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A Multi-Methodological Approach to Complex Problem Solving: The Case of Serbian Enterprise

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Abstract: Increasing complexity and diversity of management problems in modern enterprises requires the increasing diversity of models, methods, and methodologies. In creatively dealing with these complex, changeable and multidimensional management problems, i.e., problem situations, different systems methodologies for problem situations, structuring have been developed. Since no methodology is able to explore all aspects of the complex problems in enterprises, the topic of this paper is a multi-methodology approach that implies combining selected systems methodologies (Strategic Assumptions Surfacing and Testing, Team Syntegrity and Organizational Cybernetics) within a particular intervention. Therefore, research in the paper is relied on Critical Systems Thinking as a conceptual framework for combined use of systems methodologies. The paper aims to demonstrate how mixing the selected systems methodologies and tools can help managers in solving complex problems, such as the issues of strategy formulation and implementation in enterprises. Accordingly, combining these methodologies to support strategy formulation and implementation is applied to a Serbian enterprise.

Keywords: complex problem solving; multi-methodology; strategic assumptions surfacing and testing; team syntegrity; organizational cybernetics

1. Introduction

A multi-methodological approach to complex problem solving or combined use of systems methodologies represents a relevant research area within contemporary Systems Science and Management Science, emerged as a methodological response to an increasing complexity, heterogeneity and dynamism of problems, i.e., problem situations that managers must tackle in contemporary circumstances. Based on Critical Systems Thinking [1–3], a multi-methodological approach to problem solving tries to support creative dealing with the management problem situations and to facilitate the use of different methodologies in combination. According to Jackson [4], there are numerous reasons for a wide use of multi-methodological approaches to problem solving in contemporary Management Science. Firstly, the old, traditional approaches to problem solving and systems thinking have come under strong criticism, i.e., awareness of the strengths and weaknesses of individual systems approaches grows. Another important support for combined use of systems methodologies is the “prevailing fashion for relativism” [5] (p. 365). It is against totalizing discourses that claim that only they know the truth about things. In addition, from the practitioners’ points of view, it seems that a multi-methodological approach to problem solving is needed in contemporary organizations [6].

The paper deals with a multi-methodological approach to complex problem solving, i.e., with combined use of selected systems methodologies, such as Strategic Assumptions surfacing and Testing (SAST) [7], Team Syntegrity (TS) [8] and Organizational Cybernetics (OC) [9–11], in managing particular problem situations—business strategy formulation and implementation. The aim of the

paper is to highlight the ways in which combined use of these systems methodologies can help managers in dealing with complex issues of formulating and implementing business strategy. The key research hypothesis is as follows. Methodologically appropriate combined use of selected systems methodologies for problem situations structuring enables creative improvement of managing the problem situation of business strategy formulation and implementation.

Respecting the above mentioned, the paper is structured in the following way. Firstly, the conceptual framework for combining systems methodologies is introduced. Then, systems methodologies are selected and applied in order to deal with complex issues of strategy formulation and implementation. Application of these methodologies in a Serbian enterprise was conducted along with the use of an appropriately structured interview and questionnaire. In fact, empirical research results were the basis for application of selected systems methodologies in enterprise A. The results were discussed and the key conclusions were drawn. In this way, by combining selected systems methodologies, the weaknesses of their individual use can be overcome. Despite this, some barriers for combined use of systems methodologies must be taken into consideration. Thus, the key limitations and future research guidelines are presented.

2. Materials and Methods

2.1. A Conceptual Framework for Combining the Systems Methodologies

The essence of multimethodology, i.e., combining the systems methodologies is to employ more than one methodology or parts of methodologies within single intervention [12]. This approach to solving complex problems is founded within Critical Systems Thinking. As a relevant paradigm in contemporary systems thinking, Critical Systems Thinking (CST) is suitable for the systems characterized by the different power of participants, conflicts, as well as coercion [5]. In this paper, CST is considered as an appropriate conceptual framework for combining the systems methodologies. CST is aimed to support holistic managing of the diversity of systems approaches, that is, to reveal the ways of appropriate combined use of diverse systems theories, methodologies, methods and models in order to respond to complexity, change and diversity of problem situations in contemporary organizations [3].

According to Jackson [1,13], CST is based on the following commitments: critical awareness, social awareness, dedication to human emancipation, complementarism at the level of methodology and complementarism at the theoretical level. In the given context, of relevant importance is critical awareness that is related to the fact that all systems methodologies have certain strengths and weaknesses, and that it is necessary to understand these and use each methodology in the particular circumstances most appropriate for it. Another result of critical awareness is that systems methodologies should be combined in order to address different aspects of the complex problem situations.

However, in Jackson's later contributions [3,14], following three pillars or commitments of CST have been distinguished: critical awareness, improvement and pluralism. In fact, the development of CST can be linked primarily to two related sources: "a growing critical awareness of the strengths and weaknesses of individual systems approaches and an appreciation of the need for pluralism in systems thinking" [3] (p. 134). Therefore, one can conclude that development of CST is inseparable from the pluralism. In the broadest sense, pluralism can be understood as "a respect for different perceptions and interpretations of the management problems in organizations, as well as an appropriate combined use of various methodologies, methods, techniques and models in problem situations structuring and problem solving" [6] (p. 797).

In order for CST to realize its full potential, numerous issues should be considered at the level of methods, models and techniques, as well as at the level of methodology and meta-methodology. Some of these issues in combining the systems methodologies are further selected and briefed.

