Journal of International Scientific Publication:
Materials, Methods & Technologies, Volume 3

THE TOTALLY CUSTOMER CENTRED ENTERPRISE SUPPORTED BY WEB TECHNOLOGY

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Abstract

In recent years, with the support of Information Technology, continuous changes have occurred in enterprise organizational systems. Integrated information systems as Enterprise Resource Planning (ERP) has become Extendend ERP (EERP) including Customer Relationship Management (CRM) and Supply Chain Management (SCM). Nowadays, the enterprise is open and flexible in the use of technological tools to "sense" customers and market. Customers opinions and suggestions on products represent a potential of knowledge so high that it can be considered a true strategic asset for the acquisition of competitive advantages. Acquiring information in real-time allows the company to be agile and to develop "Sense and Response" capabilities. With web 2.0 tools and instruments of social networks (forum, chat, blog, wiki) the enterprise can collaborate with external partecipants (customers, suppliers, partners). The customer is involved, during the entire product lifecycle, in all business process: design, build, test, marketing. Thus a bi-directional channel is established between customer and producer and a process of co-creation and co-production is activated. In this paper we propose a new model of Totally Customer Centred Enterprise (TCCE), supported by web technology, that continuously hears customer opinions to improve product/service.

Key words: *enterprise information system, enterprise customer oriented, extended enterprise, web 2.0, enterprise 2.0* **,** *crm*

1. INTRODUCTION

In recent years continuous changes have occurred in enterprise organisational systems, from single enterprise to company networks until the extended enterprise open to customers and suppliers. All this has been done with the support of evolving Information Technology. Nowadays, enterprise invests more in customers, trust relationship, mutual cooperation, sharing and information exchange. Knowing what the customer thinks of a given product/service helps top management to introduce improvements in processes and products and so to differentiate the company from their competitors.The value of a company is measured by what customers are willing to pay to buy its products.

The digital content of the product (services) can be shared, among different actors in the production chain, thanks to Web 2.0 technologies and virtual community (blogs, wikis, forums, social networking, social commerce) (Davenport and Hall, 2002). There are various web sites that collect customer reviews (Cho et al., 2002): epinions.com, cnet.com, complaints.com, planetfeedback.com, ecomplaints.com, ciao.it, dooyoo.it. Enterprise itself must stimulate the birth of these virtual communities to communicate and collaborate, by interactive tools, with all partners.

It is important to introduce, actively, the customer in product design. That is what happens in industrial sectors such as aeronautics and automotive. Thus a bi-directional channel is established

between customer and producer and a process of co-creation and co-production is activated.

This paper focuses on a new model Total Customer Centred Enterprise (TCCE) that continuously hears customer opinions about the product/service and behaves accordingly (Consoli et al., 2008). The model reports dysfunctions about product/service to competent offices for the necessary improvements or for answering to customers.

This paper is organized as follows: in the next section we give a description of agile enterprise architecture while in the third section an extended enterprise is presented. The fourth section focuses on customer satisfaction. In the fifth section Totally Customer Centred Enterprise (TCCE) model is discussed with particular attention to a new collaborative enterprise 2.0 customer oriented. The sixth section shows results from a survey while in the seventh section case studies SMEs are presented.. Finally some conclusions are drawn.

2. AGILE ENTERPRISE ARCHITECTURE

In recent years the new paradigm web-based that stimulate interaction and integration among enterprise applications (SCM, CRM, ERP) is the Service Open Architecture (SOA) (Dan et al., 2008).

Every business application, in the Supply Chain, is seen and considered as a service for satisfy user needs. The service is provided as the paradigm Software as a Service (SaaS). Different services can be reused, modified or combined (mash up) to create new services to satisfy workload changes and applications evolution. The SOA lets us to build, deploy and integrate these services independently from applications and computing platforms.

In the company the use of these components, however, has linked to their ability to support dynamic and articulated business processes. It is necessary an orchestration layer that bind them to the logic rules of business (business process). For implement an efficient and agile technological architecture a real alignment between SOA and Business Process Management (BPM) (Harmon, 2008) is required.

Service Oriented Architecture (SOA) is a design framework for realizing rapid and low-cost development system and improving total quality system.

