

Teaching materials using ICT for the Know-How of SMEs' acquisition: A new model

Materiales didácticos usando TIC para la adquisición del *Know-How* de PYMES: Un nuevo modelo

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Abstract

The teaching materials are very important into the Small and medium-sized enterprises (SMEs or PYMES in Spanish), their use can increase the employees and company productivity; impacting the SMEs competitiveness in the global market by facilitating business processes. In this paper, a new model for the generation of teaching materials for SMEs is introduced; Our model is based on an applied survey to 81 graduated students from four Technological Universities from Puebla State. These students worked for various companies, so the results of an exit poll for identifying the necessities of teaching materials into the enterprises in this state. The main characteristic of the proposed model is that it can produce teaching materials in a semiautomatic or semi-autonomous learning way (minimum intervention of a teacher or instructor) taking advantage of the training that the students get while working in the enterprises, leads to let them to know in short time, the internal productive processes of the companies.

Know How, Teaching materials, PYMES, ICT'

Resumen

Los materiales de enseñanza son muy importantes en las PYMES, su uso puede aumentar la productividad tanto de los empleados como de la empresa; impactando su competitividad en el mercado global y facilitando los procesos de negocios. En este trabajo, se presenta un nuevo modelo para la generación de materiales de enseñanza para PYMES. Nuestro modelo se basa en los resultados de una encuesta de salida que se aplicó a ochenta y un estudiantes de cuatro universidades Tecnológicas del estado de Puebla, quienes realizaron su estadía en diferentes empresas, los resultados de dicha encuesta permitieron identificar las necesidades de materiales de enseñanza en las empresas de Puebla. La principal característica del modelo propuesto es que puede producir materiales para el aprendizaje de forma parcialmente autónoma (mínima intervención de un profesor o instructor) aprovechando la capacitación y que los discentes reciben durante el proceso de estadía en las empresas, que les permite en poco tiempo conocer los procesos internos y productivos de la empresa.

KnowHow, MaterialesDidácticos, PyMES, TIC

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Introduction

The emergence of the knowledge society exposed small and medium-sized enterprises (SMEs) to a new economic and technological prototype where flexibility and creative innovation becomes essential to stay on the margin of competitiveness.

Social networks serve as accelerators when sharing information, the user becomes the creator of content; despite this, Dess and Lumpkin (2003) argue that the important thing for the company is not the Internet technology itself, but the real use that is made of it to get profitable transactions.

The innovative capacity of SMEs depends as much on the steps of learning as on the organization of information flows; this capacity implies the creation and adoption of new products, processes and organizational techniques; it is a series of cumulative, interactive and non-linear steps (La Rovere, R., & Hasenclever, L., 2003). For Schumpeter, "the most competitive firms are those capable of permanently introducing technical and organizational innovations". The above refers to the fact that if the company makes investments in the factors that increase the innovative activity seeking to do things differently, it can achieve innovation and develop learning capabilities.

One of the questions that we have raised for this study is to know if employees can adapt to these new changes arising in the industry, using innovation technology for both processes and procedures.

The knowledge and the individual capacity to channel the information in an efficient way, are vital to provide the company with a commercial difference (Cope, 2011), this knowledge management can be done through materials and didactic resources.

As pointed out by García and Sánchez (2013) "It is possible to make an investment in the most advanced ICTs and not take advantage of them to position themselves strategically or obtain operational efficiency", in any case, this limits the capacities of the productive processes, which would be reducing their competitiveness. In addition to this, the risk that only a small group manages this technology is latent.

When a new worker is trained in the use of ICT tools or processes, resources, human capital or inputs are invested, this task is repeated in the event that there is a change of personnel; therefore, it is necessary to know if the company has induction courses or other didactic support materials that can facilitate the training of personnel, including the business philosophy, its internal policies and, where appropriate, how to perform their daily tasks. Although ICT is a valuable tool for the manipulation of information, both the experience and the expertise of the professional responsible for this particular task or activity that he develops and learns in the daily processes of his work are fundamental. Therefore, making a balance between the needs for technological training and those related to the company itself is of vital importance when planning investment costs. There is the question of knowing if those workers who leave the company document their processes or procedures for the one that will replace their work. It is important that the employer does not discard this task due to the impact it can cause on the learning curve of the future employee.

The innovative capacity of SMEs may vary since each company has different characteristics due to cumulative and localized processes derived from scientific, technical and practical knowledge. It is, through the technical experience of the workers, how integral knowledge is built within the company, with the systematic development of technologies and know-how according to the relationships with those who contribute capital goods and inputs, as well as of the contributions that could be received not only from clients, but from some universities and research centers.

The know-how of a firm includes the context of its workforce: language, knowledge of the use of technology adapted to its processes, internal and external procedures and social culture, is the knowledge that is achieved with the permanence of the staff.

