

# **TOWARD A DIAGNOSIS OF VIABILITY OF SMALL MANUFACTURING ENTERPRISES. CASE: METAL MECHANIC INDUSTRY**

**Marcos Salinas-Reyes, Isafías Badillo-Piña, Ricardo Tejeida-Padilla**

marsalmx@yahoo.com, ibadillo@ipn.mx, rtejeidap@ipn.mx

Instituto Politécnico Nacional, México.

Grupo de Investigación en Sistémica y Turismo GIST

## **ABSTRACT**

The purpose of this research is to determine, from the point of view of Systems Science, the weak organizational viability of Small Manufacturing Enterprises (SMEs) in order to advice how to raise its organizational and functional structure to face market complexity , for example attenuating the factors which affect the operation to early close enterprise . To achieve this end it were identified and ranked the most frequent factors that cause early closure of SMEs, these data were analyzed conceptually based on the Model of Viable Systems, defining a total of 30 (thirty) elements that, empirically, provide the benchmarks for diagnosing and redesigning the organizational and functional operation of an SME in order to viable organization, that is, not only to maintain its existence but to transcend the variety of market.

Keywords: Viability, SMEs, Viable System Model, Variety.

## **INTRODUCTION**

The small and medium enterprises (SMEs) have a considerable economic importance to the countries. They contribute in, the case of Mexico, with a significant percentage of the GDP (37.5%) and with a high rate of employment (6 of every 10). However, this group of companies is one of the most vulnerable since they mostly lack a robust organizational structure and a lack of functional clarity that allows them to cope with the variety of challenges imposed by the market and the implications that this entails, bringing with it the closing early of them becoming part of "mortality" business statistics.

In several documents it is informed that de closure of this kind of small enterprise, is due to the lack of organizational structure and to the lack of the quality of decisions about its internal processes.

In Mexico, despite the actions taken by public and private sectors, many entrepreneurs have failed to maintain the SME market, which is a clear indicator that in the approach to study feasibility to entrepreneurship, actions should be generated from within the company, whereas since then the outdoor stage technically in general is similar for all entrepreneurs and/or managers of an PYME.

To that end, it is adopted a tool called Viable System Model (VSM) developed by S. Beer (1985, 1979), existing in the theoretical heritage of systems science, which establishes the minimum conditions necessary for an organization to be functionally viable. This model will be the basis for structuring a guide that allows to know, identify and implement

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corrective actions in the beginning and in a second stage to take preventive and proactive actions in a phase of continuous improvement.

### DIAGNOSIS OF SITUATION OF SME's IN MEXICO

In Mexico, in 2014 were 5,664,515 economic units of the which 95.4% (5,402,412) were micro enterprises, 3.6% small businesses (206,482), 0.8% (45,291) medium-sized companies and 0.2% are large enterprises (INEGI, 2014), however while there is an increase in business creation (6.2% of growth) compared to previous economic censuses, very few that remain on the market and those that survive have an average life expectancy of 7.7 years. The above, due to a combination of factors, predominantly the lack of capacity in general management and the absence of a viable functional organization.

It is estimated that 75% of new businesses close within two years of operations and only 10% mature at age 10. In view of those affected this failure attributed to external factors (bureaucracies, lack of financing, barriers in the markets, among others.), in contrast other failures are attributed to internal causes of the organization (lack of a realistic business plan, capacity of entrepreneurs/managers, efficient management of resources, among others.).

The study of the context of the organization has been established a number of factors considered that his absence are building the conditions for the failure of many SMEs. Those factors are summarized in table 1.

**Table 1. Factors and common causes the failure of SMEs in Mexico (compilation)**

No.	FACTOR	CAUSE
1	Finance	Limited credit as high financial risk because of the high rate of closing early.
2	Organization	Lack of a business identity
3	Administration / Management	Lack of a functional definition.
4	Innovation	Stagnation in products and processes
5	Technology	Inability to address the reason for technological change to their processes and products.

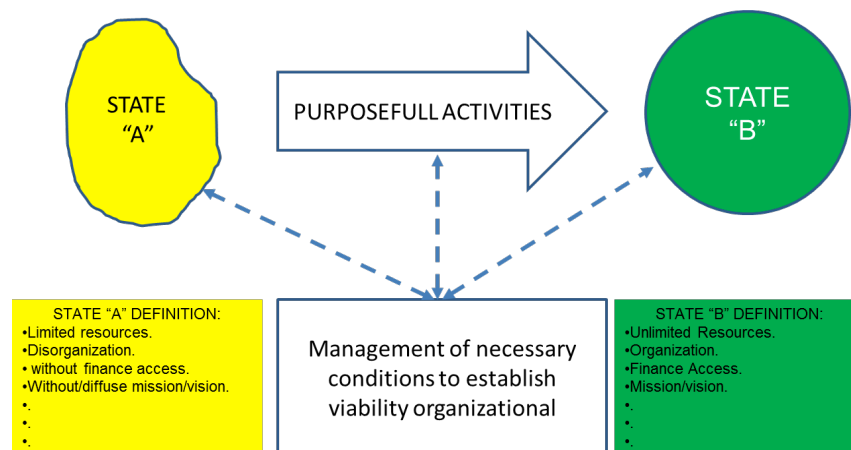
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Factors mentioned above are the lack of capacity of the SME to counter act complexity of their environment (external factors).

