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SIMULATION MODEL OF THE QUANTIFIED SWOT / TOWS MATRIX ON AN EXAMPLE OF SITUATIONAL ANALYSIS AT SUBNATIONAL LEVEL

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ABSTRACT

Based on the idea of converging the concepts and models used in real-sector strategic planning in order to be applied to the public sector, this paper is aimed at examining potential improvements of the standard process of strategic planning within regional economics, particularly in situational analysis as an initial stage. In accordance with the above, a simulation model of the application of quantified SWOT / TOWS matrix analysis was performed. Combinations of two methods of situational analysis were applied in the model, namely SWOT and TOWS matrix, and additionally introduced methods of Focus Group and Delphi method. Compared to the standard methods for developing strategic documents and analyses within the scope of regional economics planning, the proposed model emphasizes the connection between the real-sector tools and the strategic decision-making processes of the public sector, minimizes the subjectivization of the situational analysis by introducing the Delphi method, utilizing independent expert knowledge, which is also the main contribution of this model. The simulation model developed in this paper achieved satisfactory outcomes and could be applied in further research to solving of actual problems in strategic planning within the scope of regional economics. The model limitations are related to the quality of implementation of the focus group (sample, chief moderator's expertise), the selection of experts for the Delphi analysis and the moderation of the Delphi method and the process of developing optional actions in the TOWS matrix. The paper's main expected contributions are the findings obtained during modelling, model discussion and open questions related to potential future research, all based on the idea of convergence of the strategic planning tools used in the real and public sectors.

Key words: *strategic planning, regional economics, SWOT / TOWS, simulation model, Croatia*

1. INTRODUCTION

The organisation management systems are influenced by a series of internal and external factors, particularly by global competitiveness and the current trend of green and digital business transformation. Consequently, there is a need for constant improvement of the organisation management system that equally affects public (not-for-profit) and commercial (for-profit) organisations. As a result, the tools and methodologies used for managing public (national, regional, local) and private business systems converge, where, as Kaštelan (2004) points out, the efficacy of the public sector can "be explained by using the same concepts applied to the evaluation of entrepreneurial efficiency in the market economy".

Based on the idea of converging the concepts and models used in real-sector strategic planning in order to be applied to the public sector, this paper is aimed at examining potential improvements of the standard process of strategic planning within regional economics, particularly during the initial stage. First the paper will explain the relationship between the simulation analysis and the strategic planning within regional economics, which also represents the theoretical and application framework of research. Then the proposed improvement of the matrix analysis model as support to strategic decision-making at regional level will be elaborated in the main section of the paper. The elaboration of the model will first provide an overview of recent literature and critical research relating to the main model methods and then the model assumptions will be defined – as the model is developed on the theoretical and simulation level, assumptions will be used to determine the input data and the modelling limitations. The concept of the model will also be explained, the methodology of modelling described, and the improved model developed in the final part of the modelling process. In conclusion, research results will be defined and systematized in the discussion. Based on the obtained findings the questions that need to be addressed in any potential subsequent elaboration of this problem will also be identified.

The paper's main expected contributions are the findings obtained during modelling, model discussion and open questions related to potential future research, all based on the idea of convergence of the strategic planning tools used in the real and public sectors.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The field of regional economics is focused on the study of phenomena related to the subnational level of organisation of national systems. Within its scope of research, regional economics seeks to answer questions why some subnational areas, i.e. cities and regions, are more developed then others, why the configuration of subnational territorial systems is as it is and how it can be improved, what economic rationale explains the choice of a household's or company's location in space and particularly how to better manage specific space. In order to provide legitimate answers to the above questions, two main groups of theories were developed (Capello, 2007) which also represent the theoretical framework of research in the field or regional economics, namely: (i) Location theories, which address the economic models of spatial placement of activities, and (ii) Regional growth (and development) theories

that focus on spatial aspects of economic growth, development and financing. It is clear that the need for strategical planning, as the basis for decisions related to efforts aimed at spatial and community management, i.e. ensuring regional growth and development, arises from the structure and scope of regional economics.

Strategic planning is a fundamental component of organisation management and business decision-making in public, private and non-profit organisations. The key strategic questions[1], which managers, i.e. makers of key (strategic) decisions pose generally include: Where are we now?, Where are we going? and How are we getting there? All three of these standard strategic questions are a part of the process called strategic planning. Both literature and practice abound with definitions of strategic planning, which are always based on the concept that strategic planning is a process of defining key decisions and actions aimed at activities and objectives that will help to achieve the vision of the organisation in the future. According to Thompson, Strickland & Gamble (2008), "The question *Where are we now?* refers to the current position of the company. The question *Where are we going?* deals with the direction that the management believes the company should take. The question *How are we getting there?* deals with the crafting and implementation of a strategy that will move the company from its current to the intended position."