Therefore, the first issue that should be considered is whether more than one methodology is used or not. Consequently, Mingers [12] as well as Mingers and Brocklesby [15] distinguished following situations: the first situation is *methodological isolationism*, where only one methodology is used. *Paradigmatic isolationism* is a situation where several methodologies from the same paradigm are used, but not in the same intervention. Furthermore, complete methodologies from the same paradigm can be combined in the same intervention—for example, combining Organizational Cybernetics and System Dynamics—SD (e.g., [16]). In addition, the particular parts of the methodology may be combined with a complete methodology (for example, using the cognitive maps within Soft Systems Methodology—SSM). In addition, one can combine the parts of particular systems methodologies from the same paradigm (for example, combining the cognitive maps with root definitions and conceptual models of SSM) (e.g., [17]).

The situation is much more complex when methodologies from different paradigms are used in combination. In that case, there are the following possibilities: firstly, employment of systems methodologies within the System of Systems Methodologies [18] that implies using one systems methodology as a *dominant* and another methodology as a *supportive* or within Total Systems Intervention in which different methodologies may be used within the same intervention to deal with different aspects of the problem situation (e.g., [19]). Then, one complete systems methodology can be combined with the parts of another methodology (for example, using the Viable System Model or System Dynamics' causal loop diagrams within Soft Systems Methodology) (e.g., [20]). Finally, the most complex situation is the one in which the parts of methodologies from different paradigms are used together within particular problem situations—for example, cognitive maps with System Dynamics' models (e.g., [21]) or rich pictures, root definitions and conceptual models as the key methodological tools of SSM with System Dynamics' causal loop diagrams and stock and flow diagrams (e.g., [22]).

One of the key issues in combined use of systems methodologies is how one can choose an appropriate combination of methodologies in the particular intervention. Therefore, a relevant framework for mapping methodologies is developed in order to deal with different perspectives of the problem situation and to identify methodologies that can be used in that situation [23,24]. The framework for mapping methodologies is characterized by multidimensionality of the problem situation, i.e., by three different aspects or 'worlds'—social, personal and material, as well as by different phases of intervention—appreciation, analysis, assessment and action. This framework can help to identify the strengths of particular systems methodologies that are the basis for their mixing.

Decomposing methodologies is also a very important issue in the combined use of systems methodologies. It is based on the idea that some techniques or methods can be detached from one methodology and used in another. Linking the parts of particular methodologies requires that "methodologies be decomposed in some systematic ways to identify detachable elements and their functions or purposes" [23] (p. 434).

However, when we combine methodologies from different paradigms, we deal with certain philosophical, cultural, cognitive and practical limitations [25]. In this paper, paradigm incommensurability as the main philosophical limitation is an especially important barrier, since the paper deals with combined use of three methodologies that belong to different paradigms—emancipatory, interpretive and functionalist. Paradigm incommensurability figuratively could be presented in the following way: "groups of scientists relying on different paradigms see different things when they look from the same point in the same direction" [6] (p. 149). Hence, it can be concluded that paradigms are self-sufficient, internally referential and mutually exclusive [26]. On the other side, Mingers [27] makes several arguments against a strong view of paradigm incommensurability, such as:

- Although some key features of paradigms are exclusive, there are so-called transition zones in which different paradigms can be linked.

- It is not necessary to accept that certain methodology wholly belongs to only one paradigm, but it is possible to disconnect a particular method or methodology from its normal paradigm and “use it consciously and critically” within another.
- Furthermore, it is not possible to completely separate objective and subjective aspects of problem situations.
- Finally, different paradigms enable different perspectives or insights into reality that are more complex than individual systems approaches can capture. Accordingly, it is wrong to wholly accept the postulates of any one paradigm.

In the given context, systems methodologies stemming from different paradigms are selected in order to deal with complex problems, such as strategy formulation and implementation in enterprises. These are Strategic Assumptions Surfacing and Testing (SAST), Team Syntegrity (TS) and Organizational Cybernetics (OC).

2.2. Selected Systems Methodologies in Brief

2.2.1. SAST

SAST represents a relevant interpretive systems methodology that is suitable for pluralist problem situations in which the focus is on political and cultural aspects of organization. Therefore, SAST ignores the structure and functioning of the organization, i.e., the problems arising from the complexity of researched areas.

Theoretical core of SAST is a dialectical approach to objectivity that implies that some dominant world view (thesis) should be challenged by another world view (antithesis). This is based on totally different assumptions in order to accomplish more objective appreciation of the situation (synthesis). It also expresses the elements of both thesis and antithesis, but going beyond them as well [14].

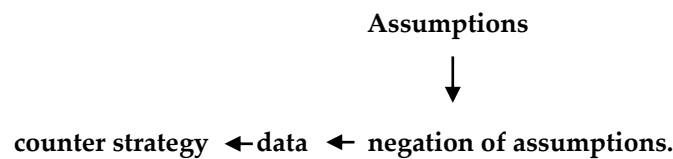
This approach to objectivity corresponds with the principle of participation, opposition and integration [7]. In fact, this methodology strives to include different levels and groups of an organization, as well as other relevant stakeholders, into the process of managing the problem situations in enterprises. The viewpoints and perceptions of stakeholders are mutually opposed, but they should be appropriately related, i.e., their synthesis should be provided.

SAST methodology is usually applied through the four following stages [7,14]: forming the groups, assumptions surfacing, dialectical debate and synthesis. Groups are formed, taking into account both minimizing the differences or conflicts within the group, and maximizing the diversity of perspectives between the groups [7,28]. No matter how trivial this step seemed, it is essential to create meaningful unification and team spirit. Groups can also provide instructions on how to identify key topics or issues that they consider relevant to a particular strategy.

