THE WEB 2.0 AS A MECHANISM TO IMPROVE COMMUNICATION AND COLLABORATION IN AN AEROSPACE MANUFACTURING ENTERPRISE IN MEXICO

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ABSTRACT

As human beings we have the need to connect with other people. Organizations who improve internal communication and collaboration will become more competitive. The evolution of Internet has resulted in the web 2.0 whose most common tools are the social networks. Through this networks, the web 2.0 has changed the way we establish relationships and communicate nowadays. This evolution does not only affect personal aspects but our professional life as well. We aimed to identify the strategical, cultural and structural variables, as well as the nature and profile of users which influence the adoption of web 2.0 tools and their potential to be applied, in order to improve communication and collaboration within an organization. We found that the factors influencing the perception of collaboration and communication within the organization using web 2.0 tools are seniority, user profile and geographical location. The web 2.0 tools are perceived as potential promoters and enablers of both corporate communication as well as team collaboration for most of the employees. People thought there might be a competitive advantage by having information and knowledge from previous success cases. Organizations perceive web tools as a risk for security and intellectual property. There are some challenges: one is the fact that every user has a different way of understanding and using the tools influenced by their background and work environment. And secondly, every organization has a different maturity level towards adoption of new technologies.

Keywords

Social networks, competitiveness, knowledge management.

1. Introduction

With globalization, the development of technology and knowledge generation has reached rates hard to imagine a few years ago. It has contributed with the development of countries and their economies. Some sectors have been playing the role of accelerators like IT, electronics, productive processes and telecommunications. Some other sectors, like the automotive, have been pillars of the development of countries like Mexico. Nowadays other sectors are trying to follow that example. The aerospace industry in Mexico has been growing in the last years, creating clusters in Baja California and Querétaro as the more developed. Mexico is now manufacturing primary components
for aircrafts with final assembly lines in North America mainly. Beyond that, R&D, design and engineering are starting to flourish in the country. Within the last 6 years, the aerospace sector in Mexico has had an accelerated development. The country registers 260 companies and support entities in the field. It generates work for 31,000 people and exportations slightly over 4.5 billions of dollars. On the other hand, Mexico is the country with the highest level of investment in aerospace manufacturing in the world with 33 billion dollars in the last 20 years [1]. Mexico has a great potential to develop the sector. It can benefit from the expertise from other sectors like the automotive and electronic and their qualified labor. Additionally, geographically is located aside the United States, the biggest aerospace market on the globe, for which Mexico represents a low cost manufacturing opportunity. Mexico has signed 44 trade agreements according to the Secretary of Economy [2], and the same source informs the opening of 105 education centers at professional level.

Talking about the industry, it is expected a growth in the following 15 years, because globalization has shifted to regional and business flights, but the industry is very sensitive to economic cycles [3]. In this context it becomes imperative to adopt tools that boost growth and competitiveness within organizations in the sector in Mexico.

In order to fulfill the expectation generated in the markets and investors, high levels of productivity and quality have to be achieved to develop competitive advantages. In the effort to be more competitive, communication, collaboration and knowledge transfer are fundamental factors that can be improved with the use of tools web 2.0. According to Senge [4] organizations should continuously and systematically find ways to obtain the maximum benefit from its experiences by learning from them. Nowadays this becomes especially difficult due to the tendency of organizations to be global and have multiple geographical locations. It is a challenge that information flows and the web 2.0 could find a good opportunity to step in. Through the web 2.0 it is possible to collaborate and communicate and the tools can be used to spread good practices and transfer knowledge within organizations. According to Porter [5] the knowledge transfer comes to a competitive advantage when the organizations are enough similar, so sharing expertise has a meaning and the knowledge represents a source for competitive advantage.

The idea of research about the potential of tools web 2.0 to improve communication and collaboration was born after realizing there is a non used potential of organizational learning to improve or optimize the productive processes of a manufacturing company where there are similar processes in different locations around the globe. Porter [6] mentioned that even though business units operate independently, the similarities make possible the knowledge sharing. Many activities in an organization involve the creation, processing and communication of information, and technologies such as Internet have a strong influence in the flow of data. The special advantage of the web 2.0 lies on its ability to link activities and make data created in real time available within the organization. The web 2.0 tools might have an impact on knowledge management, network creation, and experience share, by improving the communication processes and promoting collaboration within an organization to increase its level of competitiveness.