An Extended Enterprise that involve customers, suppliers and business partners, can quickly respond to any event or customer demand with the technology Business Event Processing (BEP) or Event-Driven Architecture (EDA). The system reacts immediately to each internal or external detected event. Agility (Plummer and McCoy, 2006) is the ability of an organisation to react quickly to market changes. For example in the airport, the architecture responds in real time to changes booking place on the flight. In a large distribution company we can have a vision in real time of the invoice of various sale points.

SOA architecture presents following objects:

- Web Services (WS), collection of services by web technology
- Universal Description Discovery and Integration (UDDI), directory of available services (recorded and identified)
- Web Services Description Language (WSDL), for describing services and access modality (API)
- Simple Object Access Protocol (SOAP), protocol to use for service request

The Web Services (Yu et al., 2008) describe a collection of operations accessible through an XML messaging. The service provided by web services is described by a WSDL document and published into UDDI repository. The framework SOAP transport the information contained in the message and the processing method.

3. EXTENDED ENTERPRISE

With the increase of competitiveness, market globalization and customer changing demand, the companies have been encouraged to increase innovation and reduce product time-to-market and all inefficiencies in the enterprise management. Enterprises have gradually abandoned not-core competencies outsourcing and splitting them in a network of more cooperating entities.

In this way the enterprise extends generating value based on the core business and on the collaboration with other business partners (Davis and Spekman, 2003).

Traditional factors, such as capital and proximity to raw materials have gradually lost importance. Nowadays, the success factors are the sharing knowledge from all players inside and outside of the company.

Knowledge is the most important asset of business because generates excellent and innovative products/services, best practices and best relationship with customers. It is important sharing this knowledge with all subjects of global extended enterprise. There isn't a linear chain of value but a constellation of value with many participants (holistic-virtual company). Bringing a number of processes in the network is a big impact for the organization and for the enterprise. The processes of extended enterprise are redesigned with a web-oriented technology that support, internally and externally, the alignment of the information flow in the entire supply chain.

With the web technologies the enterprise reach goals reducing the time to market, enhancing the quality of its product and reducing errors in the product lifecycle.

4. CUSTOMER SATISFACTION

Customer opinions constitute a gold mine for generating high value added and for making strategic decisions. In recent years, both management and marketing sectors have emphasized the importance of a customer orientation. The final product that is delivered to customer is services enhanced; in specific services as education, health, safety, customer is the final product. With services, increase the interdependence customer-producer. The enterprise must think the customer as a thinking subject and not as insignificant end user.

Customers perform different and specific roles (Lengnick-Hall et al., 2000) that enable them to create a partnership and an interactive experience with enterprise employees. As buyers, customers develop a relationship with enterprise organization and register evalutations on the products. For company it is important to capitalize relationships with customers; customer can influence company outcomes.

An enterprise take advantages of the huge amount of information present in web sites, chats, forums, blogs, and so on. Customers exploit web 2.0 tools for expressing their opinions about a product and suggesting solutions for improving it.

Users of Web 2.0 sites, User Generated Content (UGC) (Krumn et al., 2008) and Consumer Generated Media (CGM), that are parts of the community inside social network, play an important role that extends to distribution channel and viral marketing. The traditional marketing, that bases on customer target, is already dead and we, nowadays, can consider a new marketing focuses on the community. Listen customers means learning how to build products and services. For the word of mouth marketing enterprises must use different communities.

The strategies to promote the positioning and the image of company use the new digital communication channels. Nowadays the Social Media affects on the Reputation Management (Malaga, 2001). According to Jupiter Research, in the 2009, the 80% of potential customers will be affected in purchasing decisions from web information (google, youtube, blogs, social media,

consumer-opinion sites, etc..) where is difficult a direct control. In 2007, another important research by the Interactive Advertising Association has detected the trend that defines Web 2.0 as a reference system that consumer consult before buying a product. Companies like Nike, Shell, Microsoft, McDonalds, and Amazon have see how anything is published and communicated in the web can have devastating effects on their reputation. The Online Reputation Management (ORM) safeguard the image and the positioning of company on the Web 2.0.

These new ways of interacting with customers, suppliers, partners and consultants imply real innovations of the processes, products and services. The customer can be a source of innovation and can be involved in the design, development and testing of the product. Users in the world, provide ideas (technical, advertising, ...), assess solutions, collaborate with the development, design, testing of new products. Customer can actively participate in the enterpise activities on the product development. The customer plays an active role in the enterprise, in particular he/she participates as a co-producer or as a consultant.