The identified groups of stakeholders should help to highlight the following questions: what are the assumptions about stakeholders on the basis of which one formulates certain strategy? Accordingly, the next stage is specifying the assumptions in which each group generates a list of assumptions upon which the certain strategy is based. The process can be represented as follows [29] (p. 4):

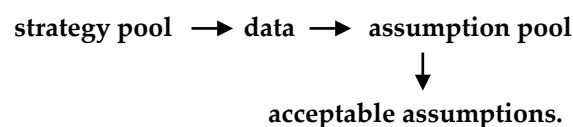
strategy → data → assumptions.

The dialectical debate is a key part of SAST methodology. The purpose of the dialectical debate is not to convince the other group in the undeniable truth of some positions, but rather to show the opposing sides that there are different perceptions of the situation investigated. The debate begins when a representative of each group presents the most important assumptions that support a particular strategy. After that, the discussion develops, which may be different [7]: in fact, the groups can identify the same set of stakeholders, but different assumptions that affect them; then, the groups can essentially share the same set of stakeholders and the same set of assumptions, but they can differently assess assumptions; in addition, different groups may have different stakeholders, and therefore different assumptions. The phase of debate includes the following set of activities [29] (p. 4):

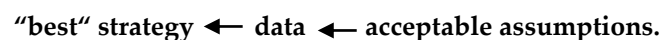


After dialectical debate, it is necessary to achieve a synthesis, i.e., a compromise between assumptions, and reach a new, synthesized set of assumptions that connects existing assumptions and at the same time is beyond them. It is essential that each group understands the assumptions of the other group and the reasons why they are critical to the success of a strategy. Namely, it is not required for the groups to accept alternative assumptions, but to try to understand them.

After the presentation of the key assumptions, the groups are asked to identify those assumptions of other groups that most likely are threatening their strategy. Then, modifications of assumptions are required, i.e., groups need to mitigate their assumptions to the point in which if they are further modified, they will no longer support certain strategy. In this way, by continuous review and modification of the assumptions of different groups, one can come to a compromise zone. If such compromise is not possible or desirable, then the participants will at least achieve a better understanding of the situation. Furthermore, if synthesis is not achieved, it is necessary to identify the points of disagreement and discuss possible ways to correct them. Thus, once the stage of dialectical debate is completed, methodology reaches the point in which maximum diversity is obtained. It can be summarized as follows [29] (p. 4):



In the phase of integration of assumptions, variety of options is consolidated and defines the so-called composite strategy. The process can be represented as follows [29] (p. 4):



2.2.2. Team Syntegrity

TS is an appropriate emancipatory systems methodology for supporting group decision-making. It is based on the geometric structure of the icosahedron, which provides guidelines for organizing discussions and creates effective dialogue. The icosahedron has 20 triangular sides described by 30 edges. It has 12 vertices each connecting 5 edges [14]. The key purpose of TS application is to improve the effectiveness of the decisions through: generating a high level of participation among individuals concerned with the problem; providing non-hierarchical structures and communication systems; using the diversity and wealth of knowledge available to each member of the group, as well as the knowledge generated by their mutual interactions; creating a collective awareness and consensus on the central issue under consideration [30,31].

In fact, analogous to geometrical structure of icosahedron, as an example of a structure that represents non-hierarchical arrangement, Beer [8] developed an appropriate model of organization. With this model, an organization can express its integrity, by formulating common, coherent arguments about the issue, or topic that is under consideration, despite discussions and tensions, i.e., conflicts that arise at the same time.

Implementation of TS is usually done through following stages: opening session, generation of agenda, topic auction, outcome resolve, and closing session. Implementation of TS begins with an opening session. In this session, agreement has to be reached on the initial issue or on the general topic of discussion. On this basis, participants that have a different perspective on the initial issue are

selected (for example: representatives of the different functional areas of the enterprise, representatives of different regions, ethnic groups, ages, gender and status groups).

The next phase of TS is generation of the agenda. Agenda is concerned with identification of twelve topics that will be discussed. This will help in dealing with the initial issue because they represent certain aspects or dimensions of the initial issue or problem [32]. During the phase of topic auction, participants are allocated into different groups according to their preferences. Individuals are asked to rank the topics, and with a help of algorithm that is often used, the highest level of satisfaction is ensured. This is all done with respect for the limitations that are imposed by the structure of icosahedron. Hence, there are twelve teams. Each team consists of 5 members and 5 critics, and every team develops a topic. Those thirty individuals play two roles: as participants in two groups-defined by the edges of polyhedron, and as critics in two groups defined by the edge on the opposite side of icosahedron [14].

The groups of participants that are taking place in a discussion about any subtopic are called teams. Five discussants in each group tend to work up their thinking on the topic into an insightful 'Final Statement of Importance' (FSI) [14]. However, in addition to these roles, each individual will participate in a discussion on two sub-topics in the role of critic. A critic is a person who helps the team members to become aware of those issues that are not discussed adequately, and thus helps to enrich the discussion. Critics should behave as the devil's advocates by challenging each achieved agreement in the group, questioning the assumptions underlying any consent. Similarly, each participant will attend the discussion of the other two sub-topics, but only as an observer. Team members need certain logistical support provided by the organizers. Part of this support are 'facilitator' whose role is that all participants and critics have equal opportunities to participate, and to summarize the conclusions obtained through the discussion, but not to affect the content of this discussion [33]. At the closing session, as the last phase of TS implementation process, teams present their FSI that should receive general approval of all participants.

2.2.3. Organizational Cybernetics

As a representative of the functionalist systems paradigm, OC is through Viable System Model (VSM) as its key methodological tool, focused on diagnosing the problems in structure and functioning of an enterprise. The theoretical foundation of OC is related to the Law of Requisite Variety and principle of recursion.

