Diagnosing and Enhancing Innovation Capabilities in Small and Medium Enterprises

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ABSTRACT

Small and Medium-sized Enterprises (SMEs) are critical to economic growth and employment, especially to the countries where these subjects represent major challenges. Evaluating the Innovation Capabilities of this type of firms may reveal their opportunities for acquiring competitive advantages in a complex and dynamic business environment. In order to achieve this, a diagnostic tool was developed by considering the most important factors that resulted from an extensive comparison between SMEs' growth models literature and the Organizational Capabilities Model for Innovation developed by the ITESM-CEMEX Research Chair*. As the result of the analysis, four factors turned out to be the most representative of SMEs' performance, which are: Top Management Leadership and Commitment, Operational Excellence Insight, Internal Innovation Processes and Culture, and Customer Value Insight. Furthermore, an innovation toolbox was designed for improving the performance of the firm in the aforementioned factors, which consists of simple and easy to use visual aids, as well as a guide to promoting innovation efforts and detecting signs of failure. The results from the implementation of these tools are to be collected from a website with a far-reaching scope and ought to be useful in the construction of a formalized insight in innovation management for SMEs' growth.

*The ITESM-CEMEX Research Chair is a collaborative effort between the Monterrey Institute of Technology and Higher Education (ITESM, for its acronym in Spanish), one of the most prestigious universities in Latin America; and Mexican Cements (CEMEX, for its acronym in Spanish), a global building materials company.

Keywords: Innovation in SMEs, innovation capabilities, innovation toolbox.

1. INTRODUCTION

Small and Medium-sized Enterprises (SMEs) are critical to Mexican Economy because of employment creation and national production capability. In Mexico, 99.8% of the economic units are SMEs that generate 52% of the Gross Domestic Product (GDP) and constitute 72% of total wage employment (INEGI, 2011). According to the relevance SMEs have in Mexican Economy, this research project aims to provide tools that support SMEs to develop competitive advantages by enhancing their innovation capabilities. The Diagnostic Tool enables the evaluation of the current firm's innovation capabilities, and is inspired in the Organizational Capabilities Model for Innovation developed by the ITESM-CEMEX Research Chair (Caffarel et al., 2012). The aforementioned model analyses eight dimensions, each corresponding to a specific innovation capability that comprises five drivers for innovation (Figure 1). The objective of this model is to evaluate de maturity level of the firm's innovation capabilities according to the 40 drivers.

In pursuance of adapting the robust model that was formerly introduced to the evaluation of SMEs' innovation capabilities, an extensive comparison to several SMEs' growth models (Wiklund et al., 2009; Hess, 2012; Li et

al., 2004; Churchill et al, 1983; McQueen et al, 2007; Mazzarol et al, 2009; Molina, 2009) was performed and the most relevant factors were identified. Table 1 shows a segment of the comparative analysis where points of agreement, marked as "1", were found in each of the 40 innovation drivers between the ITESM-CEMEX Organizational Capabilities Model for Innovation and the SMEs' growth models literature. As the result of the comparative analysis, the identified most important factors for the evaluation of SME's innovation capabilities are:

- Top Management Leadership and Commitment.
- Operational Excellence Insight.
- Internal Innovation Processes and Culture.
- Customer Value Insight.