While it is true that there are support elements such as tutorials for the use of technology, procedures manuals and specialized training in companies, there is still a lack of adequate integration according to the context and requirements that are constantly changing in a company.

In the technological universities, during the last four-month period of higher technical university and / or engineering level, the students carry out a practical stay in companies guided by an advisor of the plant and another of their own school; This bonding strategy is valuable both for students and for the educational institution, since it allows to put knowledge into practice through a real work situation. This linking strategy also represents a benefit for employers for two reasons: the student performs work that is necessary for the company without high remuneration and, in the event that the practitioner is hired by the company at the end of their stay, this would imply a saving in the costs of induction and training to the position. (Villa L., & Flores-Crespo, P., 2002)

What is proposed in this work is a third benefit of the university-company relationship that consists of a contribution of didactic materials that allow to be a support for specific training, saving with it economic resources and time because its content would promote learning almost autonomous.

These educational materials can focus not only on the knowledge and management of the technologies but also on the production processes that are generated internally, whose experience and skills of the participants become key to making the work efficient. The proposal to develop them is an adaptation of a model for Design of Didactic Materials (Roldán, 2010) and is based on the framework of teaching for the understanding of Project Zero of Harvard University (Perkins D., 1999)

Theoretical framework

When we say that the workers of a company have the "know-how" of the organization we refer to that they possess the accumulated tacit knowledge in relation to the elaboration of the product or service provision that the company offers to the market, in this same sense when we talk about "technology" we focus both on the qualitative properties of the machine, the equipment and the product, as well as on the management and organizational systems and procedures; therefore, it is the "know-how" that is incorporated both in individuals and in procedures and routines (Formento, H, & Pittaluga, J. 2005).

For its part, Kok (2007) establishes the following definitions: "human capital", which includes the experience, know-how, abilities, skills and experience of the human members of the organization; "structural capital": has been described as that knowledge that the company has been able to internalize and that remains in the organization, in this dimension all the intangibles that do not reside in the members of the organization are included, that is, from the culture and internal processes, even information systems and databases. To the respect Huber (1991) comments that the knowledge talks about a complex product of the learning and the interpretation of the information, the understanding of relations cause and effect the "know-how", that is to say the transformation of information in new knowledge.

In this sense Ramírez (2008) points out "individual learning is a prerequisite for organizational learning... After individual learning, knowledge is transmitted to other very close individuals who share similar patterns of interpretation" (p.17). Thus, learning can occur through interaction with staff, or through relationships with other agents who complete the knowledge.

As mentioned by the United Nations Organization for Education, Science and Culture UNESCO (2018) "The exchange of knowledge and information, particularly through Information and Communication Technologies (ICT), has the power to transform economies and societies... UNESCO promotes the "openness" of content, technology and processes through awareness raising, policy formulation and capacity building. These solutions include open access to scientific information, open educational resources, Free and Open Source Software, Open Training Platform, distance education and self-learning "(p.1).

On the other hand, different models and contributions have been proposed to achieve learning on the part of the students and that this is externalized through an efficient work, whose impact benefits and contributes an added value to the company. Some experts such as Perkins and Biggs (1999) argue that learning is understood as ensuring that the learner understands, not only that they know a knowledge but that they think from what they know and act flexibly in conditions different from the context in which they originated.

For his part Cesar Coll, C. (2008) mentions that "knowledge has become the most valuable commodity of all, and education and training in the ways to produce and acquire it" (p.114). In addition, as the same author Coll and Monereo points out with respect to ICT which enhance (2008) "the possibility of using sign systems- oral language, written language, static images, moving images, mathematical symbols, musical notations, et..- to represent certain information and transmit it "(p.22).

So it is important to make a distinction between the Technology of Education and New Technologies applied to Education, while the first focuses on studying teaching strategies using the characteristics of multimedia focusing on the design of technological resources for the processes of teaching learning, the second seeks training and teacher training as a user of multimedia resources. (Light, 2018).

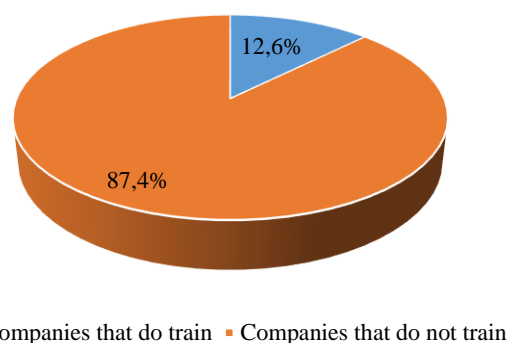
Thanks to the incorporation of multimedia and internet technologies, knowledge has been allowed not only to be acquired in educational institutions but it has been mobilized by removing spatial and temporal barriers, making it possible in practically any scenario (school, home, workplace, leisure spaces, etc.). This is how more people can access new resources and educational possibilities, so that learning is no longer seen only as an instrument to promote the development, socialization and culture of people, but it becomes a fundamental motor of social and economic development.