As the company takes actions to counteract the from complexity of the environment, this is generating functions and activities inside of it, which are often not well managed, causing chaos and lack of control that affect and/or generate reactions in chain not only inside but abroad increasing the effects for both environments. In accordance with the principles of Cybernetics, this situation becomes cyclical, causing the overflow of the weaker subsystems until collapsing the rest of subsystems.

The complexity of the environment always is present for SMEs in activity, and is latent in the case of new business ideas, whose action starts once the business idea is materialized, in which case complexity begins to flow in response from the newly created organization demand (Beer, 1985,1979).

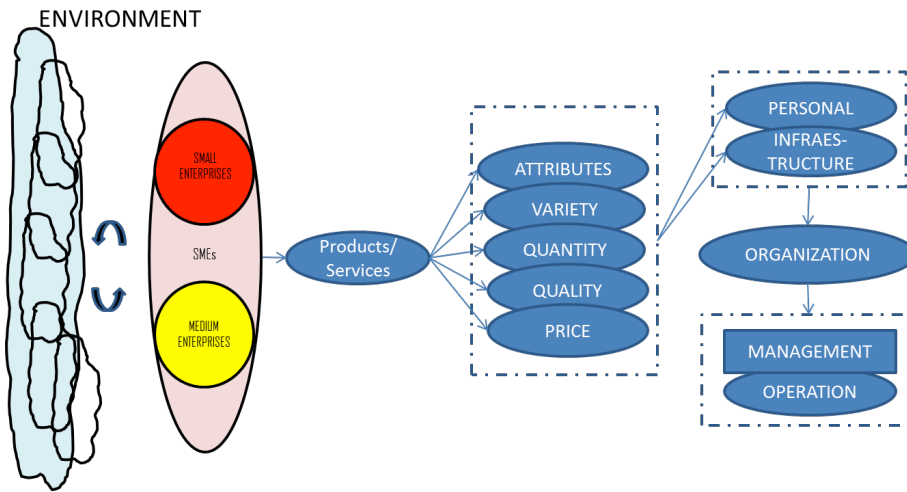
To the extent that the SME operate, limiting and absorbing from complexity of its environment, this will achieve balance and keep homeostasis that will begin to grow the ability to move from state "A" to state to State "B", as a result of an 'A' status enhanced by the actions of the applications engineering of variety.



**Figure 1. Transition of Organization to obtain viability**

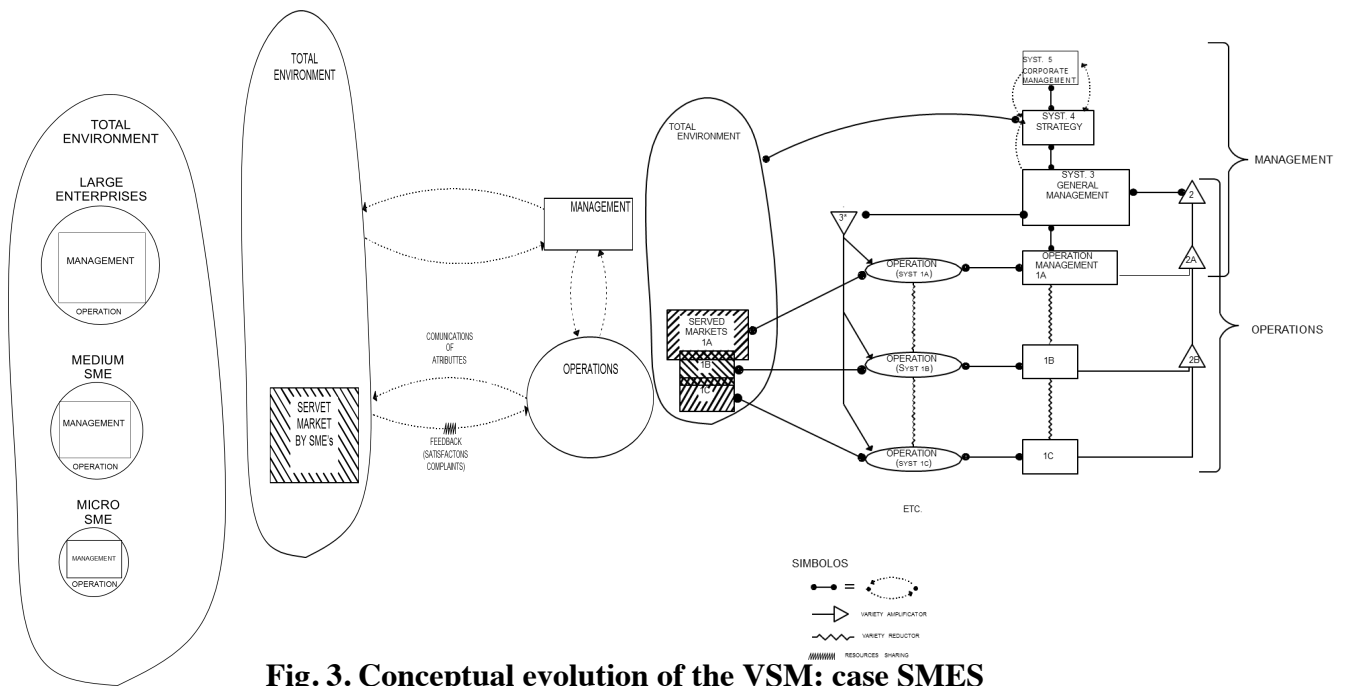
To study an organization, firstly it is required to know its main components to identify the components on which the organization is based. For such purpose it has conceptually integrated an SME (Figure 2).

