

The Knowledge Management of Export Companies From Sinaloa, Mexico: A Comparative Analysis Between Companies Register Patents and Not

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This article analyzes knowledge management in companies with patent and those without patent starting from the perspective of the knowledge production cycle of Nonaka's model. The objective is to identify the knowledge management practices of the companies with patent, and compare them with those without patent for the purpose of finding possible significant differences. The source of information is a survey given to 70 export enterprises in Sinaloa, Mexico. Using the comparative method, data is treated statistically through a multivariate analysis to identify the significant differences between the two groups: with patent and without patent, which are calculated through non-parametric tests such as the *U* Mann's Whitney and the chi-squared. It should be noted that this research was done to answer the following questions: How do the exporting companies from Sinaloa, the ones with patent and without patent, manage knowledge? Also, how is the cycle of knowledge production in such companies? The results of the comparative analysis state that there are significant differences in the knowledge management practices in the companies that and those that do not patent, the first ones unlike the second show more interest in giving "education and training" to its members as part of knowledge creation, but the next link in the value chain is wasted in the storing part; it means the organizational knowledge is created through a complex process that does not follow a specific route. Also, it is observed that the absence of projects that contribute to the integration of actions oriented to the management in the organizations and the use of methods and tools allow its use. So it is required that both groups of companies commit decisively to make the creation of knowledge which is the main objective of their management.

Keywords: knowledge management, knowledge, export enterprise, patent

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Introduction

The recognition of the importance of knowledge has motivated companies to care about creating knowledge, sharing it, and using it in a more effective way; hence the companies rediscover that the most important things for them are not their materials but the people equipped with knowledge, creativity, and initiative.

So this article focuses on presenting the significant differences observed in the management of knowledge by the exporting companies from Sinaloa, such as the production and creation of knowledge, internalization, dissemination or promotion, use and benefit; as well as the facilitator of management, which in this case is understood to be the identification of knowledge, the transfer process, the media and technology used, decision-making, and entrepreneurial culture.

Based on the above, the purpose of this article is to analyze the way that knowledge being managed by the export companies of Sinaloa, specifically how the production cycle of knowledge takes place according to the model of Nonaka (1995). The information will be run through a multivariate analysis to identify the significant differences between two groups: companies with patent and those without patent, which are calculated through non-parametric tests such as the *U* test of Mann-Whitney and the chi-squared.

To differentiate the companies with patent and those without patent, it could say that to patent means to protect knowledge, which becomes very important since it is a key factor to compete in a very aggressive market like the current one. On the other hand, companies that do not patent are considered like the ones that do not protect their new developments and innovations.

The source of the information is a survey given to the export companies from Sinaloa in 2009, in the three most important locations of Sinaloa Mexico: Culiacan, Mazatlan, and Los Mochis. It should be noted that Sinaloa is located in the northwest of the country, by the coast in the Gulf of California. Its capital is Culiacan, which is important in the industrial and agricultural sectors, with about 858,638 inhabitants. This is followed by Mazatlan in importance and size: an important tourist destination, fishing and port sector, with about 438,434 inhabitants, and finally Los Mochis, an agricultural center, with fishing, tourist sectors and a port, with about 416,299 inhabitants. Sinaloa is the most important agricultural state in Mexico, additionally, it has the second largest fishing fleet in the country.

Theoretical Foundations

According to Jasso and Torres (2008), knowledge and its productive use has been a feature in the creativity and talent of men from the beginning. In the modern world, the way the knowledge is created, used and spread has changed in recent years, and this is affecting the way it is conceived, expressed, and administered.

Hence contemporary societies face the challenge to project and adapt to a process of change that is progressing very rapidly to the construction of knowledge based societies (Arraez, 1999). Many authors have addressed the concept of knowledge (Nonaka, 1991; Nonaka & Takeuchi, 1995; Grant, 1996; Davenport & Lawrence, 1998; Bell, 1999; Staples, Greenaway, & McKeen, 2001). According to Goñi (2008), knowledge represents a deep understanding and it is considered as permanent; it resides in people and they know how to use it rationally.