The National Institute of Statistics and Geography (INEGI), indicates that there are four million 15 thousand business units in Mexico, where 99.8% are SMEs, generating 52% of the Gross Domestic Product (GDP) in addition to multiple jobs, so that their role in economic activity is fundamental. (INEGI, 2014)

Vásquez, M., Ugarte, R, Torres, M. and González, B. comment that Information and Communication Technologies (ICT) play a very important role in the competitive advantage of companies, therefore, if the company it does not have as main policy the use of ICT for its operation, it will lose ground against direct and indirect competition. If the company does not stay at the technological forefront it is possible that it loses customers and its competitive advantage is obsolete in a short time.

Therefore, it is important that you invest in economic and human resources to develop better technology and train in the use of it.

According to the National Survey on Productivity and Competitiveness of Micro, Small and Medium Enterprises (ENAPROCE) 2015, "just over 4 million existing companies in Mexico during 2014, 97.6% are microenterprises and concentrate 75.4% of the total employed personnel, followed by small companies with 2.0% and 13.5% and medium companies representing 0.4% and 11.1% respectively". Of the total of these companies considered by ENAPROCE, 12.6% provide training to their personnel. Highlights the participation of medium and small companies which registered 73.7% and 55.8% respectively. In the micro-enterprises, 11.5% train their personnel. As shown in Graphic 1



Graphic 1 Distribution of the Number of Companies that Provide Training to Employed People, 2014
Source: INEGI, ENAPROCE (2015)

In the ENAPROCE survey in the area of Information and Communication Technologies (ICT), Small companies 93.4% of companies use computer equipment and 92.4% use the Internet; as well as the Medium Companies 74 of each 100 companies provide training and 99.1% of the companies use computer equipment and 98.4% use the internet (ENAPROCE, 2015) as can be seen in Figure 2 and Figure 3

On the other hand, for 2015, AmiTi pointed out that 50% of Mexican companies invested in ICT to improve business processes and productivity. According to the IDC LA Telecommunications survey on ICT investment trends in the same year, about 28% of national companies would increase their spending on ICT, while 49% would maintain it and only 23% would seek to reduce it. We are talking about technologies that would require intensive use of the network.

It is worth mentioning the increase in the use of mobile phones for managing information and multimedia, which is why more applications are required, this leads to the use of a convergent architecture that allows the multiplicity of protocols. (Amiti, 2015).

ICT have been used in companies for different purposes, such as Peirano, F., & Suárez, D. (2004) who identify four types of use: the first, for the access and exchange of information, including the performance of procedures before public agencies, banking operations, personnel selection, search for information related to customers, suppliers, competitors and markets; the second type are the uses related to the generation and exchange of records, where the company is considered to have a website and the operations involved such as purchase, sale, organization processes, control and planning; The third and fourth types are of higher complexity since they consider analysis and planning tasks including the management of the relationship with suppliers and customers, use of software for allocation of resources within the company and for the analysis of transaction records as the follow-up to diverse activities, through internal networks.

As pointed out by Martínez, E & Martínez, F. (2009): "training methods and techniques refer to the different ways in which to organize, implement and execute teaching processes to achieve the anticipated learning objectives." They also add that There are different types of training: at work, outside of work, face-to-face and non-face-to-face, the latter being a central reason for the development of our research because it does not necessarily require the physical presence of the instructor in the learning process.

Some companies document the knowledge that is generated, but there are others where it has been visualized that students who join the practical stay must generate their own knowledge because there is no specific documentation on certain processes.

The training by expert staff is a daily and repetitive practice that could be reduced in time and cost for the company if there were support materials that were useful in such training processes within the company.

The process of designing a didactic material requires good planning, this implies different requirements that range from pedagogical, presentation, viability, technical and human requirements, etc.

From this perspective, this implies a decision-making process, taking as a reference the characteristics of the target population, the context in which it will be used, objectives and learning contents that are intended to be developed, and the support that different resources can offer or symbolic systems to present and structure the information (Cabero J., 2007).

Some methodologies have been proposed for the creation of didactic material, Ogalde I. and González M., (2007) contemplate six phases: Planning, where it considers objectives, resources, tasks and times; Analysis, where the content is selected, user profile modality, distribution form; Design, which proposes structure and technological resources; Development, for the elaboration of contents; Implementation, start-up and maintenance; and, Evaluation, consisting of carrying out an opinion poll for its evaluation.

In parallel, the Department of Computational Education and Instructional Technology of the Balikesir University in Turkey, proposes a study based on the ADDIE design model (analysis, design, development, evaluation) for the development of educational resources. (Yüzen & Karamete, 2016).

In its theoretical framework, instructional designers and educational developers are based on five phases: analysis, design, development, implementation and evaluation. Although it is true that the phases are very similar, the elements that it incorporates are based on the following forms of learning: multiple ways of representation, action and involvement. (Piskurich G., 2015).