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**Figure 2. Breakdown of the functionality of the organization.**

From Figure 2, we see that the complexity of the SMEs is based on attributes, variety, quantity, quality and price of the goods/services offered, which in turn implies a certain staff and infrastructure to produce them and supply them to the satisfaction of the customers.



**Fig. 3. Conceptual evolution of the VSM: case SMES**

**Source: Based on Perez (2008).**

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For the determination of the parameters that must comply with the SMEs to be viable, have selected the VSM (Beer, 1979) Figure 3. Decision of the choice of use of the VSM is due to the fact that as systems thinking tool, that establishes generally the necessary minimum systemic functionality that organizations should have to remain in the market, and to survive beyond 3 years of operations. The future survey will take place framing the main factors of failure in the SME's and identifying the specific management function correlation function which should mitigate each failure factor.

Considering that the factors of failure have interaction in both internal and external environments, these were classified according to the environment in which they have greater weighting or representation.

**Table 2. Classification of common factors of failure according to the environment in which they are presented**

No	External Environment	Internal Environment
1	Finance	Organizational
2	Technology	Administration/Management
3	Innovation	

The optimal organizational factor is resolved bounded from variety of the external environment (what is required to meet or satisfy the environment) and countering it with a vertical breakdown of the Organization (Beer, 1985), should be noted the existence of components of the external environment that only require attention at a moment, as in the case of compliance with certain regulations, this in order to not create a permanent idle new department (table 3).

**Table 3.- Recursive levels to structure the Organization vertically.**

No.	Environment	Vertical Levels		
1	Market	National	Costumers	Product
2	Innovation	Product	News	Improved
3	Process	Area	specialty	outsourcing

About this vertical breakdown of organizations, it is noticed that once companies decide to deal with one or several aspects from the variety of environment, functions and activities of the organization, increase often erroneously and SME's increase of staff with their corresponding organizational structure.

Framing the generic activity at the VSM, shows that when dimensioning of absorption of variety, many from the environment subsystems can be considered constants temporally and spatially, since although they are regulatory aspects and form, which require attention to the company these sub-systems become aspects to comply and only vary in a given space, and for a moment in time to return to the temporal and spatial stability. Such subsystems corresponding to the aspects that have to do with the legal Constitution of the company and its obligations to the regulatory framework (fiscal, legal, environmental, social, etc.).

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Attention to the environment of the market served is that generates a greater variety for the company, since in order to achieve the greatest possible success, it sued the organization components of financial innovation and technological activities.

Once determined the components with greater relevance, it is considered that taking action on the environment of the served market may have greater incidence in the viability and competitiveness of the organization, it follow to detect the relevant elements that must act immediately to have a greater absorption of the variety of the environment.

It is observed that variety from the market can be attenuated by the SME, based on the attributes of the product/service offered. Among largest are degrees of goodness of the attributes of a product/service specific, the greater the demand for it, which will generate infrastructure requirements to capture the corresponding increase of participation in the market.

The infrastructure required to absorb the variety of the market is going to make more complex the organization. Therefore, this requirement of infrastructure must be priority checked.

In the case of requirements of the operational units it should be deemed in the integrative analysis option absorb, variety requirements with technology for the systematization, avoiding subjectivity and human error directly in operations.