Examples of co-producer are customers buying furniture at the IKEA and then finishing the productive process by assembling it at home. An example of consultant is given in the Internet site of the "Fiat 500" (500 Wants You - www.fiat500.com), where each visitor expressed her/his creative contribution to the design of the new car.

In the last years the enterprise organizations have been designed in a customer-centric way to gather more accurate and detailed information about customers. Enterprise information System (EIS) feels the necessity to have a software application that gives, in real-time, the situation of the market and, in particular, that makes a continuous monitoring of the customer opinions.

The customer will be motivated to be loyal if the enterprise shows a strong attention to her needs and her identity. It is estimated that for each customer which makes a complaint, there are 4 to 26 customers do not claim even if they are dissatisfied. Each dissatisfied customer, on average, expresses her mood to 10 people. So, in the best case, behind each complaint there are 40 potential skeptical customers. Nevertheless, it is interesting to note that if a customer who complained sees the enterprise accepting the review and solving the related problem, then her propensity to purchase from the same company increases of 3 times, while for the customer who has not claimed, the propensity to purchase increases by 6 times (Lombardi, 2006).

5. THE TOTALLY CUSTOMER CENTRED ENTERPRISE

5.1 The TCCE model

This section focuses on the Totally Customer Centred Enterprise (TCCE) framework (Figure 1) that is aimed to continuously hearing customer opinions for product/service design and development. In the TCCE model, customer, with his opinion, collaborate in the improving of product/service. The model is divided into different phases: Opinion Gathering, Opinion mining, Improvements & Corrections, Product/Messaging, Product Design Collaboration.

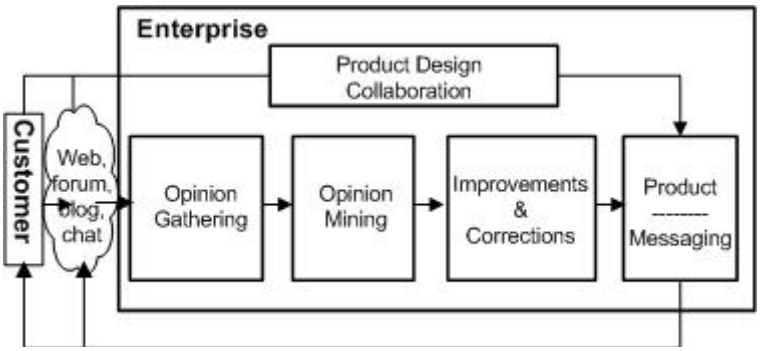

Figure 1. Totally Customer Centred Enterprise (TCCE) model

The goal of the Opinion Gathering phase is to scan the web for finding and gathering customer opinions. This module is composed by a set of crawler agents or spider specialized in different protocols (http, https, pop3, imap4, nntp), that are responsible to inspect and retrieve information, respectively, from web sites, blogs, chats, e-mails, newsgroups and so on.

The Opinion Mining phase is to polarize extracted opinion in positive or negative in order to send to enterprise competence centers for product/service improvements. To this end we use algorithms of artificial intelligence to classify opportunely customer opinion (Consoli et al., 2008).

In the Improvements & Correction phase human resources of competence centers exploit the complaint messages for the improvement of products/services or for answering customers. In both cases, the enterprise give a (indirect or direct) feedback to the customer. As a matter of fact, the improvement of a product is an indirect message, communicating that the enterprise acknowledged the customer complaints. On the other hand, the enterprise may direct answer customer over the same channel (Messaging) used by the customer for expressing his opinion. In this case, the manager becomes, in a peer-to-peer web 2.0 vision, an actor as the customer. For example Galbani company, in recent days, has emitted on its website a press release where, after some complaints, warns customers that its products are genuines.

In the Product Design Collaboration phase customer operate as co-producer of product/service. His suggestions are very useful to design a functional product that satisfy end user. Product Lifecycle Management 2.0 (PLM 2.0), that we explain in detail in the section 5.2, could work as a shared collaborative environment where all business functions and customers can participate in the product design and development.

The TCCE, bases on web customer opinions, is a model of Enterprise 2.0 that listen customer to design/improve a product/service of quality during the product lifecycle.

5.2 Enterprise 2.0

McAfee Andrew (2006), a professor at Hardvard Business School affirms that "Enterprise 2.0 is the use of emergent social software platforms within companies, or between companies and their partners or customers" (Figure 2).