It should be noted that in the process of designing a teaching material there are no defined or unique methods, each entity or institution incorporates elements that are useful in their development, adapting them to their context and needs.

For the previously mentioned, the proposal in this paper is to explain a model for the creation of Teaching Materials in SMEs, which will take as a basis the model of Design of Teaching Materials proposed by Roldán N. (2010) which has been used for modeling other materials such as the Programming Logic Teaching Pack (Roldan N. Lizardi V., 2008), Propaedeutic Study Techniques Courses (Lizardi V, Roldán N, Bolaños R, 2016), material that remains in force and is a reference in the Division of Information and Communication Technologies of the Technological University of Puebla.

Methodology

Contextualization

The educational model of the Technological Universities (UT) is based on a scheme of high intensity and short duration. "The educational content focuses on the fundamental aspects of each subject, so that students, upon completing their studies, manage a universe of theoretical-practical tools that allow them to adapt to different production processes." This scheme facilitates graduates to link with the productive sectors, achieving that their transit from the school environment to the work force is immediate. "(CGUT, 2017)

In the three levels of education: Higher University Technician, Engineering and / or Bachelor's degree, a four-month period of professional training is offered whose purpose is to allow the student to put into practice the skills related to the work methodology, both intellectual and practical, to solve problematic situations in real conditions; This must be approved by business and academic advisors.

The students that make their practical stay are incorporated to diverse entities, including PYMES. During their stay they observe, gradually knowing and managing the context of the work plant, the technical language, use of their own technologies, information management and the way they carry out the production processes, handling of internal and external procedures, organizational and social culture; This learning acquired during your stay is a training that, in an inherent way, these practitioners develop.

Each student who joins the productive sector not only leaves a contribution through the development of their projects (requirement to complete their practical stay), but generates knowledge and new skills but, once your stay ends, this could be lost if not the member who replaces it is replicated. It is likely that you leave documentation regarding the development of your project, however the acquisition of know-how may not be documented. Hence the importance of generating teaching materials that can be used as support elements in self-training processes.

Instrument design and type of research

The scope of this study is descriptive-qualitative, since it was developed thanks to a series of questions whose information allowed to describe the general perception of the answers collected according to the percentages obtained. A total of 81 students of practical stay were interviewed: Higher University Technician and Engineering of four UT: Technological University of Huejotzingo, Technological University of Xicotepec de Juárez, Technological University of Tehuacán and Technological University of Puebla. The following divisions were taken into consideration: Higher University Technician in Information and Communication Technologies; Corporative development and innovation Engineerign; Engineering in Information Technologies; Administration Human Resources Area; Superior University Technician in Industrial Area Maintenance; Engineering in Business Development and Business Innovation; and Industrial Maintenance Engineering.

For the first block, open short answer questions were prepared to identify the type of stay, each student's training, as well as to know the context where the practical stay was conducted and investigate the type of company, the age of the staff work on it. Obtaining the following results of the total of the population that responded to these questions. (See Table 1)

The second part of the survey considers the induction that the student receives when entering the company, as well as the supports that are provided and the types of technological resources; in the third part, the end of the stay is investigated, what kind of materials are left to the company as part of their training and the learning generated during this process.

No. Question	Statement	Answers			
P1	Year in which a practical stay was made	2014 4%	2015 21%	2016 75%	
P2	Level of student training	Senior University Technician 25.9%		Engineering 74.1%	
P3	Type of company where practical stay was made	Micro Company 11.1%	Small company 8.6%	Medium Company 80.2%	
P4	Average age of employees	19-22 years 3.1%	23-30 years 54.7%	31-40 years 31.3%	More than 40 years 10.9%

Table 1 Practice Stay Identification Questions

Source: Own Development (2017)

In this section, the Likert scaling method is used, using five levels to measure the students' reaction to each questioning. The variables with response have a nominal value associating the words: Totally Agree (TA), Agree (A), Partly Agree (PA), Partially Disagree (PD) and Totally Disagree (TD), these levels will make it possible to qualify and capture the feelings of the respondent towards the questions raised. (See Table 2)

Questions	Statement	Totally agree			Totally disagree	
		TA	A	PA	PD	TD
P1	Did you receive an induction course about the company? Business philosophy (mission, vision, values)					
P2	You were informed of the company's policies: entry and exit schedules, tolerance, remuneration (if any), information management, rights and obligations.					
P3	You received a training course or, in any case, advice on how to carry out daily activities.					
P4	In case you were asked to improve a project, you were given a development manual indicating how the project was made.					
P5	In case you were asked to work on a specific software system to control, personnel, processes, information, etc., you were given a user manual.					