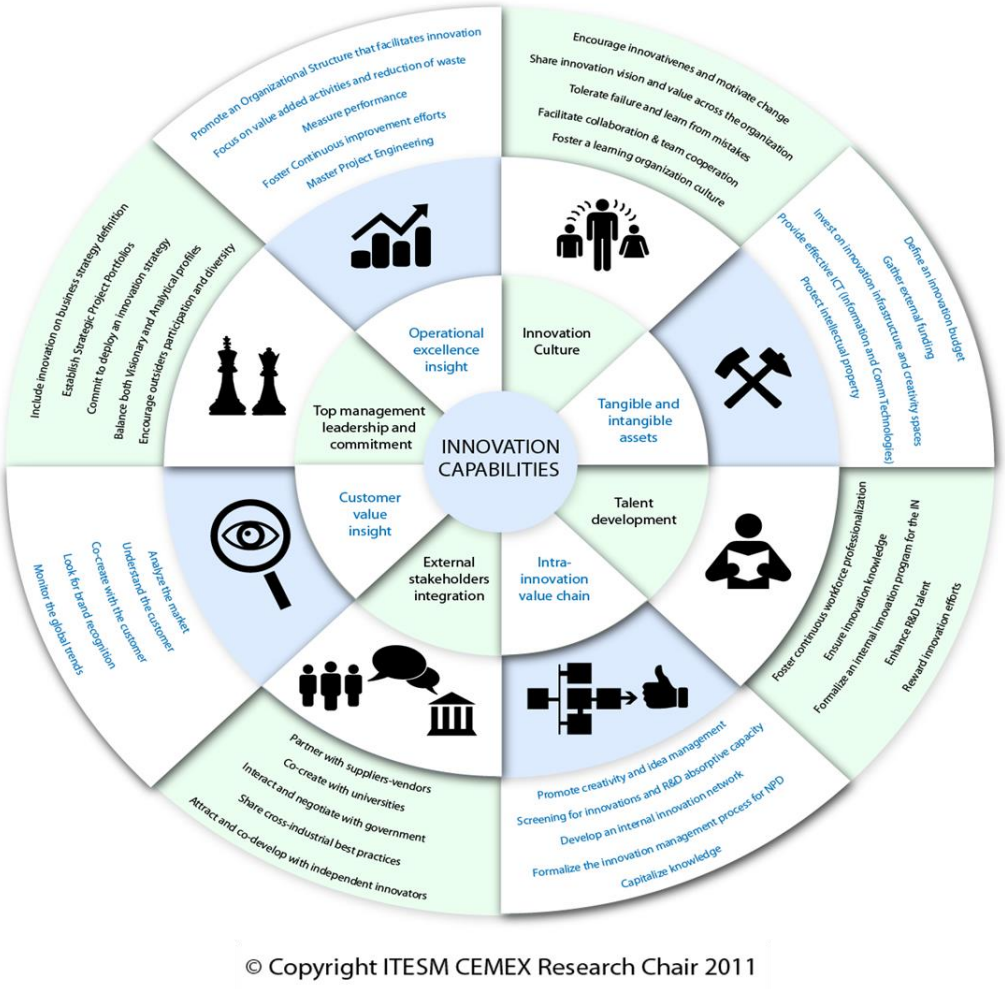

Figure 1: The eight dimensions of the ITESM-CEMEX Organizational Capabilities Model for Innovation.

These SMEs' critical innovation factors not only enabled the design of the Diagnostic Tool for SMEs' Innovation Capabilities, but also, the means of enhancing the innovation capabilities to which they are related. These Enhancing Tools are the Innovation Toolbox and the Guide to Promoting Innovation Efforts, which will be thoroughly described in the following section.

2. DIAGNOSTIC AND ENHANCING TOOLS

In this section, a general description of the Diagnostic and Enhancing Tools is shown, as well as their relation with the aforementioned critical factors. The application is meant to be sequential. In Figure 2, the proposed implementation of these tools is depicted.

Table 1: A segment of the comparative analysis between the robust Organizational Capabilities Model for Innovation and the SMEs' growth models.

ITESM-CEMEX Organizational Capabilities Model for Innovation		Drivers of innovation	SMEs' Growth Models							Sum by driver	Sum by dimension
			1 (Wiklund et al., 2009)	2 (Hess , 2012)	3 (Li et al. , 2004)	4 (Churchill et al. 1983)	5 (McQueen, et al. 2007)	6 (Mazzarol et al., 2009)	7 (Molina, 2009)		
1	Top management leadership and commitment	1.1	1	1	1	1	1	1	1	7	20
		1.2	1	1	1					3	
		1.3	1			1		1		3	
		1.4	1			1				2	
		1.5	1			1	1	1	1	5	
2	Operational excellence insight	2.1		1	1	1	1		1	5	11
		2.2							1	1	
		2.3		1					1	2	
		2.4			1				1	2	
		2.5			1					1	
3	Innovation culture	3.1	1					1	1	3	11
		3.2		1				1	1	3	
		3.3								0	
		3.4		1		1			1	3	
		3.5		1			1			2	
4	Tangible and intangible assets	4.1	1		1	1		1		4	8
		4.2					1			1	
		4.3							1	1	
		4.4				1			1	2	
		4.5								0	