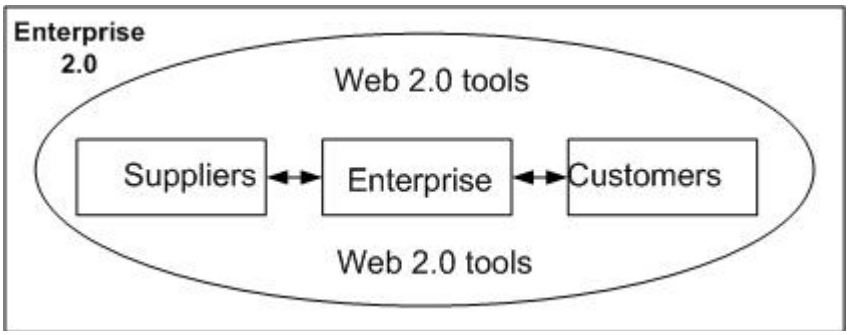

Figure 2. Enterprise 2.0

Enterprise 2.0 exploit Web 2.0 technologies, social networking sites and portals User Generated Content (UGC). The term web 2.0 was coined in 2003 by Tim O'Reilly (2007) and Dale Dougherty to describe the current stage of Internet. The term denotes the transition from conceptual sites designed as container to real service where users can interact with ease interfaces similar to desktop applications. The Web 2.0 is a new way of design applications that involve online collaboration between users.

The differences, between Web 2.0 and Web 1.0, are shown in the following Table 1:

Table 1 - Web 2.0 vs Web 1.0

Web 1.0	Web 2.0
Client/server architecture	Services oriented architecture
Sites	Services
Pages browsing	Applications use
Click and wait	Asynchronous
Unidirectional	Bidirectional
Directory (taxonomy)	Tagging (folksonomy)
Content publishing	Content delivery

In the web 2.0 we can consider other important characteristics: content provided by users, active partecipation and cooperation, collective intelligence, social network community.

Enterprise 2.0, that use web 2.0 technology, present 4 main dimensions: Social Network & Community, Content & Document Management, Adaptive Enterprise Architecture, Enterprise Application Integration.

Social Network & Community. Initiatives where is fundamental the use of social networking technologies (networks of relationships) to generate support to internal and external communities. People feel an increasingly "belonging" to extended dynamic network rather than a single organization. New technologies (global mobility) give to people the ability to connect anywhere, from their job places at any time of day with flexible working hours. People, in their communications, use mobile devices and both synchronous (chat, instant messaging, video conferencing) and asynchronous

(shared calendars, sharing and co-editing the papers, SMS, e-mail, forum, wiki) tools.

Content & Document Management (Knowledge Network). An efficient management of information (contents and documents) inside and outside the organization, through tools that improve the accuracy, accessibility and integrity. People produce knowledge and information by a variety of explicit sources (Document Management, Business Intelligence, Videosharing, RSS) and tacit sources with tools that encourage interaction between themselves (Forums, Polls, Blogs, Folksonomies, Wikis).

Adaptive Enterprise Architecture. Support to flexibility and reconfigurability of the processes with the changes of organizational strategy by tools and technologies developed for the flexible management processes (BPM). Support to construction and management of services for the application architecture (SOA, Mash up, RIA) and use of application services provided by third parties (SaaS). All these technologies can give to companies tools to refine and adapt the processes with a dynamism, flexibility and customizations.

Enterprise Application Integration. Integration of application suites as ERP, SCM, CRM, Cax technologies and PLM.

Enterprise 2.0 is a breakdown of traditional organization model towards an open and cooperative architecture with external partecipants (customers, suppliers, partners).

Enterprise 2.0 helps business partners to be more active and collaborative to reach business goals. This is a more flexible and dynamic organization able to acquire the external information and to manage, distribute and capitalize the tacit and explicit enterprise knowledge.

Keywords of Enterprise 2.0 are: sharing, cooperation and interactivity. In the Enterprise 2.0, as in Web 2.0, everything revolves around people, users, producers/consumers of data and metadata.

If we compare Enterprise 2.0 with a traditional enterprise, there are following differences (Table 2):

Table 2 – Enterprise 2.0 vs Traditional Enterprise

Traditional Enterprise	Enterprise 2.0
Product-oriented	Customer-oriented
Closed and rigid structure	Open and flexible structure
Traditional marketing	Social Marketing
Competition	Collaboration
Hierarchy	Network
Centralization	Distribution
Intranet-extranet	Web 2.0
IT- driven	User - driven
Top down	Bottom up
Location	Mobility
Owner standards	Open web based standards
Planning production	On demand production
Rigide	Agile

In the Enterprise 2.0, the customer is involved in all processes: design, development, build, test, marketing, buy (Figure 3) while in the traditional enterprise the customer is involved only in the buy process.