P6	Before leaving, you were asked to document the work prepared for future practitioners. For example: you left a writing showing how to carry out a process that you learned (handling information from the company, from a software system, specialized machinery or personnel).	TA	A	PA	PD	TD
P7	Before leaving, if you elaborated a process or product, they asked you to document how to update it.	TA	A	PA	PD	TD
P8	You were offered training on some knowledge that you would have to apply in the company. For example, the use of ICT, or specific software.	TA	A	PA	PD	TD
P9	You were provided with sufficient support material for the performance of your activities.	TA	A	PA	PD	TD
P10	You were given time to investigate what you did not know and needed to know to perform your functions. For example, how to link Excel files with Word, mass mailing, email account management, etc.	TA	A	PA	PD	TD

Table 2 Generic questions made to obtain information on materials and / or resources used during the Practical Stay
Source: Own Development (2017)

Finally, a question was elaborated that sought to investigate the type of materials that the practitioner received, including six options to choose from: Text Documents, Slide Presentations, Video tutorials, Interactive Multimedia Activities, Direct explanation with the expert instructor.

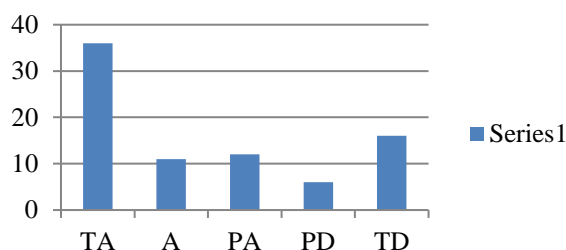
Results

With the information obtained from the questionnaire, a measurement is made of the way in which knowledge is generated, induction courses and / or training that is applied during the practical stay, in addition to the contribution that the practitioner leaves of said experience for users or future apprentices.

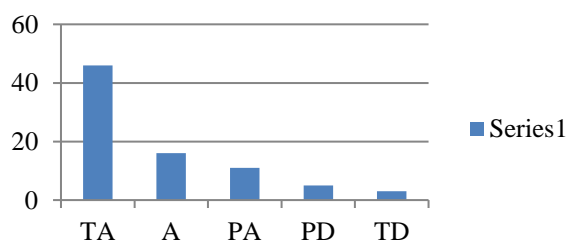
The results obtained in each statement are presented below by means of bar graphs to present the frequency of variables of nominal scale. The length of the bar indicates the frequency and the width of the constant.

In questions 1, 2 and 3, where you want to know if students receive an induction and / or training course about the company, as well as its operational part and policies, it was found that 69% of students expressed their opinion on the acceptance scale (TA, PA, A), where it can be seen that when students enter a company they receive information on how the activities, regulations, schedules, handling of information, etc. are carried out. Which implies that they have a time of induction and training that helps the student adapt to the work activity of the company (See Graphic2).

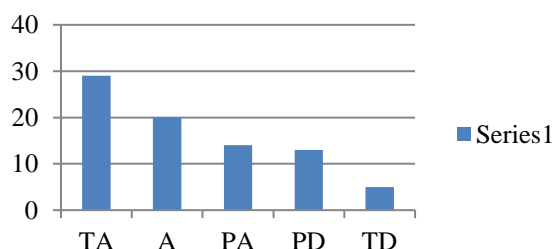
P1. Induction course of the company was received



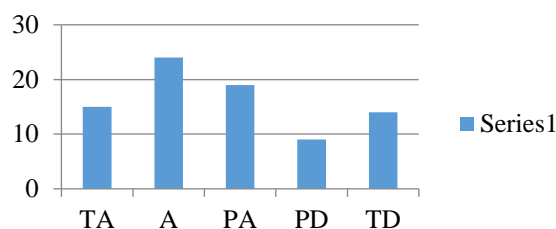
P2. We received political information, information management, etc.



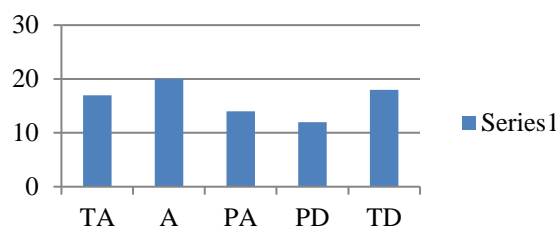
P3. Training course was received



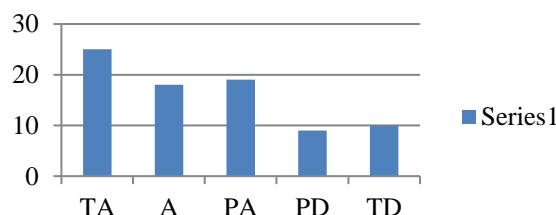
P4. Project development manual received



P5. User manual received about a particular process



P6. It was requested to document elaborated work

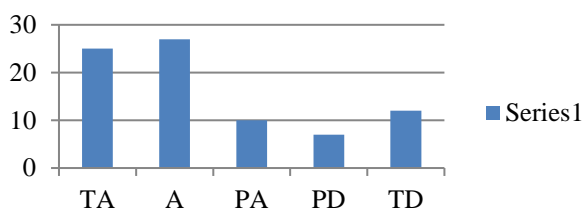


Graphic 2 Results of questions 1, 2, 3, 4, 5 and 6 Research Instrument Statistics Technological Universities
Source: Own Elaboration 2017