The Law of Requisite Variety generally reads as follows: "Only variety can destroy variety" [34]. This means that the variety of high-variety systems should be decreased and the variety of the low-variety system should be increased. This process is called variety engineering. According to this process, organizations should deal only with the part of the environment causing the threats that the organization must react to in order to survive. This is about the so-called residual variety of environment [35,36]. It can also be applied to the organization and its management, where residual variety of the organization is relevant, i.e., the variety that is not absorbed by the process of self-organization and self-regulation.

The principle of recursion implies hierarchical arrangement of the system. This means that the system is comprised of a set of subsystems that are characterised by their own organization and regulation. At the same time, each subsystem is comprised of its own subsystem, and so on, to the lowest levels [9].

VSM is originally developed by Stafford Beer [9–11] and contains the following five subsystems [37,38]:

- subsystem S_1 , or the function of implementation, is represented by operational elements facing directly with external environment;
- subsystem S_2 —function of coordination, enables harmonious functioning of operational elements;

- subsystem S_3 —function of control that maintains and allocates resources to the operational elements, along with the segment S_3^* representing audit channels through which the monitoring of operational elements functioning is carried out;
- subsystem S_4 —function of intelligence that collects information about strategic opportunities, threats, as well as future directions of the system; and
- subsystem S_5 or function of identity, which defines the purpose of the system.

Employing VSM in organizational (re)design usually involves the following three relevant subprocesses [39,40]: system identification, system diagnosis and redesign (if it is necessary). Starting from the formulation of organizational purpose, identification proceeds with specifying the following recursive levels: system in focus, i.e., the system for achieving the purpose and the objectives resulting from the purpose—recursive level 1; suprasystem, i.e., the relevant environment of the system in focus—recursive level 0; operational elements of the system in focus, i.e., the subsystems of the system in focus—recursive level 2.

The subprocess of diagnosis is conducted through analysis of subsystems of VSM—the S_1 , S_2 , S_3 , S_4 and S_5 segments. Then, the analysis of all information channels, transmitters and control loops is done. In this process, the researched organization should be compared with VSM. This enables identification of problems in structure and functioning of the organization. When some problems are observed in the organization, redesign is carried out as a final subprocess in VSM using [39].

Respecting the presented theoretical and methodological features of selected systems methodologies, and relying on critical awareness, some of the key limitations of these systems methodologies present a basis for their combination. In fact, one of the key limitations of SAST is related to the fact that it is not able to provide a real democratic dialogue and, as such, it often supports the stakeholders that hold the power. Accordingly, TS, as an emancipatory systems approach, can be employed to enable effective dialogue and discussion among stakeholders about the most important assumptions on which some strategy is based. Nevertheless, neither SAST nor TS possess the tools to support efficient implementation of identified strategy. Thus, functionalist OC, i.e., its key methodological tool—VSM—can be applied as a support for efficient implementation of the strategy for which the stakeholders reached an agreement.

3. Applying the Selected Systems Methodologies in Strategy Formulation and Implementation

The process of formulating business strategies represents one of the most important activities of strategic management. However, there is often no awareness that any activity undertaken in the company is based on appropriate assumptions. Accordingly, in the process of business strategy formulation of adequate importance is to identify and assess the assumptions on which certain strategies are based. Respectively, as an appropriate support for the process of formulation and implementation of strategies, the recommended systems methodologies can be applied. Each of these systemic approaches focuses on the corresponding relevant aspect of the research problem situations, i.e., the system of interconnected problems. In this sense, one can first apply SAST methodology, which will provide the appropriate context and framework in which two other methodologies may be further applied. Namely, SAST methodology will ensure the identification of different ideas of relevant stakeholders on potential strategies, as well as the assumptions on which these ideas are based. In accordance with different interests, value systems, opinions, knowledge of relevant stakeholders, different, opposing groups of stakeholders can be identified. In order to apply SAST in the process of formulating business strategy of adequate importance is the fact that organizations realistically are beginning to learn when most of the accepted assumptions are challenged with corresponding opposite assumptions. Thereby, different strategies are developed that are based on alternative conceptions of the world and each with a different interpretation of the data provided. This way leads to different types of conflicts, and SAST can be understood as an appropriate methodology for conflict management in organizations.

Zlatanović [41] developed a framework for combining SAST and OC. Aiming to remove some limitations of combining SAST and OC, such as an inability to deal with coercion, in this paper, combining SAST and OC is supported by application of TS in the stages of debate and synthesis of SAST. Accordingly, the paper firstly introduces the possible application of SAST methodology in the process of formulation and implementation of strategy in selected enterprise A (In order to protect the identity, the researched enterprise is marked as enterprise A.), which sells spare parts for vehicles.

