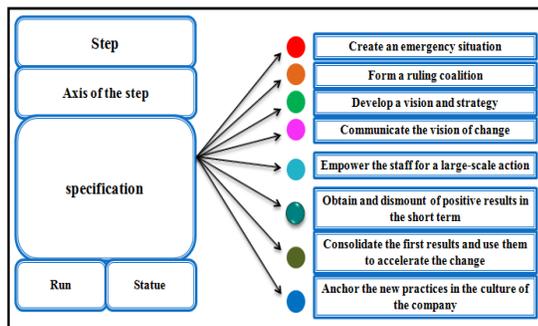


Fig. 16: The design of game cards of the method of OLIVER for each phase [15]

C. Method of SPARGGON

A method based on two sentences:

- *The first* requires planning at the level of leaders: This phase starts by understanding the need for change, and then the mobilization in forming a coalition to orientation in order to develop a vision for change.
- *The second* is to implement this vision in the resources of the firm: After creating the vision for change, it is important to create a sense of urgency to involve the motivation in the various resources of the company, this creates a motivation than communication between the various staff on the vision of the change to be able to act in making a few gestures as the first signs of change, and in the end the consolidation of these practices in the process of the company (Figure 17), [18].

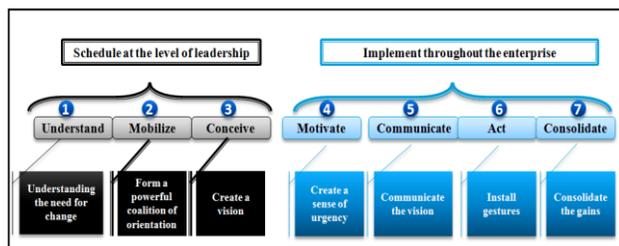


Fig. 17: Concept of change according to SPARGGON

D. Factors of failure

A process of change toward the virtuality can suffer a failure having to cause:

- The members of the team are not ready to make the change.
- Lack of necessary skills.
- Absence of good leadership.
- The expectations are unrealistic.
- The pace of change is too fast.
- Too much of an obstacle is against the change.
- Poor planning.

These factors are derived from one and the same factor that encompasses a mismanagement of human resources.

V. CONCLUSION

The virtual enterprise is a flexible strategy in the company of the future, this vision is needed in the face of globalization and the race to the competitiveness, this strategy is carried out mainly by the contribution of the New Information and Communication Technologies (NICT) to facilitate the sharing of resources and information to distance, and the systems integration for the work in a group such as groupware, WORKFLOW or email.

The implementation of these tools must have interoperability with the culture of the company in order to ensure a successful management of change; this could be achieved by the application of the methods for the conduct of the change.

The conduct of change may fail; it depends on the management of human resources and the know-how or knowledge of leaders who can block the continuity of this change.

An approach of E-Learning or K. M. (Knowledge Management) will have a positive effect to decrease the factors of failure and having to aim to have a successful change in order to transform the traditional firm to the virtuality.

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