According to Lloria's (2004) studies, the concept of knowledge presents some important characteristics:

- Knowledge exists predominantly in individuals. Knowledge is what is known, there is no understanding without someone who has knowledge;
- Knowledge has an ambiguous character and it is not tangible; that causes contradictions related to its definition. Many times, therefore, it is going to be necessary to make it visible and tangible in order to manage it;
- Knowledge is transferable with no loss;
- Knowledge increases its value with is used;
- Unless it is represented in documents or embedded in processes, routines and organizational networks, knowledge is volatile;
- Knowledge is developed through learning;
- It could be difficult to transfer knowledge;
- Knowledge does not have limits, is dynamic and if it is used in a time and specific place, it does not have value, therefore, the use of knowledge requires to be focused in a certain space and place;
- Knowledge is transformed in action and boosted by motivation;
- Knowledge requires a framework or organizational design where conditions facilitate and stimulate its formation, since it is substantial to be created and applied.

A thorough review of definitions given about the management of knowledge highlights a conceptual chaos, attributable, among other causes, to the relative origin of this matter, which leads to the absence of a solid and structured doctrinal body, and to the diversity of disciplines of origin from authors that address this topic (Blackler, 1995; Saint Onge, 1998; Nonaka & Takeuchi, 1999; Sveiby, 2000; Gupta & Govindarajan, 2000; Bueno, 2000; Alvesson & Kärreman, 2001; Staples et al., 2001; Obeso, 2003; Giannetto & Wheeler, 2004; López & Leal, 2005; Rodríguez, 2006; Arbonés, 2005; Morales, 2006; Carballo, 2006).

Researchers Nonaka and Tekeuchi (1999) agreed that management of knowledge is the ability of a company to generate new knowledge, disseminate it with the organization members and materialize it in products, services, and systems. The creation of organizational knowledge is the key to this peculiar process through these firms innovate. They are especially able to innovate continuously, in bigger quantities each time and in spiral, generating a competitive advantage for the organization. For his part, Carballo (2006) pointed out that knowledge management is a very important resource that makes innovation possible and it is a paradigmatic step in the organizations that has not been explored.

The Sinaloa Exporting Company: A Methodological Approach

The questionnaire used in this research covers the aspects pointed out by González, Castro, & Roncallo (2004), from the production of knowledge cycle to the management enablers, with the purpose of finding different ways of managing; in first place, considering the production and creation of knowledge, its internalization, dissemination or diffusion, its use and benefit, and in second place, introduce the concept of enablers of knowledge to understand how the identification and the processes of transmission are done, how media and technology are used, and the importance of decision making and the entrepreneurial culture. Empirical study is based on a survey given to the export industry of Sinaloa (see Table 1) located in the northwest of Mexico, in the three major cities of the state¹: Culiacan, Mazatlan, and Los Mochis. It must point

¹ Project funded by PROFAPI /UAS/2009.

out, that for professional interest, the sample was divided into two groups: the companies with patent and those without patent, integrated with 12 and 58 organizations respectively.

In Table 1 the distribution of the companies by size is presented, the obtained sample $n = 70$.

Table 1

Calculations to Select the Surveyed Companies

Company size	With patent		Without patent	
	No.	Percent (%)	No.	Percent (%)
Micro	2	17	15	26
Small	3	25	15	26
Medium	4	33	21	36
Large	3	25	7	12
Total	12	100	58	100

Note. Source: Authors compilation based on survey's results.

As detailed in the following sections, the analysis of the information identifies significant differences between the two groups of companies studied and the parameters of centralization such as the mean and the dispersion and the typical deviation, to observe how the information is grouped or dispersed around a main value. So a non-parametric test is given: Chi-square (χ^2), and the differences among the means of the two groups of companies studied are considered, these differences are considered significant if the test result is more than 0.00 and less than 0.05.