As the first step, the Diagnostic Tool was designed to detect the current performance of the firm to deploy innovation efforts and aims to identify the main opportunity areas. Secondly, the Innovation Toolbox has the objective of improving the efficacy and efficiency of the firm to succeed as an innovative organization and addresses the means to seizing the opportunity areas. Finally, the Guide to Promoting Innovation Efforts consists of a simple verification checklist that enables innovation leaders to assure the necessary resources and to detect signs that indicate problems in the implementation of the Innovation Toolbox.

2.1 DIAGNOSTIC TOOL FOR SMES' INNOVATION CAPABILITIES

According to the most important factors, a short and simple questionnaire was developed so that the innovation leader can evaluate the innovation capabilities of the firm in a quantitative manner. Each of the statements is

designed to maintain an objective approach by using different descriptors at the edges of a Likert scale that represent opposing responses.

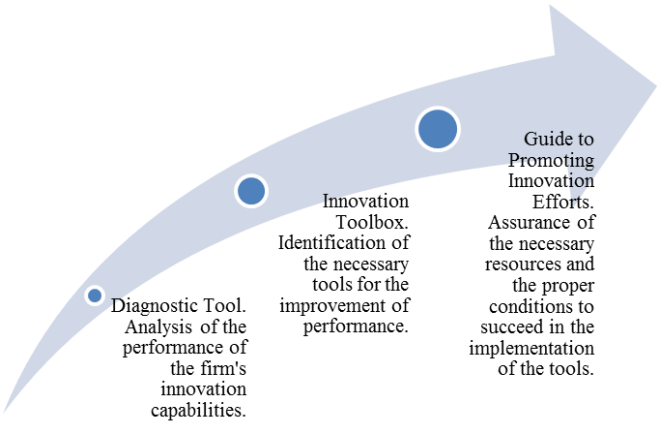

Figure 2. Implementation sequence of the Diagnostic and Enhancing Tools.

As an example, in order to identify how relevant are the innovation efforts for the Top Management, the used statement is "For the Top Management, the innovation efforts represent a…" in which case, the descriptors are, on one hand, "Limited commitment", and, on the other hand, "Institutionalized commitment". If the innovation leader chose the first option, he would be implying that the Top Management of the firm considers the innovation efforts as relevant but does not encourage them in a way for it to succeed as an innovative organization. In contrast, the second option suggests that innovation efforts are essential for the firm to be effective in attaining its strategic goals. There are several alternatives to complete the statement according to the rapid changes that SMEs experience in an ever-changing business and technological environment.

Considering the complexity of the answers, it is not expected from the innovation leaders to select one of the descriptors, but to illustrate the degree in which the innovation capability is present in the firm. As a consequence, it is asked to evaluate the firm with an odd number, between 1 and 7. As an example, the following pairs in Table 2 are some of the descriptors used for the scales of the Top Management Leadership and Commitment section.

Table 2. Examples of descriptors for the responses in the Top Management Leadership and Commitment section of the Diagnostic Tool.

Descriptor	Context
Absent	Denies that the concept in the statement is present in the procedures and communications of the firm.
Formalized	Accepts that the concept in the statement is present in the procedures and communications of the firm.
Homogenic	Refuses that the workgroup counts with gender, age or ethnic diversity.
Heterogenic	Assures that the workgroup counts with gender, age or ethnic diversity.
Intuitive	Expresses that the style in which the Top Management addresses strategic issues relies on experience.
Analytical	Specifies that the style in which the Top Management addresses strategic issues relies on hard facts.