2. Problem definition

Most aerospace companies have factories around the globe. Each factory generates its own knowledge about processes and markets and many times knowledge transfer among them happens in an organized and structured way, following standardized procedures or moving experts to share in a practical way their expertise. But continuous improvement keeps enhancing processes and although they are similar in different locations, the knowledge transfer is limited to traditional ways to communicate and learn.

The research on this topic is driven by the experience in processes in which previous experiences were not exploited. In many cases knowledge and experience
were lost due to a lack of capacity to share, communicate and collaborate around them. The need to know if similar processes have found solutions for similar problems is always present among organizations. This becomes even harder when several locations of the organizations are geographically separated and many times even in a different time zone. Previous experiences represent an opportunity to simplify improvement cycles in terms of time and complexity, which represents itself a competitive advantage.

After seeing the web 2.0 tools (including social media) exponential growth in the last years both in capacity and use it is time to question if those tools can help managing knowledge within an organization by improving communication and collaboration to generate competitive advantages.

We aimed to identify the strategic, organizational culture and structure variables that affect the adoption of web 2.0 tools within an organization, as well as profile of users and their perception if whether they can improve communication and collaboration.

We proposed the following 3 hypotheses testing:

Hypothesis 1 (H1). The blockers for the use of web 2.0 tools within the organization are: organizational culture, the business strategy, the IT strategy and the concerns for safety and privacy of confidential data.

Hypothesis 2 (H2). Personal factors influencing the adoption of web 2.0 in the organization are: age, gender, position, seniority, activities, IT knowledge, geographical location and personal user profile of the web 2.0.

Hypothesis 3 (H3). The members of the organization perceive the use of web 2.0 tools as an aid to replicate success stories from other processes, to improve the knowledge transfer, communication and collaboration among employees.

3. Theoretical framework

Nowadays the Internet is a dynamic tool of communication and there are still many applications to explore the process of knowledge management. The web 2.0 has emerged as and evolution towards applications allowing collaboration. Now it is not only about reading or reviewing contents, it is about collaboration creating, commenting or even qualifying contents. The web 2.0 has strengths and opportunities, but the most important is that organizations are starting to explore its use exploiting strengths and trying to coexist with threats and risks [7].

The social software allows the interaction between individuals or groups, from instant messaging to asynchronous collaborative work environments. It arises from 3 converging facts: the need of individuals to connect, the evolution of technology and preferences of new Internet users. It also opens a space for social feedback that qualifies others contributions which create a digital reputation [8]. Van Zyl [9], concludes on his research that and individual’s success in society, depends on the shape and size of its social network and ability to network and form connections with other social groups.

Organizations that can harness the innate human ability to manage knowledge will be able to lower transactions costs and become more profitable. According to Hinchcliffe [10] the web 2.0 has some characteristics that made it unique. The effect of users creating networks on a common virtual space is more powerful than single user applications. On the other hand the software lies on the web, which makes it easy to update, and its value relies not on the software itself but in the data they contain. Other key strength is that applications are easy to access from tablets and cell phones, not only PC’s.

Some of the opportunities of the web 2.0 according to Sbihi [11], start with a low rate of participation, many people reads, but few tend to create contents. On the other hand it is very difficult to prove the validity and accuracy of the information flowing. The life cycle of information is short and of course the main concern revolves around confidentiality and safety information.