It is important to mention that in the group of companies that patent, two are registered in the food, beverages and cigarettes sector, five are registered in others², one company is not registered, another one belongs to the agricultural and livestock sector, one to the agriculture and forestry, another to hunting and fishing, one to the metallic products, machinery and equipment and another one belongs to the machinery and capital goods sector. Also, in this group of companies, five of them are certified and seven do not have any certification, 11 are industries and one belongs to the retail sector, we should note that from the 12 companies that patent, six of them are located in Culiacan, three in Mazatlan and three more in Los Mochis.

On the other hand, there are 58 companies without patent which have the following characteristics: eight belong to the food, beverage and cigarettes, 30 are registered in other sectors, six are not registered in any sector, three belong to the agricultural and livestock, four to the agricultural and forestry, six belong to hunting and fishing and one is part of the paper, printing and publishing sector, also in the same group 20 have a type of certification and 38 are not certified, three belong to the retail sector and 55 are part of the industrial sector, according to the geographical location there are 22 in Culiacan, 19 in Mazatlan, and 17 in Los Mochis.

Comparative Analysis: Companies With Patent and Without Patent

The following is a comparative analysis for the companies with patent and those without patent, observing

² The "others" sector is integrated by 35 exporting companies, from those, five with patent and 30 without patent. From the patenting companies, four are producers and one is an assembly plant, three are part of the agricultural sector, one to the packing sector and one to the steel sector; instead the non-patenting companies, 23 are producers, four are trading companies, one is an assembly plant, one is dedicated to the foreign commerce, and one to the fresh produce sector, 13 participate in the agricultural sector, whereas that 11 with the shrimp sector, one exports fertilizers, one is part of the juice concentrate industry, one to the steel, one to the crude oil, one to the tiling sector, and one to the aircraft sector, it should be noticed that these companies are registered in such sectors in Bancomext.

that only 12 of 70 companies, from the sample used in this investigation has patent, therefore, non-parametric tests were performed to understand the relevant practices within these two groups of companies.

Knowledge management can be defined as the set of policies and directive decisions with the objective of boosting individual, group and organizational learning processes for the purpose of generating knowledge aligned with the objectives of the organization. In this regard, the exporting companies with patent differentiate from those without patent in the fact that they give importance to “education and training” as much as “organizational policies” (see Table 2), which are used to retain information. This is because trusting only in individuals entails risks of losing what has been learned due to the fact that individuals moves from one job to another, as suggested in Balbastre (2001).

Table 2

Construction of Knowledge

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
Knowledge elements					
Availability of software	2.25	2.01	1.50	1.65	0.22
Machinery and equipment and tangible assets	3.00	1.71	3.29	1.85	0.40
Education and training	4.00	1.04	2.62	1.95	0.03
Tacit information	1.33	1.92	1.66	1.76	0.58
Tested and standardized procedures	1.50	2.20	1.64	1.77	0.64
Respect to the organs of power	0.33	1.15	0.91	1.51	0.11
Intangible assets	0.83	1.53	0.97	1.62	0.93
Organizational policies	2.00	1.41	1.03	1.53	0.01
Knowledge sharing with other departments	1.25	1.60	1.64	1.61	0.41
Organizational memory	0.67	1.23	0.28	0.77	0.21
Domain analysis and conceptual	0.42	1.00	0.55	1.29	0.83

Note. ^a U-test of Mann-Whitney. Source: Authors compilation based on survey's results.

Also, creating flat organizations oriented towards adding value suggests an increase in the confidence and responsibility of the employees. Thus, they find themselves with the need of being provided with the knowledge and methodological tools that enable them to face this process of change, this evolution, which coincides with the works of (Arbonías et al., 2003).