The Evaluation Tool consists of 35 statements divided into 4 sections, corresponding to the identified factors. At the end of each section, the ratio between the obtained points and the available points sum shows the state of performance of the firm regarding each factor. If the ratio is less than two thirds, it is strongly encouraged for the

innovation leader to implement the suggested aids for that specific factor in the Innovation Toolbox. Furthermore, the arithmetic mean of the ratios of the factors can be used to signal the overall capability of the firm to succeed in innovation efforts.

2.2 INNOVATION TOOLBOX

The Innovation Toolbox was designed for improving the performance of the firm in the sections in which it showed a poor performance, according to the Diagnostic Tool. It consists of a set of 12 tools, 3 for every factor. The primary directive of its design was to be simple and easy to use and to include visual aids. Each of the tools is spread into 2 pages in which the first of them includes a table with the most critical information about the tool, which is explained in Table 3.

Table 3. Description of the available content in the Innovation Toolbox.

Tool's aspects	Content
Common name	The name for which the tool is known in the business environment and informal publications.
Technical name	The name for which the tool is known in academic publications.
Benefits and applications	The uses of the tool and the benefits that result from its application.
Main characteristics	This section contains overall information regarding the implementation procedure of the tool, as well as simple suggestions.
References	The academic references employed for the design of the tools are shown in this section. It is highly encouraged for the innovation leaders to use the open information sources that are available as the final part of the table.

It is necessary to explain that the language in which the information is shown is meant to be simple and easy to understand and that, in case of needing further references, the table includes the technical name of the tool and suggests a list of online sources that are mainly related to official governmental and academic websites which do not require any type of payment in order to obtain the information. Also remarkable is the insight of the section "Benefits and applications" because it stresses the reasons for the firm to seize the diagnosed opportunities.

For the selection of the tools, governmental resources were critical such as the guide "InnoSupport: Supporting Innovation in SMEs" (Leonardo DaVinci Transfer of Innovation Project, 2012), which is a pilot project supported by the EU's Culture and Education Committee. Academic literature was consulted (Akao, 1994; Knowledge Based Systems, 2010; Sánchez, 2004; Lucio, 2006; Osterwalder, 2010) to present the main activities related to each tool, as well as the most important suggestions to succeed in their implementation. It is important to mention that most of the proposed tools require participative processes with a very heterogenic workgroup. Furthermore, some require client participation which might become a complex task given that the Innovation Toolbox does not include suggestions on how to lead these participative processes, hence, the use of the Guide to Promoting Innovation Efforts is embolden.

The second page of each tool includes a visual aid that aims to improve the clarity of the implementation procedure. It shows, in a simple manner, the steps that are followed in order to attain a final result, as well as the physical aspects and necessary resources for its implementation. Thus, these aids become an extension of the "Main characteristics" section; furthermore, some depict an example of the expected result.

2.3 GUIDE TO PROMOTING INNOVATION EFFORTS

As a final step, the Guide to Promoting Innovation Efforts has the objective of helping the innovation leaders to gather the necessary resources and to assure the correct conditions for the implementation of the Innovation Toolbox. On one hand, it offers a verification checklist that is inspired in the ITESM-CEMEX Organizational Capabilities Model for Innovation as well as in the Model for Improving Innovation Efforts (Dhillon, 2006). By

completing the seven sections of the "Verification Checklist for the Effective Implementation of Innovation Tools and Techniques", the innovation leader can compare between the current and desirable state of the firm's conditions and resources to succeed in the tool's implementation. The areas of verification are displayed in Figure 3.

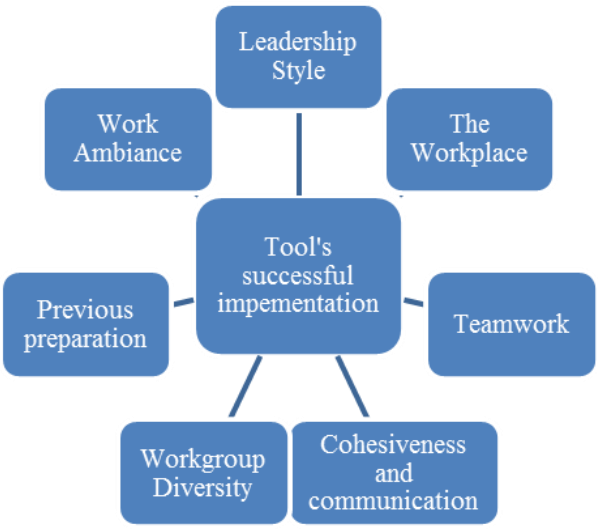

Figure 3. The 7 sections of the Verification Checklist for the Effective Implementation of Innovation Tools and Techniques.