In order to obtain the opinions and views of employees in the enterprise A and other stakeholders about possible strategies in the global financial crisis that negatively affect the operations of the investigated enterprise, i.e., in collecting the relevant data, the appropriate research techniques, such as interview and questionnaire, were applied. Firstly, the interview was conducted with top management of enterprise A. The goal was to discover the main problems that this enterprise is dealing with, i.e., to formulate a problem situation, but also to identify the activities that top management have undertaken to solve these problems. The following findings were obtained [41]. It was found that the enterprise was faced with the problems such as: the loss of purchasing power, the financial problems of some customers (for example, a blocked account and the inability to settle obligations), lack of new liquid customers, as well as the inability to renew the vehicle park. As a result, sales and profitability decreased. Thus, one was able to observe the first symptoms of the crisis in the enterprise A, but its survival was not threatened. The interview also provided the findings on how to overcome identified problems, i.e., which strategy enterprise management decided to follow and which assumptions underpin this strategy. Actually, in the given situation, the enterprise management decided to enter a new business as a response to crisis. However, internal stakeholders primarily did not agree with such a determined strategy. In fact, there were conflicting perceptions of owners, top management, and other employees of the enterprise (for example, top management and middle management). We can conclude that it is a pluralist problem situation, and, thus, SAST methodology can be applied. In order to examine opposing point of views of relevant stakeholders, an appropriately structured questionnaire was distributed to employees of the enterprise A and to other relevant stakeholders. Data analysis was conducted using appropriate methods and techniques of statistical software package for social sciences SPSS 20.0 (IBM, New York City, NY, USA). In addition to the owners and employees of the enterprise A as the internal stakeholders, the survey also included the enterprises that represent their customers, suppliers, i.e., manufacturers and competition. Therefore, a certain number of these enterprises were included in the research and they are labeled as representatives of customers, suppliers, i.e., manufacturers and competition. Furthermore, the research included some representatives of financial institutions and local authorities (Table 1). The questionnaire included the questions referring to the assumptions on which the strategy for entering a new business is based, as well as the assumptions on which an alternative strategy can be underpinned (The questions, as relevant claims of assumptions underpinning the strategy, are presented in the Tables 3 and 4).

Table 1. Sample structure.

Stakeholders	Frequency	Percent (%)	Valid Percent (%)
Enterprise A (employees in enterprise A)	20	25.6	25.6
Representatives of financial institutions	4	5.1	5.1
Representatives of manufacturers	28	35.9	35.9
Representatives of competition	9	11.5	11.5
Representatives of customers	14	17.9	17.9
Representatives of local authorities	3	3.8	3.8
Total	78	100.0	100.0

Methods of descriptive statistical analysis and Hi square (χ^2) test were used in order to obtain the empirical research results. Based on empirical research results, different groups of stakeholders were singled out, and assumptions that underlie different, alternative strategies were identified, as

the initial stages of SAST methodology application. Therefore, the link between different types of stakeholders and their (dis)agreement with the proposed strategy for entering the new businesses was established, and, for this purpose, results of the Hi square (χ^2) test was used (Table 2) [41] (p. 28). In this way, one can distinguish the different groups of respondents (for example, the group *For*, the group *Against* and the group *For and Against* were singled out).

As mentioned above, the interview with the top management of the researched enterprise has provided the identification of key assumptions that support the proposed strategy for entering the new business, as well as an alternative strategy. Apart from this, through the questionnaire, the level of agreement of stakeholders with suggested assumptions was examined. In this regard, Tables 3 and 4 show the results of descriptive statistical analysis—mean and standard deviation.

Table 2. Results of Hi square (χ^2) test.

			(Dis)agreement with Proposed Strategy			Total
			Group 1	Group 2	Group 3	
Stakeholders	Enterprise A	Total %	16 80.0%	4 20.0%	0 0.0%	20 100.0%
	Representatives of financial institutions	Total %	0 0.0%	0 0.0%	4 100.0%	4 100.0%
	Representatives of manufacturers	Total %	14 51.9%	1 3.7%	12 44.4%	27 100.0%
	Representatives of competition	Total %	8 80.0%	2 20.0%	0 0.0%	10 100.0%
	Representatives of customers	Total %	8 61.5%	3 23.1%	2 15.4%	13 100.0%
	Representatives of local authorities	Total %	1 33.3%	2 66.7%	0 0.0%	3 100.0%
Total		Total %	47 61.0%	12 15.6%	18 23.4%	77 100.0%

$\chi^2 = 37.13$, $p = 0.000$; Group 1—group *For entering new businesses*; Group 2—group *Against*; Group 3—group *For and Against*.

Table 3. Assumptions underlying the strategy for entering the new business—Mean and Standard Deviation.

Assumptions Underlying the Strategy for Entering the New Business	M	SD
Increasing demand will lead to better performance of the enterprise (A_1)	4.45	0.708
Entering the new business will be a response to different requirements of customers and consumers, which will lead to increasing demand (A_2)	4.45	0.791
Improving the incentives system will result in employees' greater motivation for work (A_3)	4.37	0.675
The enterprise will enhance the position on the market in relation to competition (A_4)	4.28	0.673
Better performance will result in a better incentives system (A_5)	3.78	1.111
The entry into the new business reduces the risk (A_6)	3.38	1.071

Table 4. Assumptions underlying the alternative strategy—Mean and Standard Deviation.

Assumptions Underlying the Alternative Strategy	M	SD
Entry into the new business involves additional training of employees (A_7)	4.23	1.104
The customers are primarily oriented towards prices (A_8)	4.17	0.986
The entry into the new business reduces the risk, since financing the new business implies growing debt of the enterprise (A_9)	3.83	0.913
Reaction of competition (e.g., "price war") will negatively affect the enterprise's performance (A_{10})	3.52	0.986
Growing debt will weaken the position of the enterprise while it negotiates with suppliers and/or financial institutions (A_{11})	3.40	0.932
Costs of entering in the new business are greater than the yields expected (A_{12})	3.33	0.844

4. Discussion

4.1. Discussion on Research Results

As we can see from the Tables 3 and 4, the majority of respondents are agreeing with the assumption that the increasing demand leads to better performance ($M = 4.45$). In addition, we can see that the respondents are at least agreeing with the assumption that entering the new business is reducing the risk ($M = 3.38$). Therefore, it can be concluded that the top management of the researched enterprise and their initial assumption (that entering new business reduces the risk) is challenged. This reveals that the relevant stakeholders have different opinions.