In order to adopt tools web 2.0 in organizations there are 3 key factors: organizational culture, business strategy and technological strategy [12]. But the users are also very important actors because for the first time multiple generations are converging at the workplace. The groups are as big as heterogeneous;
therefore collaboration, authenticity, personalization, 
innovation and social networking should be 
promoted. The users are the starting point of a 
successful web 2.0 implementation within 
organizations [13]. A research by Papadopoulos et al. 
[14] indicated that self-efficacy, perceived 
enjoyment, certain personal outcome expectations, 
and individual attitudes towards knowledge sharing 
are positively related to the intention of knowledge 
sharing in employee weblogs.
Social networking, incorporating web 2.0 
technologies, has been credited with the ability to 
expand social contacts, accelerate business processes, 
the improvement of customer relations and the 
improvement of morale, motivation and job 
satisfaction among staff. It allows group interaction 
regardless of geographical location or time zone. The 
social networking can assist organizations to create 
an online resource containing the accumulated 
wisdom and while providing a collaborative learning 
environment, in which problems encountered are 
collectively solved and solutions are shared among 
peers, bridging the gap between procedures and 
practice [15].
Companies are interested in incorporating social 
networking at the workplace. In 2007 McKinsey 
performed a study cited by Warr [16] in which 
affirms that 19% of companies surveyed have already 
invested in social networking but the same survey 
founded 37% of the companies questioned are 
planning to implement them. Rooksby [17] 
confirmed that Microsoft and IBM use Facebook and 
LinkedIn openly. Facebook with the objective of 
strengthen personal relationships within the company 
and LinkedIn to create and maintain networks. 
In Mexico, according to Manpower [18], 38% of the 
organizations block access to social networks and 
43% limits it. Only 19% of the companies allow 
access to web 2.0 applications to their employees. 
Contrasting 73% of the professionals surveyed have a 
profile on a social network and almost 50% had a job 
offer through that media.
At the end the idea of using web 2.0 in organizations 
should be translated in creating added value capable 
of generating competitive advantage. According to 
Altimeter [19] there are 4 ways to achieve that: 
Promoting collaboration, storing knowledge, 
facilitating action, and empowering people.

4. Context
This research contains experiences and data from a 
manufacturing organization in the aerospace sector in 
Mexico. Due to confidentiality reasons the name is 
not published. The organization has 1950 employees 
with 1500 unionized operators. The Mexico site is on 
of the group with plants and sites in Canada, the 
United States, and the United Kingdom.
The Mexican site has 6 directions (Operations, 
quality, logistics, finance, human resources and 
engineering) reporting to the Vice presidency of 
operations in Mexico. It has 2 manufacturing 
factories within 10 km. distance (one with 200 
employees and the rest in the other), although all 
support activities are concentrated on the biggest site. 
The organization has manual assembly processes of 
metal parts and electrical harnesses as well as 
manufacturing processes with composite materials of 
high technology. Each one of the business units has 
its own indicators contributing to the overall result of 
the site and the organization through a balanced 
scorecard. 
On the business strategy of the organization it was 
not possible to find one referring to information 
technologies as an element to achieve neither a more 
efficient communication nor collaboration within the 
company. There is no reference to knowledge transfer 
either. As a general objective talent management is 
mentioned. The goal is to have the best 
trained employees, but there is no mention about the way to 
achieve that.
At the same time, the IT strategy and objectives 
declare the intention to be the point of contact 
between each business unit or function and 
information technologies to support requirements 
regarding computing services and software. The 
requirements could be strategical or tactical including 
participation and guidance. Although the objectives 
do not contemplate the use of web 2.0, there is no 
restriction for a possible adoption.
It was interesting finding that internet access is closed except for those workers whose function requires access to develop their activities. But even those with access not necessarily have granted access to web 2.0 applications like facebook, twitter, youtube and others. This is a strong message from the organization regarding the use of web 2.0. Only employees managing the presence of the organizations in social media are authorized access through a special request.

5. Methodology

Type of research.
This study was an exploratory and descriptive research.

Target population.
The research was performed among non unionized workers, supervisors, managers of productive areas and support functions such as logistics, engineering and quality. At the same time workers from administrative areas such as finance, human resources and procurement were included. Only for these study personnel was divided in productive and administrative depending on their functions.

Sampling frame.
The site in Mexico is the sampling frame with 1950 employees.

Sample.
From the 1950 employees, 1500 were operators with no access to internet or email. Therefore the sample was of 450 employees with access to internet or at least email.

Sampling procedure.
The target population received a survey invitation through email to be answered online, the sample used was confirmed from those returned surveys. Therefore it was convenience sampling procedure. We supposed all individuals have the same probability of answering the survey and that the results would not differ from those answering from those who did not. To guarantee a confident level of 95% and a degree of error of 5%, there should be at least 271 answered surveys.