On the other hand, the Guide to Promoting Innovation Efforts offers a way of detecting sign of failure. Several problems may arise from the implementation of participative processes. Dealing with coworkers and clients include a series of requirements such as convincing other people to actively generate and communicate ideas and proposals, maintaining a respectful and encouraging work ambiance, promoting feedback and idea exchange, and keeping the pace to meet the work schedule. This second part, named the "Guide to Leading Creative Teams", which greatly relies on academic literature (Cook, 1998; Flew, 2012; Doorley, 2012; Gallego, 2011), proposes a simple mean to prepare the innovation leaders to deal with many of these problems, and basic directives of how to behave in order to obtain a positive outcome of the participative sessions. The information is displayed as explained in Table 4.

Table 4. Information distribution for the Guide to Leading Creative Teams.

Directive	Sign of Failure	Suggestions
Positive statements declare the desirable state in which the best outcome of the participative process can be achieved.	The noticeable problem.	What the innovation leader should do in order to act by the directive.

3. TOOLS' IMPLEMENTATION

The aforementioned items have a far-reaching scope through an online website. The initiative "Strategic Advises and Resources for the Growth of Firms: Micro, Small and Medium Enterprises" (CRECE-MIPYME) aims to enhance the effectiveness of firms with the insight of growth by offering free and interactive academic content. It is remarkable to mention that self-directed learning is crucial for the innovation leaders to take full advantage of these aids. The results from the Diagnostic Tool for SMEs' Innovation Capabilities are to be collected through this electronic service, still under construction, and ought to be useful in the future construction of a formalized insight in innovation management for SMEs' growth.

As it has been depicted, the innovation leader is guided through the 3 steps of the procedure. The starting point is the completion of the Diagnostic Tool for SMEs' Innovation Capabilities in which it is required to provide a response for each of the statements in the sections of: Top Management Leadership and Commitment, Operational Excellence Insight, Internal Innovation Processes and Culture, and Customer Value Insight. Once completed, the overall state of the innovation capabilities of the firm is displayed, as well as the links to the necessary aids in the Innovation Toolbox. In Figures 4 and 5, it can be appreciated the way in which the Diagnostic Tool and the outcome are displayed on the CRECE-MIYME website.

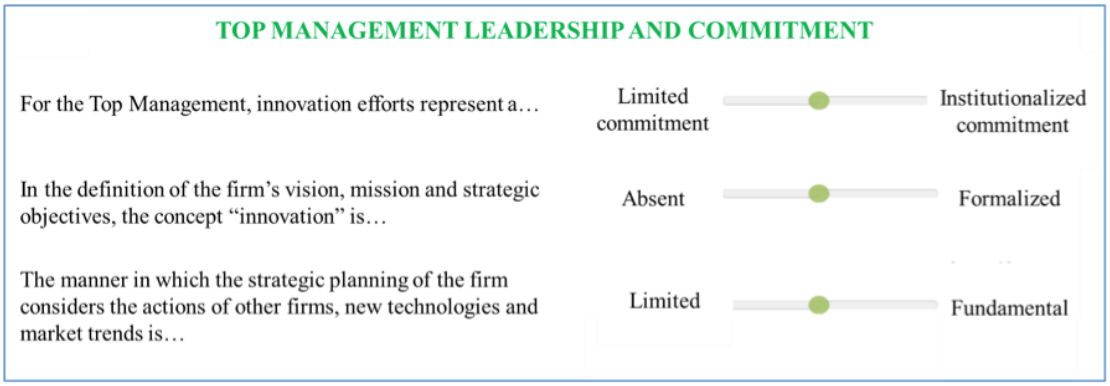

Figure 4. Segment of the "Top Management Leadership" section of the Diagnostic Tool.