The alternative assumption, with the highest Mean, is that entering a new business involves additional training of employees ($M = 4.23$). On the other hand, the alternative assumption, with the lowest level of respondents agreement, is that the costs of entering new businesses are higher than the expected yields ($M = 3.33$). With that in mind, we can assume that respondents regard additional training of employees as one of the key assumptions underpinning the alternative strategy. One can assume that this point of view reflects resistance to change, but it can also be the consequence of the fact that additional training of employees requires additional financial recourses.

The results of descriptive statistical analysis (Tables 3 and 4) were the basis for the further implementation of SAST-methodology—stages of debate and synthesis. In addition to the above, of relevant importance is to emphasize that the phases of debate and synthesis are not carried out in realistic conditions. The key reason for this is that the top management of the investigated enterprises was not willing to allow debate, and this is mainly explained by a lack of time of potential participants in the debate. Thus, the possible debate and synthesis based on the empirical research results were presented.

In order to ensure democratic discussion about alternative attitudes and assumptions that underpin them, TS can be further applied. That is, the phase of the dialectical debate can be conducted on the principles of TS, i.e., based on the geometric structure of the icosahedron. As the process of implementing TS begins with opening session, in this context, the general topic is already identified by SAST methodology. It is a proposed strategy for overcoming the crisis—entering the new business. In addition, participants concerned with a given problem situation have been distinguished through SAST methodology (groups *For*, *Against* and *For and Against*). Thus, the next phase of TS is generation of the agenda that will help them in dealing with the initial issue. In a given context, it is about various assumptions that support the proposed strategy or not.

Taking into account the results of the research and the fact that the discussion is mainly around two opposing sets of assumptions—those who support the strategy of entering new businesses and those who do not, twelve different teams can be singled out. In fact, conducted research identified twelve assumptions in total, i.e., six assumptions that support and six assumptions that do not support the strategy for entering into the new business. Thus, the application of TS requires thirty individuals who discuss the topic. Accordingly, the five individuals will participate in the discussion about each identified assumption, twice as a participant and twice as a critic, which can be illustrated by Figure 1.

As Figure 1 shows, a participant that is marked as A_6-A_3 is included in the two groups as a participant (in both groups A_6 and A_3), with the other participants defined by a structure of the presented polyhedron (A_6-A_{10} , A_6-A_8 , A_6-A_{12} , A_6-A_1 , for the group A_6). If this participant is the part of the team that supports the strategy of entering the new business and discusses the assumption that the entry into the new business reduces the risk (group A_6) as well as the assumption that a better system of incentives leads to greater motivation of employees (group A_3), then he can also play the role of a critic in groups that do not support the strategy of entering the new business, i.e., the group that supports alternative strategy and discusses the assumption that the entry into new businesses increases the risk, as well as the assumption that the entry into the new business involves additional training of employees (for example, the groups A_9 and A_7).

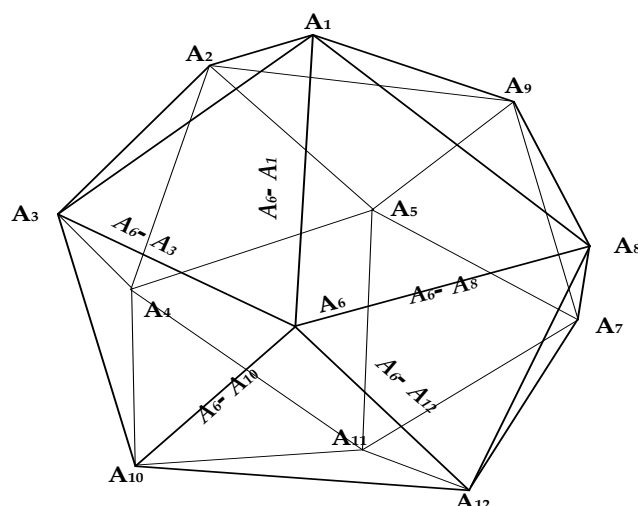


Figure 1. TS as a support to SAST—icosahedron representing the conversational structure of TS.

The phase of synthesis may also be supported by TS. Thus, despite previous conflicting viewpoints, TS may help to reach an agreement on which strategy the enterprise A should follow and which assumptions support it. In fact, bearing in mind that each participant belongs to four different teams (two as a participant and two as a critic), they act as channels for the dissemination of information that rapidly spread information around the different teams. This produces the desired reverberation or ‘echo effect’, which ensures that all team members share information about all the others, thanks to the icosahedron structure [42]. In this way, the idea is returning to participants with a different and improved form, which enables the identification of the most important ideas, as well as the convergence of different perspectives and perceptions of possible strategies and assumptions. In the given case, the research results show that there is a group of respondents that simultaneously supports both alternatives and for which it is easiest to achieve synthesis. That is, groups marked as *For and Against* are composed of respondents who support both strategies—for entering into the new business and alternative strategy. The synthesis can also be achieved with two preliminary sharply opposing groups, if each group partially accepts the views of other groups. For example, it is possible that the group *Against* accepts that entering into the new business does not necessarily increase the indebtedness of enterprise, which would weaken its position in the market, i.e., in negotiations with suppliers and/or financial institutions. Respectively, it is possible to partially agree with the assumption that the demand will grow by satisfaction of the various needs of customers and consumers, and thus better performance will be achieved, which would have avoided growth of indebtedness.

In addition to these, the assumptions regarding the risk of entering the new business (A_6 and A_9) are strongly opposed. To achieve the synthesis of the corresponding importance, both groups accept the view that entry into the new business implies an appropriate level of risk, but this risk is dispersed to a larger number of businesses. Similarly, the other assumptions may be modified in order to achieve compromise between initially conflicting groups. In fact, the process would continue until the discussion of all assumptions is completed and until synthesis is achieved.