Questionnaire design Research instrument.
A structured questionnaire with 20 closed and open-ended questions, undisguised were used.

Method of Administration.
The questionnaire was applied using a web application (monkey survey) allowing answering it from each workstation and saving data to a web database.

6. Results

In order to prove H1, the business and technology strategies were deeply reviewed and the conclusion is that there is no support to adopt applications based on the web 2.0. There is no mention for IT as a tool for training and on the mission statement there is no mention about the creation of networks within the organization.

Moreover, the organizational culture does not promote the development of an innovative channel to transfer knowledge. The use of web 2.0 tools is not mentioned at all. Another fact that impacts negatively, is the low tendency in the use and adoption of this kind of applications by members of management, while according to several authors they should be the ones promoting and leading by example on adoption and use. Only 9.0% of the employees recognized the use of these applications by managers of the organization.

On one hand the business strategy odes not contemplate the use of web 2.0 nor any of its applications. On the other hand, the technological strategy not only does not contemplate the use of web 2.0, but also sends a strong message about concerns regarding security and confidentiality of data. Moreover this kind of tools have a bad reputation as distractors which do not impulse the objectives of the organization. All these facts of the organizational culture and direction do not promote the adoption of web 2.0 applications confirming H1.

For this analysis 279 questionnaires were considered which is more of the expected n=271 required for a trust level of 95.0% and the degree of error which was of 5.0%. 72.0% of the population is male and most people were below the age of 46. More than
95.0% lives in Mexico and almost 90.0% have a bachelor’s degree. A significant amount of people is user of programs related to work like office, windows, or email applications. In the case of content editors for images or web content no more than 30.0% mentioned their knowledge to be above regular. 54.5% mentioned a knowledge good or above in social media applications even when they have restriction to access on the organization. 85.6% of the employees have a profile in at least on social media application and is active in updating it.

User profiles obtain information through web 2.0 but very few generate contents. Although most of the users are frequently on the web, less than 10.0% create contents or publish something on the web. According to Li and Bernoff’s [20] classification, most users in the organization were spectators. Interesting to note that 51.8% reads blogs outside the organization, but 53.9% reads the one in the organization. And more than half of them read pages related to the organization. No more than 10.0% recognizes its use by the upper management of the organization. This shows the interest in the channel and might be exploited as an opportunity but at the same time the not recognized use by upper management, sends a strong message against their use; this reinforces H1.

85.0% responded at least “sometimes” when questioned if they think the web 2.0 applications could be useful for the organization confirming H3. On the other hand 42.1% answered “sometimes” the web 2.0 might not add value. Another important fact was that 81.1% prefers training with the live presence of an instructor versus online training. 82.0% thinks if success cases are public through these tools, the organization could use that experience to improve, again reinforcing H3. Both communication and collaboration might improve with the use of web 2.0 tools according to the employees. This is specially reinforced with people living geographically away from the site.

To continue with the statistical analysis, a relationship among variables was searched; therefore tables of contingency were used [21]. If there is no association the variables are independent, which means the value of one does not influence the value of the others. The analysis was performed using Ji -squared and P-value with adjusted values [22].

The first question analyzed regarding collaboration, was crossed with the personal profile, giving the results show in Table 1. Gender, age, position and department showed strong independence, while profile, seniority, and place of residence show strong dependence.

### Table 1. Do you consider web 2.0 applications could help you collaborate more effectively with your team?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Ji</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.1052</td>
<td>0.9487</td>
</tr>
<tr>
<td>Age</td>
<td>0.7652</td>
<td>0.6821</td>
</tr>
<tr>
<td>Position</td>
<td>10.0976</td>
<td>0.1206</td>
</tr>
<tr>
<td>Seniority</td>
<td>9.0370</td>
<td>0.0602</td>
</tr>
<tr>
<td>Department</td>
<td>2.9576</td>
<td>0.2279</td>
</tr>
<tr>
<td>Residence</td>
<td>12.1244</td>
<td>0.0023</td>
</tr>
<tr>
<td>Profile</td>
<td>8.6996</td>
<td>0.0691</td>
</tr>
</tbody>
</table>

When testing for communication, the results show independence with most of the personal profile characteristics. The evidence of dependence is on the position in the organization (Table 2).