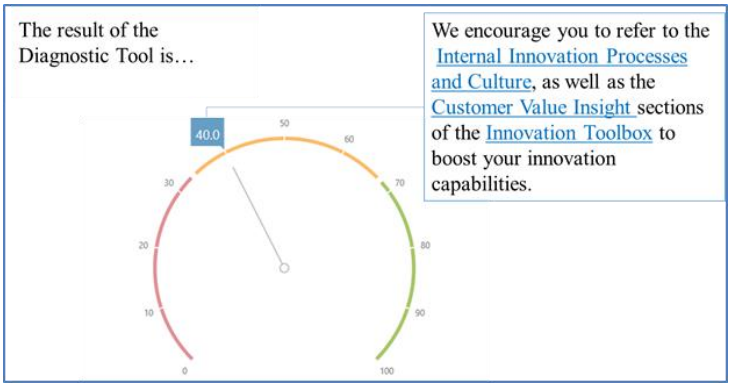

Figure 5. Example of the outcome of the Diagnostic Tool.

As the second step, the innovation leader can access the document containing the suggested tools and investigate more about their characteristics, required resources and implementation procedure in the critical information tables, also, the visual aids provide a clearer overview. As an example, Figure 8 depicts the visual aids suggested for the elaboration of a Business Model Canvas, which is a tool suggested for the Customer Value Insight section in the Innovation Toolbox.

As a final step, it is encouraged to assure the necessary resources and conditions indicated in the Verification Checklist for the Effective Implementation of Innovation Tools and Techniques, and to carefully read the Guide to Leading Creative Teams to prepare for the implementation of the tools that imply participative processes. In Figures 6 and 7, a segment of both parts of the Guide to Promoting Innovation Efforts are shown.

Leadership style

- ☐ I promote ideas exchange and developments sharing between my colleagues.
- ☐ My colleagues are allowed to evaluate my own work and thinking style.
- ☐ I consider my colleagues' thinking style when communicating with them.
- ☐ I've discussed the way in which my colleagues are used to solve problems.
- ☐ When differences in opinion exist between colleagues, it is my initiative to identify the causes of such disagreements.

Figure 6. A segment of the "Leadership Style" section of the verification Checklist.

Guide to Leading Creative Teams

The following table explains the main directives and suggestions of how to behave when a sign of failure in the implementation of the Innovation Toolbox is detected.

Directive	Sign of failure	Suggestions
Focus on results	The participants ignore the objective of the participative session.	• Communicate the objective of the session. • Establish the interaction and etiquette rules. • Explain the activities' sequence. • In case of having modified the work schedule, clarify your motives for doing so.

Figure 7. A segment of the Guide to Leading Creative Teams.

4. CONCLUSIONS

In furtherance of the achievement of competitive advantages, SMEs ought to enhance their organizational capabilities for innovation in the myriad of a complex and dynamic business environment. The proposed tools aim to diagnose and enhance the firm's innovation capabilities. On one hand, the proposed Diagnostic Tool for SMEs' Innovation Capabilities facilitates the identification of the degree in which the firm is able to get the most benefit out of its innovation efforts. The Enhancing Tools, on the other hand, enable the firm to implement the tools and techniques that requires to seize the opportunity areas that the Diagnostic Tool emboldened. In the deployment of these tools, it is highly required for the innovation leaders to adopt a discipline scope, and an encouraging and persuasive personality. This self-directed learning approach is vital to the firm's capability to overcome the continuous challenges of innovation deployment. Additionally, the results from the implementation of these tools that are to be collected from the once completed CRECE-MIPYME website ought to be useful in the future construction of a formalized insight in innovation management for SMEs' growth.