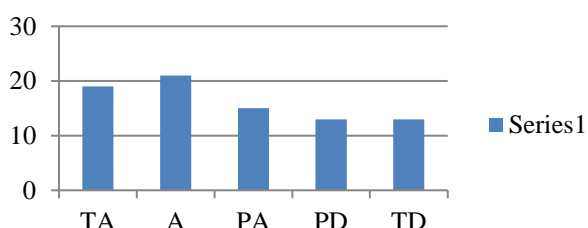
In question 4 regarding the improvement of a project, it was questioned if a manual of elaboration was given indicating how it was done, 48% thought they did receive this information. (See Graphic 2). In question 5 questions whether working on a specific Software System to control, personnel, processes, information, etc., they were given a user manual, 45% agree, but also 37% think they did not receive it (See Graphic 2).

In question 6 we want to know if the student is asked to document the work prepared for future practitioners, 53% of the students answered that they do it and 23% do not (See Graphic 2). Question 7 investigates whether, before finishing your stay, a project was developed (product / service) and if you were asked to leave documented how to update it, 64% students said they do leave this information and 23% do not out (See Graphic 2).

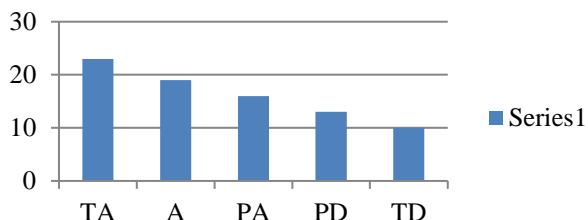
P7. Project Update document was left



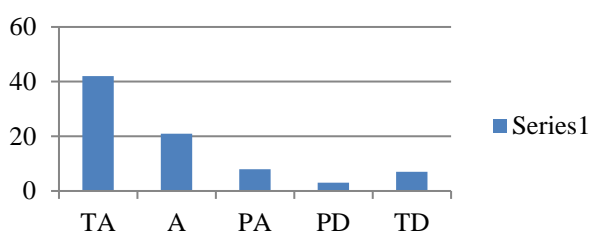
P8. Specialized training was received



P9. Sufficient support material was provided



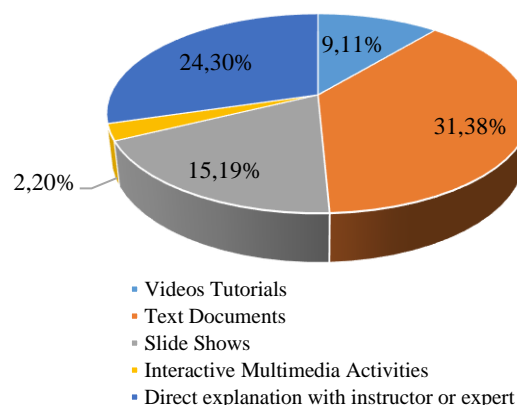
P10. Time was provided to investigate information



Graphic 3 Results of questions 7, 8, 9 and 10 Research Instrument. Stays Technological Universities
Source: Own Development (2017)

In question 8 we want to know if specialized training is obtained: 49% of the students answered yes and 32% did not. In question 9, he questioned whether he was provided with sufficient support material for the performance of his activities: 51.8% were in the affirmative, while 28.3% did not have enough support. Finally in question 10 we wanted to know if the time provided for research was sufficient: 51.8% participants answered positively and 12.34% did not have enough time. (See Graphic 3)

Finally, a question is added to know the types of materials that were provided for induction courses, management of a specialized technology, or knowledge of a process. Six options were shown and the percentage of responses can be seen in Graphic 4.



Graphic 4 Technological Resources for Training used in the Practical Stays
Source: Own Development (2017)

Discussion and Model Proposal

From the results obtained it is observed that the company considers a time to incorporate the student in the knowledge, skills and management of the company processes (Know-How), within this same resources and supports are provided both for the development of the project, as well as to know the internal steps of the entity. Most practitioners are asked to leave documented the project they developed during their stay: operation manuals and / or development of a certain technology, however there are activities that are not documented, lessons learned that are not followed up.

In fact, the last question is revealed where the percentage of materials they have is known: where the documents extracted from the internet occupy 31.38%, which has a disadvantage, since it does not adapt to the particular characteristics of the company; Slide shows occupy 15.19%; and, there is a low tendency in the use of video tutorials.

It is also interesting to know that there is training done orally (24.3%), that is, it requires the explanation of an expert to understand the topic, procedure or specific technology management; this information is not documented and this process has to be repeated as soon as a new member arrives.