On the other hand, the results show the importance of access to data bases, forums, and markets etc. (see Table 3). There are means to generate knowledge in the exporting patenting companies, because of the easy access to millions of electronic information data bases, these are becoming common assets. This generalization presents the following advantages and facilities: not only texts are accessible, but also images, sounds, and representations. The problem is regarding the excess of information, interpersonal communications, in addition to the classic media, have a great potential in telematics. Telecommuting is a reality within the enterprise. The requirement for face to face time is abandoned by allowing each individual to choose the moment to communicate according to their schedules and situations, borders and set schedules with precise regulatory terms are disappearing, which coincides with the works of Rodríguez (1998).

Training courses present a number of important advantages, they allow access to advanced knowledge concerning that subject from an outside instructor that contributes experiences that are external to the organization, which could enrich the contents of these courses. Furthermore, the instructor is chosen purely on the basis of their expertise, being able to choose from a wide range of professionals, which coincides with the

works of De Tena and Ongallo (2004). It should also be noted, the lack of connection of the exporting companies in Sinaloa with Universities and Government Institutions (see Table 4), because it is considered very unimportant in both groups.

Table 3

How the Knowledge Takes Place

Practices	With patent		Without patent		Significance ^a
	Frequency	Percentage	Frequency	Percentage	
Face to face formal and planned	5	41.7	23	39.7	1.00
Internal documents	3	25.0	11	19.0	0.70
Access to data bases, forums, markets	5	41.7	7	12.1	0.03
Face to face formal an spontaneous	2	16.7	16	27.6	0.50
Information technology	2	16.7	9	15.5	1.00
Others	0	0.0	2	3.4	1.00

Note. ^a Test χ^2 . Source: Authors compilation based on survey's results.

Table 4

Means of Knowledge Dissemination

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
Training courses	3.17	2.21	2.05	2.39	0.17
Attendance at forums, conferences, seminars	1.42	2.07	1.10	1.89	0.44
Extraordinary internal meetings	1.42	2.02	0.76	1.66	0.15
Others	0.00	0.00	0.14	0.74	1.00
Internet	0.92	1.62	0.83	1.66	0.64
Periodic internal meetings	3.08	2.35	2.91	2.36	0.86
Meetings with external institutions	0.83	1.11	0.36	1.10	0.02

Note. ^a U-test of Mann-Whitney. Source: Authors compilation based on survey's results.

Knowledge can be found at different levels: in their employees and managers, in their suppliers, in their relations with other enterprises in the sector, in their own company information systems, as well as in clients (see Table 5), as pointed out by the companies with patent. In general, to access such knowledge, it is convenient to make use of different groups that are considered under the category of intellectual capital, which refers to the intangible assets that are not entirely accounted for in the balance sheet. It also includes those in the minds of individuals as well as the intangible assets that individuals leave to the enterprise when they leave. These results coincide with J. Roos, G. Roos, Dragonetti, and Edvisson (1997).

Under a strict definition, a "radical innovation" (see Table 6) was understood as the creation of a new product or service. It means that its vector of characteristics is completely different from those of existing products as well as its technical components vector. Also, Oslo Manual (2006) suppressed the word "technological" of definitions because they feared that service enterprises could interpret it as the use of materials and high technology equipment, such innovations exist in exporting companies that patent with significant difference from those that do not patent, the same happens in the case of the "new methods of organization management".

Table 5
External Sources of Knowledge

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
External sources of knowledge					
Suppliers	1.17	1.70	1.33	2.04	0.89
Attendance at forums, conferences, seminars	1.67	2.31	2.81	2.42	0.15
Consulting	2.17	2.25	1.91	2.23	0.50
Competition	0.67	1.37	0.71	1.63	0.68
Clients	3.00	2.30	1.22	2.02	0.01
Government	0.42	1.44	0.57	1.49	0.78
Educational institutions	1.25	2.26	0.41	1.14	0.19
Others	0.50	1.45	0.22	0.97	0.15

Note. ^a U-Test of Mann-Whitney. Source: Authors compilation based on survey's results.