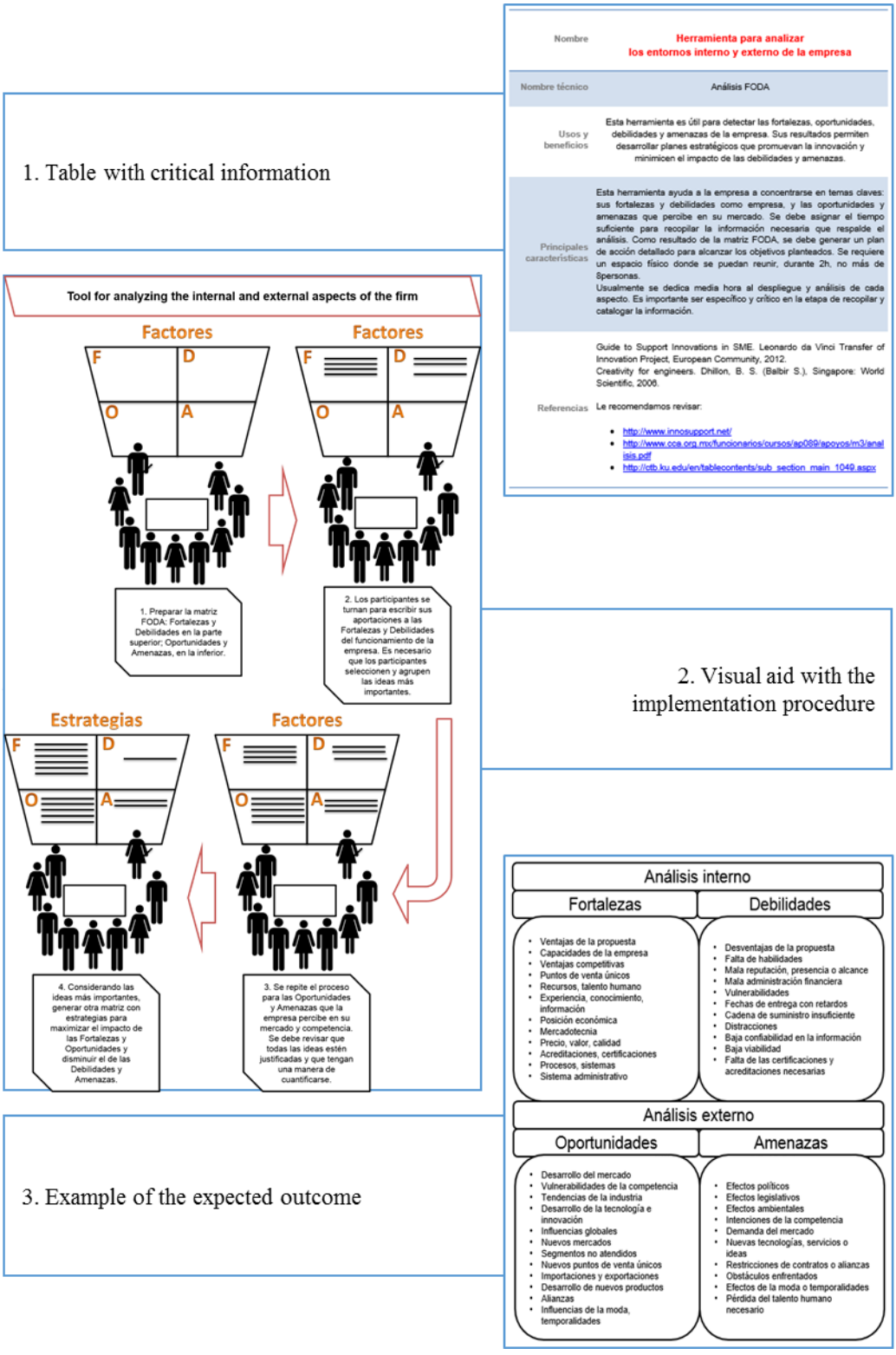

Figure 8. Segments of the Tool for Analyzing the Firm's Internal and External Business Issues, one of the tools suggested for the Top Management and Leadership section, as displayed on the CRECE-MIPYME website in Spanish, its original language.

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