For the reasons mentioned above, it is proposed to use a Model for the Design of Teaching Materials within SMEs so that students not only leave the contribution of the stay project, but also add teaching materials that can be used to acquire the Know-How of the company and are incorporated in the training processes. The proposed design and production is based on the Didactic Materials Design Model proposed by one of the authors of this article (Roldán N., 2010), which has been tested to generate educational materials at the Technological University of Puebla adapted to the conditions we have in the practical stay.

At Harvard University, Project Zero (Perkins D., 1999), known as "Teaching for Comprehension" (EpC), was developed, in which a set of investigations was carried out to determine the characteristics of understanding teachers should use in order to promote teaching - learning based on "understanding".

A conceptual framework was developed that includes four key ideas: generative topics, comprehension goals, comprehension performances and continuous diagnostic evaluation, these elements allow focusing on what topics, including their aspects, should be understood; In addition to how to promote and verify the progress of the apprentices to find out what they really understood. Our Didactic Materials Design Model is based on this theory that includes different phases and elements.

Phases for the Design of Teaching Materials in the SMEs

This model consists of six phases: Context Analysis, Establishment of Generative Topics, Design of Understanding Goals and Sub-goals, Design of Comprehension Performance, Evaluation of Learning and Application. (See Figure 1 to visualize the relationships between these phases).

Phase 1. Context Analysis The situation where the material will be used is analyzed, answering the questions: where, when, how, with what and why an instruction should be carried out, which will give meaning to its elaboration. Based on four important factors: characteristics of the entity, establishment of priority needs, characteristics of users and technological infrastructure.

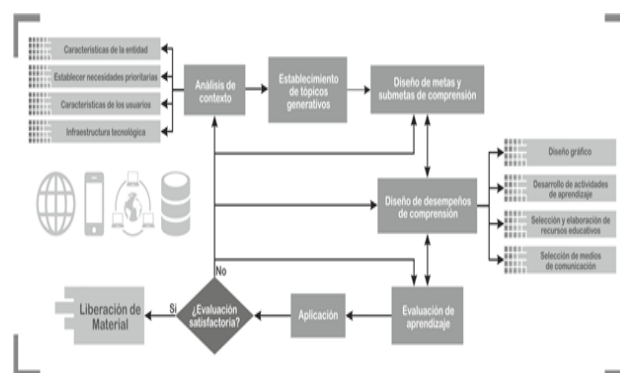


Figure 1 Model for the Design of Didactic Materials (Roldán N. 2010)

Source: Own Development (2017)

In the analysis of the context several characteristics are taken into account that allow to have a general overview of the company, its objective, mission values, policies, processes, form of organization, information management, technology and infrastructure with which it is counted. It is essential to know these elements since the proposals of support material that are generated should be aligned to these guidelines that frame the way of work and operation of the firm.

In this analysis, four important factors are considered: Characteristics of the company: mission, vision, values, objectives, internal policies, management of information and processes, cultural factors, technical limitations, etc; Priority Needs: the Know-How that the student knows and manages during his / her practical stay process, an analysis is made to order according to the importance of the concepts that are used, in two senses: one is, generation of new knowledge and another is the one that is carried out on a daily basis but that is not documented; of this classification is selected along with the project leaders and / or organization of the company the learning priorities that have (urgencies) to train people who join the workforce; Characteristics of the users: the type of audience (users) to which the didactic material will be directed is analyzed, in the instrument that was applied, it is observed that 54.7% are between 23 and 30 years old and 31% among the 31 -40 years, so we must consider learning elements according to age and learning styles, another feature is the language, the terminology used, including knowledge and use of ICT; Technological Infrastructure: which studies the elements that are available to propose materials that can be supported by technological elements and / or communication with which the company has.

Phase 2. Establishment of Generative Topics Generative topics consist of those ideas or central questions that are guidelines in the generation of knowledge or management of a skill, are topics of rich and illustrative character.

The selection of central topics is related to the priority needs that were established from the context analysis phase.

Therefore, it is essential to be able to extract the important issues, that the project leader together with the practitioners question which is a priority, either because it is used in various projects, processes or situations that the company solves or optimizes the time start-up of some activity. You can use a conceptual outline or map that allows analyzing, relating and discriminating the different topics and questions that you consider important.

Phase 3. Design of Understanding goals and sub-goals. Understanding goals: refers to specifying the concepts, processes, skills and abilities required to have an understanding that serves as a firm basis for later constructions. There are two types of comprehension goals: those that correspond to "particular issues," which are very specific, and the "encompassing or conducting threads" that are broader.

They can be elaborated in the form of statements or questions, the elaboration of which allows the apprentices to have clear the comprehensions that they wish to develop.

It also allows to give value to a concept, that is, why or why is it useful to understand some process in the company? Where do you want to get all this information? What do you get with it? of understanding allows you to remember the objective, this will help you not to get lost in the sea of knowledge when you are designing comprehension performances. Understanding sub-goals: once the overarching goals have been established, one can begin to define for each of these the small goals that must be achieved in a generative topic.