**Table 4. Correlation of the causes of failure with its corresponding position in five subsystems of the SMV**

	Environment	Factor	Accountable Subsystem				
			1	2	3	4	5
1	Finance	Finance					
2	Laws and standards	Administration/Management					
3	Market	Innovation					
4	Social, Sustainability	Administration/Management					
5	Polices	Administration/Management					
6	Technological	Technological					
Black=accountability			Clare=coaccountability				

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### DETERMINATION OF SUBSYSTEMS OF ORGANIZATIONAL VIABILITY IN SME's

An integrative analysis of SMEs framed in the VSM, was performed and it served in the determination of the elements which meet the minimum necessary to maintain the viable functionality of the subsystem.

The resulting determinants consist of five elements grouped in sections that correspond to each one of the systems of the VSM (table 4), correlated among themselves, and thereby be able to establish the relevant actions in an urgent time pay attention to the most pressing elements, and gradually attend the rest of the elements in descending order. It is worth mentioning, that attention to one of the elements will affect the rest of the systems due to cyber interactions resulting from the structure of the VSM.

**Table 5. Subsystems of components determinants of viability**

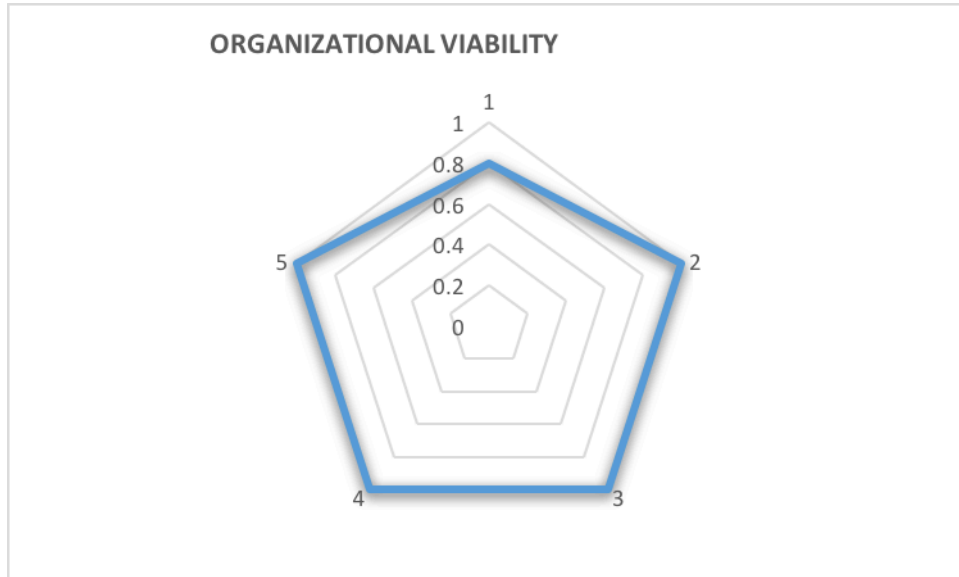
System 1: Operation	System 2: Coordination
1.1 Production schedule	2.1. Conflict solutions
1.2 Critical Path of production	2.2. Materials availability
1.3 Manufacturing manual	2.3. Human Relations
1.4 measurement instruments	2.4. Resources coordination
1.5 Technical interviews	2.5. Conflict statistics
System 3: Operations managements	Systems 3*: Auditing and Monitoring
3.1. Production goals	3*.1 TQM
3.2. Resources assignation	3*.2 Statistical Process Control
3.3. Sustainability and quality standards	3*.3 Costumer Claims
3.4. Materials and process requirements planning	3*.4 Delivery on time
3.5. Communications programs	3*.5 Documentation
System 4: Strategic Management	System 5: CEO and Staff
4.1. Competitors	5.1. Mission
4.2. Emergent markets	5.2. Vision
4.3. Changes industry	5.3. Policies
4.4. Updated information of industry	5.4 Efective comunicaton
4.5 Knowledge of new technologies	5.5. Bussines Plan

**Source: Based on Kim *et al.*, (2008) and Strnad (2012)**

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### Pilot application

To validate and illustrate the use of the resulting determinants of viability, a diagnostic instrument (25 items) was applied to a SME with 21 years of existence in the market, dedicated to the manufacture and marketing of spray paints, with current standard organizations (illustration 1) :



**Figure 4. Results of pilot application**

## CONCLUSIONS

1. The outcome of the diagnosticated prototype show that the studied SME has limited organizational viability by a certain time (7.6 years national medium) since it lacks technical visits to customers, however if this aspect is accordingly taken care of throughout his career, will bring improvements to the product and/or service offering and even radical innovations that will make move or expand its customer base. It is very likely that this time of viability to continue for as long, since in an interview with the director of the company it been detected that this function is done indirectly by this.
2. The obtained parameters correlate with respect to the factors of failure assumptions of the pilot application to the SME, however it is considered that these empirical parameters should be validated in the industry sector
3. The detected "pathologies" in the operations of System 1, give evidence for decision-making with respect to corrective, preventive and proactive actions.



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