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THE VIABLE SYSTEMS MODEL: A LITERATURE REVIEW

Mario Aguilar Fernández[1]*, Julián Patiño Ortiz[2], Brenda García Jarquín[3]
Paola Fortanell Estrada[4], Jesus A. Álvarez Cedillo[5]

[1] Professor MSc., Instituto Politécnico Nacional-UPIICSA-SEPI, maguilarf@yahoo.com, México.
[2] Professor PhD., Instituto Politécnico Nacional-ESIMEZ-SEPI, jpatinoo@ipn.mx, México.
[3] Professor PhD., Instituto Politécnico Nacional-ESIMEZ-SEPI, jarquin_garcia@yahoo.com, México.
[4] Professor MSc., CET1-Instituto Politécnico Nacional, pfortanell@ipn.mx, México.
[5] Professor PhD., Instituto Politécnico Nacional-UPIICSA-SEPI, jesusantonioa@gmail.com, México.

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***Abstract**: Adapting to changes in the environment has been one of the main objectives of organizations in recent decades. Systems theory becomes the main focus to achieve this, as it provides the necessary models, methodologies, and meta-methodologies. The Viable Systems Model (VSM), also called the "science of effective organization," is a tool that aims to govern complex systems. This article aims to explore the different applications of VSM based on a literature review. The method is qualitative, with an exploratory scope. Fifty-two articles were retrieved, which were classified, about theoretical contributions, applications, and multimethodological approaches.*

Keywords- Literature review, viable systems model, organizational cybernetics*.*

I. INTRODUCTION

While Walter and Ashby were dealing with models of machines and the human brain, Stafford Beer (1926-2002), a systems theorist, in the early 1970s, in a set of books, proposed the Systems Model Viables (VSM) as part of the *"management cybernetics*." However, to describe how organizations manage to adapt, continuously, to dynamic contexts, based on the principles of Ashby [1]: *"negative feedback control," "Black box technique,"* and *"law of requisite variety."* The VSM proposes recursive structures. Recursion refers to structural patterns, which are fully repeated at different levels of the organization. The basic principles of VSM are recursion, autonomy, cohesion, and viability [2].

In order to challenge traditional management models, which he found inadequate to address the many complex and confusing situations that leaders face, Beer [3] proposes organizational cybernetics, defining it as the "science of effective organization," specifying the criteria that any company must meet to be viable.

II. METHOD

A formal literature review is carried out, based on the methods of Hart [4] and Jesson *et al.* [5], and the Walker criteria [6]. In English, the search for scientific documents is carried out from 1980 to 2021 in the database *Web of Science*. Particular attention is paid to the articles published with the most significant relationship on viable systems model (*VSM*). A brief description of each of them was made.

The quality of the information on the subject fulfills the attribute of validity [7]. The critical compound words and phrases are *viable system models*, *countries*, and *Mexico*.

III. RESULTS

In the *Web of Science Core Collection* [8], the publications on the subject of VSM have not been numerous. Since then, worldwide, until the first week of May 2021, 106 results appear Fig. 1, with the title (*viable system model*), where 88 are research articles in areas such as management, computer science, and cybernetics, operations research, and interdisciplinary social sciences. The journals with the highest number of publications are *Kybernetes, Systemic Practice and Action Research, System Research, and Behavioral Science.* The countries in which it is published the most are England, the USA, Iran, and Spain, in the institutions: *the University of Hull* and *Iran University Science Technology.* The English language prevails with 101 references (Spanish is absent, with only 4). It is important to note that in the Chinese language, only one article appears.

The findings are described below. With the search profile *(viable system model)*, in the title, 106 studies were found, in which theoretical and practical studies of the VSM are proposed. With the profile *(workable model system)* and *(countries)* is registered two articles. Another key profile is *(viable system model)* and *(Mexico)*, not yielding results. That is, evidence on the use of the viable systems model in Mexico is not located. In total, 52 documents were recovered.

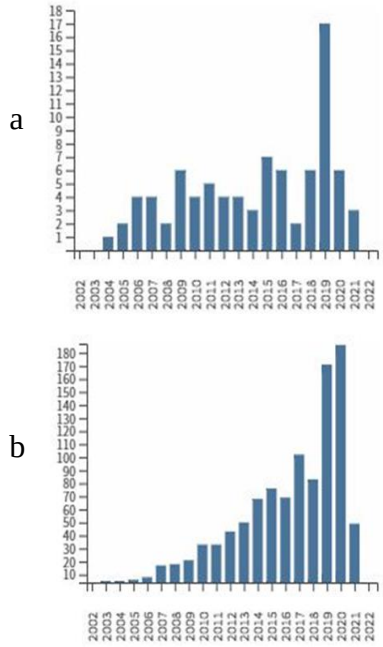

Fig. 1 Figure a shows the total number of publications per year, and b, the total number of citations per year [8].

A first group describes theoretical contributions [9], [10]. A second group describes the applications in: family businesses [11], different diagnoses [12], processes [13], [14], information systems [15], sustainability [16], [17], [18], natural disasters [19], business performance [20], forecast [21], projects of all kinds [22], [2. 3], [24], [25], capacity and production management [26], higher education [27], cooperativism [28], national innovation systems [29], governance [30], laws [31], in countries like Brazil [32] , Ireland [33], Iran [34], as well as banking systems [35]. And a third group, which integrates the multi-methodologies approach (with the VSM), are for example: the theory of constraints (TOC) [36], the methodology of soft systems (SSM) [37], [38], [39], multi-criteria decisions (MCDA) [40], artificial neural networks (ANN) [41], internet and intranet [42], system dynamics (SD) [41], [43], [44], VIPLAN method [45], [39], strategic planning [46], [47], simulation of complex systems [48], [49], *Team Syntegrity* [50], Research-Action [51], Social Network Analysis (SNA) [52], all kinds of qualitative research methods [53], [54] and quantitative [55], knowledge management (KM) [56], [57], [58], *Smart Business Networks* [59], and design theories [60].

IV. CONCLUSIONS

A considerable amount of articles on VSM was found. With the previous results, using the *Web of Science*s the central database, the evidence raised by the search results suggests that the studies for Mexico, on proposals or the design of a viable model, present a vital scarcity, thus opening opportunities for further investigation. It is possible to mention that the VSM uses different methodologies. That is, the VSM integrates multi-methodologies (pre-systemic and systemic) in its application.

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