Table 6
Use and Benefit of Knowledge Management

Practices	With patent		Without patent		Significance ^a
	Frequency	Percentage	Frequency	Percentage	
Practices that generate organizational dynamic					
Incremental innovation	5	41.7	19	32.8	0.74
Process improvement	9	75.0	36	62.1	0.52
New methods of marketing	3	25.0	4	6.9	0.09
Radical innovation	4	33.3	3	5.2	0.01
New methods of organization	4	33.3	5	8.6	0.04
Others	0	0	1	1.7	1.00

Note. ^a Test χ^2 . Source: Authors compilation based on survey's results.

Table 7
Use and Benefit of Knowledge Management

Practices	With patent		Without patent		Significance ^a
	Frequency	Percentage	Frequency	Percentage	
What or who drives technological development					
ICT Specialists only	3	25	2	3.4	0.03
The strength of the technology itself	6	50.0	21	36.2	0.52
The public outside the company	0	0	2	3.4	1.00
Public policy	1	8.3	0	0	0.17
End users	3	25.0	8	13.8	0.40
People within the company	9	75.0	35	60.3	0.51
Others	0	0	1	1.7	1.00

Note. ^a Test χ^2 . Source: Authors compilation based on survey's results.

Information and Communication Technologies (ICT) are fundamental in managing the resources of the organization (see Table 7), which are vital for client's relationship management and the key to knowledge management, as well as for continuous innovation and growth, thus companies that patent use them more frequently than those that do not patent. It should be noted that knowledge management is not a project of ICT,

but rather a combination of individuals and technology; always keeping in mind that individuals play a more important role than technology. Exporting companies with patent and without patent consider that individuals drive technological development within the enterprises, which coincides with the works of Stable (2003).

A significant difference observed between companies that patent and those that do not patent is “the level of communication with suppliers” (see Table 8), in other words, when companies look to achieve knowledge to develop new products they use different interactions with their suppliers, as mentioned in Bueno (2000). The importance the suppliers have as transmitters of external knowledge for the Sinaloa agricultural activity should also be emphasized.

Table 8

Knowledge Identification

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
Elements for knowledge identification that the enterprise possess					
Aware of the activities carried out in other than their own processes	2.92	0.67	2.59	1.16	0.42
They recognize the knowledge acquired through experience	3.42	0.67	3.22	0.94	0.67
Has acquired knowledge training	3.08	1.00	2.76	0.84	0.20
Considerable knowledge acquired by their peers	2.50	1.45	2.66	0.91	0.97
There is resistance to sharing information	1.17	1.03	0.84	1.28	0.16
There is availability of access to knowledge	3.42	0.67	3.22	0.94	0.69
There is disruption of the process by the absence of an operator	1.42	1.24	1.45	1.30	0.98
There is a level of communication with suppliers	3.58	0.90	2.98	0.98	0.03
There is a level of communication with the competition	1.83	1.34	1.78	1.35	0.82
There is a level of communication with customers	3.42	1.16	3.50	0.80	0.89
There is a level of communications between workers	3.17	0.72	3.17	0.80	0.93
There is the use of knowledge databases	2.83	1.27	2.31	1.42	0.24

Note. ^a U-Test of Mann-Whitney. Source: Authors compilation based on survey's results.

Socialization is part of the Nonaka and Takeuchi (1995) knowledge cycle. This stage facilitates the activity of sharing experiences through oral presentations, documents, and manuals that add new knowledge to the collective of the organization. This coincides with the fact that “creation of manuals” is a characteristic of the companies that patent from those that do not patent with significant differences, as well as the “existence of information deposits” (see Table 9), which coincides with the works of Alavi and Leidner (1999) and Piedrahita (2003).