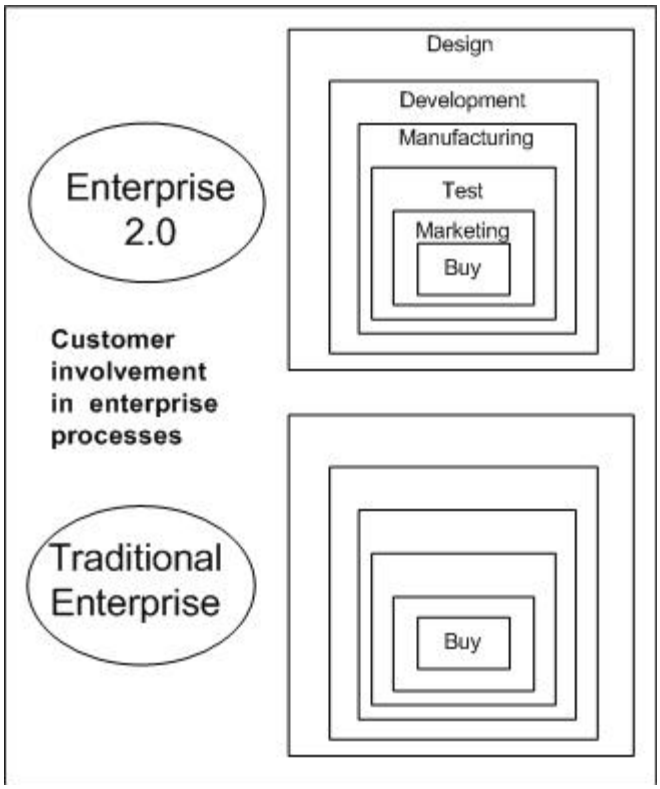

Figure 3. Customer involvement in enterprise processes

Enterprise 2.0, supported by instruments of Social Network, increase productivity, optimize processes and redefine relationship with all partners.

In the Enterprise 2.0 the web site portal plays a key role as an element of integration and interactive interface with end user. The winning companies must have a clear vision of the complete supply chain in all its aspects in order to well reorganize the internal and external processes (Business Process Rengeneering).

The Enterprise 2.0 involve a radical change in organization to improve performance, reduce costs, support innovation, build membership and motivation. The Enterprise 2.0 bases mainly on collaborative models: marketing collaborative (blogosphere, blogging), collaborative innovation (mash-up, blogging, buzz), collaborative CRM (corporate wikis, podcasting, feed RSS, forum by theme, analytics 2.0 as text mining, opinion mining).

SOA supports, very well, partnership collaboration and involves all actors in the chain value of extended enterprise.

5.3 The PLM 2.0

The PLM (15) is a strategic approach that integrates people, processes and technologies and that supports collaborative implementation of product conception, design and development (Ahmad et al., 2005).

PLM is the core of the life of a product; it keeps the traceability of information used in the phases of lifecycle of the product system. It is possible change without redo the whole project and add improvement in innovation and quality. Nowadays PLM is evolving with forms and tools for collaborative product management.

PLM coordinate and control, in a remote mode, design and development (Schuh, et al., 2008). The PLM (Figure 4) integrates, in a collaborative environment, different applications from CAx technology, Computer Aided Design (CAD), Computer Aided Engineering (CAE), Computer Aided Manufacturing (CAM), with Product Data Management (PDM), Extended Enterprise Resource Planning (EERP) o ERP II (Weston and Ted, 2003) that include ERP (internal operations), CRM (customers), SCM(suppliers). For example exchanged data from PLM and EERP can be customer orders, supplier buying and daily production planning.