Thus, from the process of presented hypothetical dialectical synthesis, it can be concluded that, in the given context, certain modifications of assumptions can be achieved, which means that the synthesis is possible, i.e., the strategy for entering the new business with elements of alternative strategies can be accepted as a response to the crisis.

The presented application of SAST-methodology and TS does not show the structure and functioning of the investigated enterprise A. Accordingly, the structure and functioning of the enterprise A should be explored in the conceptual framework of the Viable System Model and thus provide appropriate support to SAST-methodology and TS in the implementation of strategy. Therefore,

of relevant importance is to show how Organizational Cybernetics, through the Viable System Model, could help in implementing the defined strategy.

In researching enterprise A in the conceptual framework of VSM, the following recursive levels are identified:

- The system in focus-recursive level 1, i.e., the system which enables the achievement of pre-defined purposes, and which is represented with subsystem S_1 . In the given case, it is about the spare parts sales department, the car sales department and the department for servicing cars, i.e., the service center, which represent appropriate operational elements.
- Suprasystem, i.e., the relevant environment of the system in focus-recursion level 0. It is the automotive industry as a branch with which the enterprise A is related, i.e., the relevant stakeholders of enterprise A.
- Units of the system in focus-recursive level 2. Each of the identified operational elements could be further split into different groups depending on different products—the sales department of batteries from different manufacturers, sales of oil from different manufacturers, sales of tires from different manufacturers, sales of other spare parts, as well as sales and service of different types of cars.

Since this enterprise has functional organizational structure, the research of the enterprise A in the conceptual framework of the VSM includes examination of its structure and operation, and thus identification of their deviations in relation to VSM. Previously identified recursive levels show that operational elements—spare parts sales department, departments for the sales and servicing cars—are the key for the achievement of defined purpose. With diagnosis of operational elements and meta-system of the enterprise A, certain problems in its structure and operations are identified. According to diagnosis conducted by Azadeh et al. [38], the diagnosis of the enterprise A revealed which functions, i.e., organizational units of the enterprise A, are responsible for conducting meta-systemic functions, as shown in the Table 5.

Table 5. Diagnosing the meta-systemic functions in enterprise A.

Organizational Unit in the Enterprise A	Meta-Systemic Function of VSM
Department for commercial affairs	Control and Coordination
Department of finance	Control and Intelligence
Department for human resources and general affairs	Control and Intelligence
Department for international trade	Intelligence
Logistics	Coordination

Therefore, with the diagnosis of the investigated enterprise in the conceptual framework of VSM, certain problems were identified that can be summarized as follows—Figure 2. The above-mentioned interview with top management has also enabled the key information that is related to the structure and functioning of this enterprise. At the same time, relevant documents of the enterprise were also used to discover the structure and functioning of the same. By comparing these findings with VSM, some of the key problems were identified, as we can see from Figure 2.

First of all, these problems refer to the fact that organizational units of the enterprise A are not clearly distinguished, and, therefore, the units, such as the spare parts sales department, the car sales department or the car service center, are not viable systems for themselves. In fact, the enterprise consists of departments for commercial affairs, human resources, etc. (Table 5). In addition, these operational elements are not adequately coordinated—for example, enterprise sales for two types of cars. Sales of one type of car is a new segment in enterprise A, which has its management and employees. On the other hand, sales of another type of car is a part of existing organizational structure. Apart from this, control is highly centralized and it is mainly in jurisdiction of top management. Audit channels are not sufficiently developed and the intelligence function is not integrated. This means that it

does not exist as a separate function in the enterprise, but some elements of this function are distributed through different organizational units, such as the department for human resources, the department for finance or the department for international trade. Furthermore, the information about threats, opportunities, strengths and weaknesses collected by these functions are not adequately distributed to the decision-makers. Namely, better cooperation between intelligence function and identity function is necessary. In addition, conducted empirical research showed that relevant stakeholders are not sufficiently involved in the process of decision-making. In addition, organizational culture does not encourage the team spirit and cooperation and it is not an innovation driver.

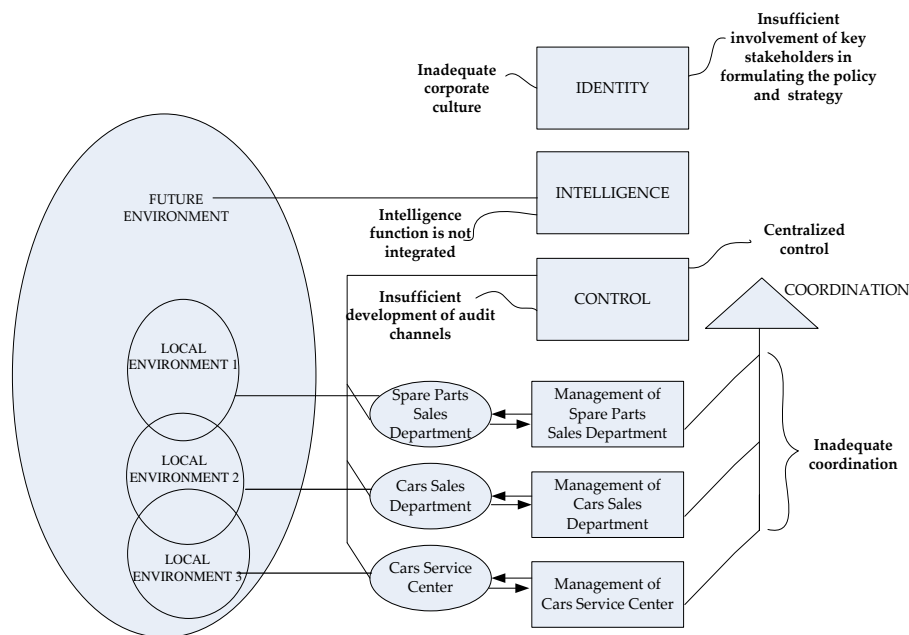


Figure 2. Diagnosis of enterprise A in conceptual framework of VSM.