Therefore, a generative topic must have a goal of understanding and a set of sub-goals that once carried out, achieve the understanding and the learning of the desired ability.

Phase 4. Comprehension Performance Design **Comprehension Performance:** are activities designed to help the learner to explore and establish connections between the new concepts and their previous knowledge implies to perform a variety of actions (performances), which demonstrate what is meant by Some particular subject Comprehension performances are considered a very valuable element for understanding because through these the learners express the ability to use what they know creatively and competently when faced with solving a specific problem within the company.

At this stage, once the topics and goals of understanding and sub-goals have been selected (general and specific objectives), the characteristics of the entity, users and technological infrastructure must be considered, since the resources selected to generate self-learning activities must be supported under the technology with which it is counted. Another element that is considered is the management of the technology and means of communication of the personnel, if it is native or digital immigrant: "the digital natives are all those people who were born in the middle of the 90s (last century) onwards, and the Digital immigrants are all those born before said date. (Prensky, M. 2001) Therefore, the characteristics and skills they possess are different in the learning process.

It is essential to take into account the age of the apprentice because it is not the same way of learning from a digital native to a digital immigrant since, while the former prefers to learn through manuals and written elements or diagrams in one plane, the latter prefers multimedia elements visuals accompanied by image, audio and movement.

Once the activity is visualized and the type of profile of the apprentice is analyzed, a review of the educational resources (presentations, videos, texts, audio, web sites, etc.) that can be used is made. It is ideal that in the elaboration of these activities there is an interdisciplinary team: graphic designer, pedagogue and expert in the area of knowledge. Although, given the circumstances, the consultant of the company would be the expert in the area, the internal advisor would cover the pedagogical part and the student would be in charge of the graphic design and the development of the material.

Phase 5. Evaluation of Learning Allows to assess how much the students have understood, through feedback situations or integrating works that show evidences about the skills and knowledge acquired.

The way to clarify and improve the theories is through the exchange of knowledge since the discussion with other people allows to restructure and reflect the conceptions that were at the beginning of the learning process. To develop the evaluation criteria, the established comprehension goals must be taken into account.

Phase 6 Application (Evaluation of Teaching Materials) Once the material is elaborated, it is important to evaluate it in five basic aspects: the first one is the content: which must be carried out by experts in the disciplines and in the handling of the topics; the second is in didactics: where it is suggested that the evaluators be aware of the methodological and technical strategies in teaching; the third is learning: here the experts who will use the material to verify if it produces learning, it is convenient to know the opinion of the apprentices; the fourth refers to the technical aspect: IT professionals are the ones who must guarantee the functioning of the ICTs used, also the students who managed the material can give their opinion regarding the efficiency; and, finally, the impact: which measures how attractive and motivating the material is to whoever is going to use it. (Roquet G. 2010)

Release Following the evaluations, if there is any observation, it is allowed to return to any of the previous phases in order to improve the product. In case of detection of any failure that has to do with the functionality of the technological resources, these remain in the hands of the experts and the modification does not intervene in the design phases. If in the evaluation of all these aspects the requirements are met, the final phase will be the release and use of the material.

Conclusions

In this work we focus on using technology in education through the generation of educational materials to promote knowledge, skills and experiences obtained in a SMEs ("Know-How").

It is essential to invest in human talent developing programs and training methods to anticipate changes, impose competitiveness and meet demands in productive processes, teaching materials can be a form of support in the training and independent learning of company personnel.

The generation of information, knowledge management, management of information and communication technologies within SMEs can be carried out through materials and didactic resources specifically for each particular situation of the companies. This training will allow a time saving that can have a beneficial impact on the productivity and competitiveness of the firm.

A survey was developed that reflected the way in which the students of the technological universities receive courses of induction and training for the performance of their activities during their stay in the company, however the materials they have are mostly foreign internet documents. to the characteristics of the entity, and a considerable percentage receives direct instruction through an expert.

Derived from the above, it is proposed to generate educational materials of the skills and abilities developed by practitioners during their stay in the workplace. Although, at the beginning, practitioners may be unaware of the organizational and procedural policies of the area where they provide their services, as they learn they learn and identify needs that can be covered not only with the entrusted projects but with specific didactic materials that encourage self-learning personal.

The proposal to generate these materials is through a Model for the Design of Educational Materials proposed by one of the authors of this article, which consists of six phases that provide a guideline for their development.

As future work, it is intended to develop didactic materials in the different companies SMEs supported in the collaboration of the students who carry out their process of practical stay. Once this is done, it will be necessary to measure their contributions to know what the opinions are and the impact regarding the training and learning of the knowledge for which they were prepared.

Similarly, it seeks to promote this model within the ICT Division at the Technological University of Puebla and share it with other educational institutions.

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