### Table 2. Do you consider web 2.0 applications could help improve the communication within the organization?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Ji</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1.2818</td>
<td>0.5268</td>
</tr>
<tr>
<td>Age</td>
<td>1.2999</td>
<td>0.8614</td>
</tr>
<tr>
<td>Position</td>
<td>11.1456</td>
<td>0.0840</td>
</tr>
<tr>
<td>Seniority</td>
<td>6.9750</td>
<td>0.1372</td>
</tr>
<tr>
<td>Department</td>
<td>2.6005</td>
<td>0.2725</td>
</tr>
<tr>
<td>Residence</td>
<td>3.9594</td>
<td>0.1381</td>
</tr>
<tr>
<td>Profile</td>
<td>3.2834</td>
<td>0.5116</td>
</tr>
</tbody>
</table>
After the analysis we concluded that the factors influencing the perception of collaboration and communication within the organization using web 2.0 tools are seniority, position, user profile and geographical location. This partially proves H₂, because age, gender and type of work showed to be independent for the same relationships.

Web 2.0 tools have a great potential to be used in the organization because they promote collaboration and enable workers to share knowledge and experience having as result the improvement of processes to create competitive advantages. The web 2.0 tools are perceived as potential promoters and enablers of both corporate communication as well as team collaboration for most of the employees. They think there might be a competitive advantage by having information and knowledge from previous success cases. This proves H₃. Tables 3 and 4 show most employees perception is that both collaboration and communication can improve at least sometimes using web 2.0 applications at the workplace.

### Table 3. Perception of improvement of collaboration using web 2.0 applications

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Valid</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>81</td>
<td>27.6</td>
</tr>
<tr>
<td>Frequently</td>
<td>176</td>
<td>60.1</td>
</tr>
<tr>
<td>Almost</td>
<td>24</td>
<td>8.2</td>
</tr>
<tr>
<td>Never</td>
<td>12</td>
<td>4.1</td>
</tr>
<tr>
<td>Total</td>
<td>293</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 4. Perception of improvement of communication using web 2.0 applications

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Valid</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>73</td>
<td>25.0</td>
</tr>
<tr>
<td>Frequently</td>
<td>176</td>
<td>60.0</td>
</tr>
<tr>
<td>Almost</td>
<td>30</td>
<td>10.3</td>
</tr>
<tr>
<td>Never</td>
<td>13</td>
<td>4.5</td>
</tr>
<tr>
<td>Total</td>
<td>292</td>
<td>100.0</td>
</tr>
</tbody>
</table>

7. Conclusions

Organizational culture along with informal messages from management and the role of each user are inhibiting the adoption of web 2.0 tools. It happens in such an obvious way that creating a strategy to overcome should not be very difficult.

The entry of web 2.0 inside organizations marks a new way to interact by individuals. It represents a new channel of communication and a new alternative for collaboration.

There are some challenges. One is the fact that every user has a different way of understanding and using the tools influenced by their background and work environment. And secondly, every organization has a different maturity level towards adoption of new technologies. The management team plays a key role in the adoption and promotion of the applications. In this case it is very important to send a strong message not only allowing but also promoting the use of the web 2.0 as a tool inside the workplace. The management team has to act as role models of the use of web 2.0 within the organization.

The statistical evidence shows that the execution of a strategy with a model to promote use of the applications web 2.0 will not have major obstacles due to relatively very few variables influencing their adoption. The strategy should consider managing the influencing variables towards the desired direction.

There is a strong tendency to condemn web 2.0 applications before using them, but organizations should start thinking about adoption anyway, because social media is a reality, keeps growing its use, and is not going to stop. The key to adopt them is having a plan to auto – regulate the network. There are great success stories and messages about it, like Wikipedia or multiple crowdsourcing sites with capacity to manage different problems in order to find the best solution while being regulated by the users.

The web 2.0 application and its tools, represent a viral force very difficult, if not impossible for the
organization to stop. There are two options in the light of this fact: deny their adoption or adopt them in an organized way to start generating a competitive advantage through improved communication and collaboration and the sharing of information as soon as possible.

References