Respecting the above mentioned, we can conclude the following. The possible use of SAST-methodology and TS shows that the involvement of relevant primarily internal stakeholders could contribute to the identification of different, conflicting perceptions of the problems facing the enterprise and ways of their solution. In order for stakeholders to be able to properly review the problems and to contribute to their solution, a strong connection is necessary between functions of identity and intelligence. In this way, stakeholders will have access to appropriate information from the market, but also the internal information, and could equally participate in decision-making. This would ensure both change of management philosophy and adequate identity of enterprise A.

In general, it can be concluded that, for redesign of the investigated enterprise A, of relevant importance is respecting the cybernetic principles and laws in implementation of the defined strategy, which means that the appropriate operational elements should be viable systems for themselves with all meta-systemic functions.

In addition to the above, information obtained from the possible application of VSM can be built into the process of formulating the strategy. In fact, the problems that are revealed by the diagnosis of enterprise A in conceptual framework of VSM can be the basis of formulating an appropriate business strategy as a response to identified problems. This represents an important basis for potential future research. Thus, regarding the problem situation of formulating and implementing business strategy, VSM can be viewed as a means of efficient implementation of the previous formulated strategy through the application of SAST methodology and TS, but also as a means of providing adequate information about internal strengths and weaknesses of the system, as well as the external opportunities and threats to the enterprise. Since subsystem S_5 of VSM is responsible for identifying policies and purposes

(in this context, responsible for identifying potential strategy), the combined use of those systems methodologies can be carried out in the segment S_5 of VSM. In this way, decision-makers and other relevant stakeholders, who will be involved through the SAST-methodology, shall receive all relevant information from the market about possible opportunities, threats, etc., but also on certain limitations, weaknesses and strengths of the enterprise. With this, effective communication and debate of relevant stakeholders, which were organized on the principles of TS, will be supported by adequate information that will provide the adaptability and efficiency of the enterprise.

4.2. Limitations and Future Research

According to Mingers, the following two basic arguments support combined use of systems methodologies [27]: the first argument refers to the multidimensionality of the problem situation under consideration—material, personal and social ‘worlds’—which means that different aspects of problem situations need to be addressed. If we accept only one methodology, we get a constrained view of the considered problem situation. Secondly, the intervention itself is the process that has several phases—appreciation, analysis, assessment and taking action. Particular methodologies have certain strengths and limitations related to these different phases. According to Mingers [37], other benefits of combining the systems methodologies are as follows: seeking to assess validity of data through combining different sources of data, methodologies and researchers; creativity—discovering the new factors that stimulate future research; and expansion—broadening the scope of research to consider wider aspects of the situation.

Taking into account certain philosophical, cultural, cognitive and practical limitations of combining systems methodologies, one can conclude that in this paper, paradigm incommensurability is an especially important barrier, since the paper deals with combined use of three methodologies that belong to different paradigms—emancipatory, interpretive and functionalist. In addition, one can emphasize the following limitations of combining systems methodologies [25,43]:

- Cultural difficulties are related to the extent in which organizational culture and education could be obstacles for combining the methodologies, i.e., the competencies in using the different systems methodologies are very important
- Cognitive barriers can be divided into difficulties in shifting paradigms and characteristics of personality that use particular methodology. In fact, acquiring the new paradigm is more than acquiring the relevant knowledge, i.e., it requires active participation, experience and practice. At the same time, different people have different preferences for using the methodologies (e.g., people who are precise, accurate and reliable will prefer using the quantitative approaches).
- Following practical limitations of combining the systems methodologies can also be distinguished: combined use of systems methodologies takes more time, practitioners who do not have enough experience in using the systems methodologies, and clients who think that combined use of methodologies is risky, etc.

It is also important to emphasize that some of the stages in using selected systems methodologies for strategy formulation and implementation are not conducted in real circumstances, i.e., the phases of debate and synthesis of SAST supported by TS. It can be a guide for future research. Accordingly, it would be very helpful to realistically apply these methodologies in selected enterprise. It further means that debate and synthesis, supported and organized according to principles of TS, should be conducted with employees in the enterprise A along with other relevant stakeholders (representatives of suppliers, customers, etc.).

5. Conclusions

Growing complexity and diversity of problem situations in contemporary enterprises imply using different systems approaches, i.e., systems methodologies, methods, models and techniques. They address and highlight different aspects of considered problem situations. Respecting the critical

awareness, as one of the key commitments of CST, one can conclude that each systems methodology has certain strengths and weaknesses that are the basis for their combined use.

Respecting all of the above-mentioned, one can conclude that a methodologically appropriate combined use of systems methodologies contributes to a more comprehensive understanding and improvement of managing the problem situations in enterprises. In a given context, methodologically appropriate combining of SAST, TS and VSM can ensure holistic dealing with complex issues of strategic formulation and implementation in enterprise and improving the management of this problem situation. This is illustrated by the possible application of these methodologies in a chosen Serbian enterprise. In this way, the key research hypothesis is confirmed. However, the paper does not illustrate real application of all stages of selected systems methodologies in enterprise. It is a relevant research limitation, which can be a basis for future research.

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