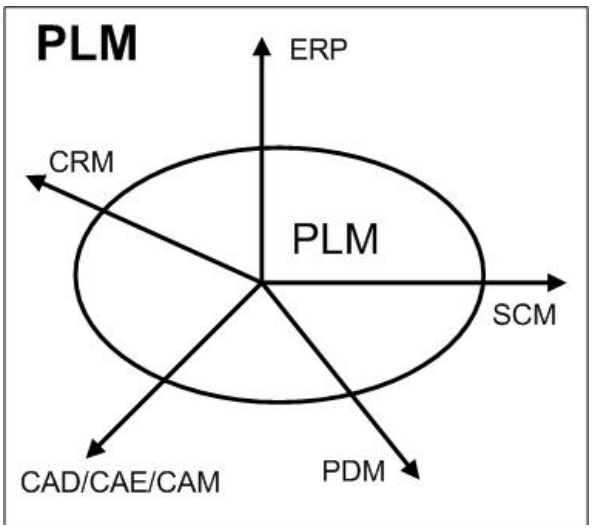

Figure 4. PLM

The Product Data Management (PDM) (Ahmad et al., 2006) integrate all product documents: design data (geometric data, models, schemes,..), Bill of Material (BoM) with different views (designers, industrializations and technical assistants), product configurations. PDM describes how the product is designed, its physical features, its functions and process information with associated technical documents (models, drawings, trademark...). Most of the production process are automated and incorporated in the same technological platform. The efficient management of shared data automatizes and accelerates the process of the product lifecycle and the launch in the global market. PDM create productive objects that integrate data and processes in a workflow where it is possible to check the list of project partecipants, authorizations, activities and the entire path of the product in its business process.

For analysing customer preferences in the web 2.0 and in the world, it is necessary to integrate, in the

PLM system, web 2.0 and social networking. PLM 2.0 (Figure 5) is working as a shared collaborative environment where all business functions and customers can participate. Consumers are seen as collaborators (co-producer) and not as end-users. In an extensive collaboration are involved designers, suppliers, business, marketing and consumers. The collaborative environment consists in Enterprise Collaborative Portal with Web 2.0 tools and Computer Supported Collaborative Work (CSCW) (Weiseth et al., 2006).

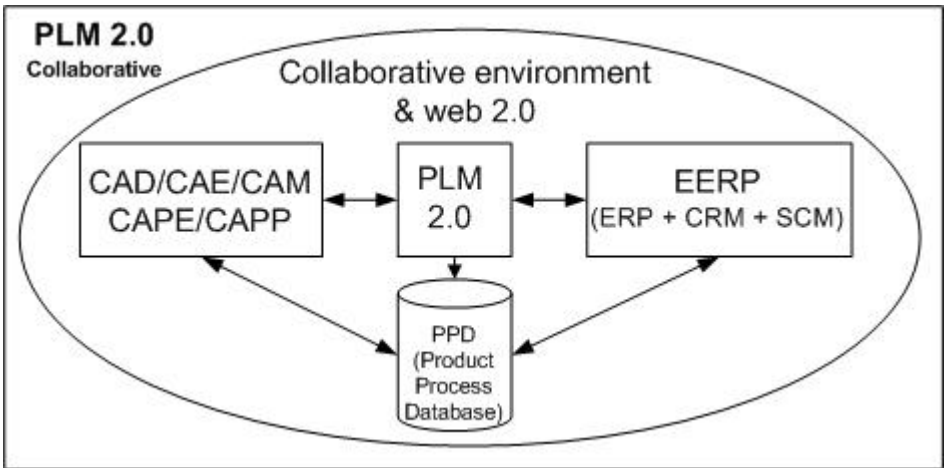

Figure 5. The collaborative PLM 2.0

In design and production it is important to share data on product and process. Internal and external information, collected by collaborative environments, is stored in a single integrated Product/Process Database (PPD).

6. SURVEY ON ENTERPRISE 2.0

From a survey (Enterprise 2.0 observatory, 2008) on implementation of Enterprise 2.0 model in traditional companies the following data have been gathered:

• 34% of companies (small, medium and large) shows a strong interest in the Enterprise 2.0 and 14% is already working in the implementation and on pilot projects

• 58% of CIO believes that the Enterprise 2.0 has capability to advance in the organizational model while 11% think in a new revolutionary business modality. A 18% doesn't pronounce, while the remaining 11% see the Web 2.0 still far from the company

• The data relative to top management (CEO) is certainly not encouraging, but 14% push in the first person for the introduction of Enterprise 2.0 initiatives, with 22% disinterested, 52% a little informed about the business impacts and 12% at least that know the issues.

• Lack of understanding of the potential of Enterprise 2.0 (51%), difficulties to identify and to assess the economic benefits (48%), needs for organizational change (37%).