The implementation of induction courses determines the interest of companies in keeping their personnel in continuous preparation, which is reflected by significant differences in the exporting companies that patent from those that do not patent as well as the companies that patent promote innovation in new services and products (see Table 10), which is related to the fundamental changes in organizational culture, adaptation and transformation of products and services offered in the market through a higher satisfaction and anticipation of the clients tastes and preferences, being the origin of innovation in products and services, which coincides with the works of Mandl, Winkler, and Schnurer (2004).

Table 9

Process of Knowledge Transmission

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
Process of knowledge transmission	3.08	1.00	2.12	1.24	0.02
Existence of information repositories	2.58	1.38	2.31	1.30	0.49
There is a classification of knowledge according to their importance or degree of specialization	3.33	0.89	2.36	1.47	0.03
Elaboration of manuals	2.75	1.60	2.21	1.39	0.15
There is a flow charting and graphics	2.67	1.07	3.02	1.02	0.24
There is exchange of information between the areas					

Note. ^a U-Test of Mann-Whitney. Source: Authors compilation based on survey's results.

Table 10

Organizational Culture

Practices	With patent		Without patent		Significance ^a
	Mean	Standard deviation	Mean	Standard deviation	
Existence of an organizational culture	2.58	1.38	2.59	0.94	0.63
There is a work environment focused on the generation of knowledge	3.25	1.06	2.97	1.04	0.33
There is interest in conducting training	1.50	1.09	1.19	1.18	0.32
There is resistance to change	2.92	1.08	2.02	1.21	0.02
Implementing induction courses	3.00	1.28	2.22	1.49	0.08
There is compliance with the internal	2.50	1.24	2.21	0.99	0.36
How is the level of education	2.75	1.14	2.72	0.95	0.78
There is a level of commitment of the workers with the company	2.92	0.79	2.79	0.89	0.67
There is a level of staff satisfaction	2.67	0.89	2.52	1.00	0.77
How is the level of motivation that is given to staff	2.50	1.17	2.17	1.33	0.48
A system of rewards given to staff	2.33	0.89	2.55	0.99	0.49
There is a creative dialogue between workers	3.25	1.22	2.24	1.30	0.01
Innovation of new products and services is promoted	2.33	1.30	2.41	1.11	0.95
We evaluate the concerns and ideas from employees	3.08	0.90	3.03	0.92	0.89
They seek new and better ways to do the job					

Note. ^a U-Test of Mann-Whitney. Source: Authors compilation based on survey's results.

Conclusions

According to the results obtained from the sample of 70 companies, it can be noted that there are some organizational entities where knowledge management exists. It should also be mentioned that companies that with patent make more effort in this matter, but in spite of this, these practices are not well articulated, and there's no indication of the presence of projects that encourages integrated actions towards knowledge management in the organizations, and the use of methods and tools that allow its utilization.

For this matter, management plays a very important role in Sinaloa, therefore companies with patent and without patent need to define how to build up their innovation capacity with clear vision and focus their

attention on those activities that add value. These actions must be analyzed in collaboration with the individuals involved, because each individual has a set of abilities, idiosyncrasy, stories, and personalities. Therefore each activity could be performed in a different way depending on the individual or group in charge, the entire organization has to be involved in the synergic process to create knowledge, as employees, engineers, or knowledge officials; the creation of policies, strategies and tactics of knowledge management is function of the management.

According to the empiric results of this work, the companies that with patent are different from those without patent in giving more importance to “education and training” to their workers as part of the creation of knowledge, but the next step in the value chain gets lost in the accumulation and storing of information process. In other words, the organizational knowledge is created through a complex cycle, that does not follow a determine route.

Lastly, it is concluded that it is necessary that both groups of companies compromise in making the creation of knowledge a priority in their management. For this, they need to see the importance of education and training as a part of their organizational policy and take advantage of the knowledge generated by external institutions such as universities, creating a vision of high commitment from the directors with their employees.

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