The same survey, where 65 Chief Information Officers (CIO) were interviewed, emphasize that main elements, for the implementation of an Enterprise 2.0, in percentage, are (Table 3):

Table 3 - Enterprise 2.0 significant elements expressed by CIOs

Distinguishing element	Percentage (%)
Open organization	46%
Global Mobility	45%
Process reconfigurability	42%
Emergent collaboration	31%
Network Knoweledge	26%
Social network	26%

CIOs consider very important that the company is open, flexible, reconfigurable in the processes and in the use of mobility tools to "sense" customers and the market. Acquiring information in real-time allows the company to be agile and to develop "Sense and Response" capabilities. Agility is the ability of an organisation to feel environmental changes and to respond efficiently to these changes (Hadidi and Rawabdeh, 2008).

7. CASY STUDIES OF ENTERPRISE 2.0

In this section we present 4 Small Medium Enterprises that implement Enterprise 2.0 model.

7.1 Lago

The LAGO SpA of Padova (http://www.lago.it) is a young company of furniture designer that has been successful on the market thanks to its creativity, freshness, desire to contamination and ability to innovate through a careful management of production processes. Lago, use cleverly all available web 2.0 tools: blogs, photos, video, wiki, project management and services provided in SaaS modality.

Any decision is taken on unanimous and transversal, in collaborative web environment, with designer, commercial and creative. Lago has used the Web 2.0 to timely convey its products and content but also to involve its employees, dealers and consumers, external consultants in a conversation for improving processes, supporting sales, diffusing brand.

Many projects, from the lean management, to research of new products, customer satisfaction, are now coordinated through web 2.0 technology.

The old area available on the web site has been replaced by social Lago Community Sales. The main purpose of the community is to create a direct channel for the conversation with a select group of about 150 dealers and partners.

7.2 Yous

Yous Agency Spa of Roma (http://www.yous.it) for Labor and Human Resources Management focuses on communication built around concepts as Web 2.0 and global enterprise.

Yous offers its content with the RSS, a simple and comfortable way to be informed in real time. With RSS feeds, it's possible receive on proper computer updates on latest job ads. The enterprise use MYOUS, Intranet on WordPress platform, to exchange all type business documents in a collaborative work by making full use of the blog. The collaborative platform support the distribution of articles, social news and press releases.

7.3 Glossom

Glossom (http://www.glossom.it) is a Social Media Network for Fashion, Style and Creativity that aims to allow people, with an interactive platform, to express themselves, sharing creative collections of images, videos and text and freshest trends.

The philosophy of Glossom could be summarized in this way: every day we choose the things and the images that best describe our personality and our taste. We do this routinely, in a natural way to express ourselves to people that are around us. Some do it for work, others just for fun. Glossom stimulate people in order to transfer their experience online and to share their style, skills, and desires. Glossom develops people socialization around a collection; users have the ability, with own sense of style, to establish relations of friendship.

7.4 Dada

Dada (http://www.dada.it) is a European society leader in the field of community and web & mobile entertainment. With your intranet "Tata Dada 2.0" each employee has a personal space that can be customized with widgets of any kind; for example with view charts, booking a flight or hotel rooms, meetings. The new Tata tools will be perfectly integrated in the social network of Dada company. It is possible looking for an online colleague and in a few clicks we can reach your personal space and share its resources. A dedicated team will work steadily on this project to improve and add new features.

8. CONCLUSIONS AND FURTHER WORKS

In recent years there has been an increase in the complexity of products, technologies and customers needs. To be competitive, the enterprise must be prepared to accept customer opinions and suggestions. It is important that customers can cooperate and participate in product design. Only in this case we can reach full Customer Satisfaction and Total Quality. With the Web 2.0 tools it is possible to use collaborative PLM also in Small Medium Enterprise (SME). In these enterprises it is necessary to align business processes with collaborative information system. In this work we propose a Totally Customer Centred Enterprise model to exploit customer opinions for enriching the enterprise knowledge and behaves according improving product/services.

The further works will interest the Enterprise 3.0 that will use the web 3.0 technology. Web 3.0 will be an intelligent and semantics network, characterized by machines that will perform intelligent actions thinking as human resources. The web 3.0 will mine into deep of the content and meanings of words for extracting useful information and for discovering associations in the network and in the relationship between information. Managers can analysing and manipulating customer behavior and needs. In the future will realize the convergence between Service Oriented Architecture and Semantic Web, in the "Internet of Services" machine readable that will provide any required service to people/enterprises.

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