2. 1 Strategic planning at the subnational level in the public sector

Strategic planning in the public sector at the regional (subnational) level is affected by the specific nature of the community (population, economy – business community), requiring the combination and application of both quantitative data and qualitative values derived from the attitudes and beliefs of the community as the social system. Authors Leigh & Blakely (2013) also point out this combination of quantitative and qualitative values, specifying how the strategic planning process comprises "The overall environment of the community – physical and regulatory environment, as well as attitudes and beliefs". This view is shared by many other researches, including Bryson, Edwards & Van Slyke (2018) who say that strategic planning "is not a single thing, but instead consists of a set of concepts, procedures, tools, and practices that combine in different ways to create a variety of approaches to being strategic". We can, therefore, conclude that the approach to public-sector strategic planning that would rely only or mostly on quantitative or qualitative indicators is not an optimal solution for the social systems at the subnational organisational level. Strategic planning at regional level requires a combination of quantitative and qualitative indicators, with the qualitative indicators sometimes being more important and the quantitative indicators taking priority in another set of questions. However, regardless of the mutual relationship between these indicators, strategic decision are particularly important, since, according to Sikavica, Bebek, Skoko & Tipurić (1999), the planning process results in "strategic decisions that define the framework for tactical decisions; thus, an error in strategic decision-making can result in

[1] *Mintzberg* was one of the first authors to note multiple meanings of the concept of strategy. Based on his work, strategy can be categorized into five groups which he labelled as follows: (1) Strategy as Plan, (2) Strategy as Ploy, (3) Strategy as Pattern (4) Strategy as Position and (5) Strategy as Perspective (author's note). Refer to: (Mintzberg, 1987)

long-term negative consequences". Characteristics of strategic decisions include (Rajagoplan, Rasheed & Datta, 1993): (i) Strong (decisive) impact on an individual or organisation; (ii) Permanency; (iii) Complexity; (iv) Risks and uncertainty; (v) Resource requirements and (vi) Understanding and communication for the purpose of implementation.

According to Chang & Huang (2006), strategic planning process consists of three main stages: (i) Strategy formulation; (ii) Strategy implementation and (iii) Strategy evaluation. The system of methodologies and tools for the formulation and implementation of strategies i.e. strategic planning process is termed competitive analysis. Authors Fleisher C.S. and Bensoussan B.E. define competitive analysis as "application of scientific and non-scientific methods and processes by which individuals interpret data or information to produce insightful intelligence findings and actionable recommendations for decision makers." (Fleisher & Bensoussan, 2007). Depending on the application methodology and the type of knowledge used, according to Kopal & Korkut (2011) we can divide the competitive analysis techniques into four categories: (i) Expert knowledge; (ii) Expert quantitative analytical techniques; (iii) Empirical quantitative analytical techniques and (iv) Structured analytical techniques.

As a number of indicators (economy, population, transport, education, etc.) need to be taken into account and comparatively evaluated in order to make strategic decisions in a regional community, because of its features, matrix analysis emerges as a suitable tool. Accordingly, a series of matrix methods of competitive analysis are applied in the standard models of strategic regional planning, whose characteristics make them applicable both in the private and the public sector.

2. 2 Situational analysis and matrix modelling

Relationships (connections) between the elements of two or more sets can be demonstrated in the form of a matrix. The composition of established relationships within the matrix simplifies the analysis of connections between the elements of the sets, which makes the matrix analysis i.e. matrix method widely applies to the problems of comparative evaluation of different indicators, with a particularly important role in strategic planning. Matrix analysis is also combined with other suitable methods to determine the position of the observed subject (problem) based on internal and external factors in order to make strategic decisions on the future planned behaviour of the subject of research that would result in achieving the desired position in a projected moment in the future. In this sense, when we determine the internal and external factors influencing a certain system (organisation), we are talking about situational analysis.

Situational analysis is usually defined as critical evaluation of the internal and external environment influencing the system tested, with the aim to determine the initial situation before making key decisions on actions aimed at improving the system's position at a given moment in the future. Thus, situational analysis is a part of the process of strategic analysis

and planning and is an essential tool when it comes to making key growth and development decisions, whether the organisation in question is public, private or non-profit.[2]

Simulation analysis is generally used in strategy formulation which is the first stage in strategic planning. Situational analysis is performed using a number of different methods such as SWOT, TOWS, 5C, STEEP/PEST, Porter's five forces model, VRIO, scenario analyses, cost-benefit analysis, as well as some variants and derivatives (combinations) of other known analytical tools. Some of these methods are better applicable in profit- and market-oriented organisations, others are adapted to non-profit, public systems, while a certain number of methods can be applied to both profit and non-profit systems.

2. 3 Critical review of model methods

For the empirical analysis in this paper, we adopted a method that combines the SWOT and TOWS methodologies (Wheelen & Hunger, 2011), supplemented with the Focus Group and Delphi method approaches. When evaluating the advantages and disadvantages of the other methodologies mentioned, this approach was determined to offer the most benefits for establishing the regional strategic framework. The 5C analysis (Kotler & Armstrong, 2017) is better suited to the business sector and often misses the dynamic nature of processes. The STEEP/PEST analysis (Johnson, et. al., 2014) solely concentrates on the external environment, making it inadequate for the objectives of this paper. Porter's five forces model (2008) similarly lacks a dynamic context. The VRIO framework (Barney & Hesterly, 2006) overlooks external factors, while scenario analysis (Van der Heijden, 1996) essentially offers hypothetical options. The cost-benefit analysis (Boardman et al., 2017) is methodologically too narrow to address this multidisciplinary problem.

Therefore, a combination of two methods of situational analysis that are widely used in both private and public systems, i.e. the SWOT matrix and the TOWS matrix will be used to developed the simulation model presented in this paper. The Focus group and the Delphi method will also be used in the model as qualitative and quantitative tools. For the purposes of this research, a critical review of the advantages and limitations of the applied methods will be presented below.

SWOT analysis is a widely accepted tool for understanding factors that influence a company's results, i.e. of the object of research from the strategic perspective. It is applied at the beginning of the strategic planning process in public (non-profit) and profit organisations

[2] According to Neves (2004) economy first and foremost deals with choice and human practice in the "ordinary life" and their implications on the wider environment. In that sense, people (agents) must constantly take decisions and make plans based on current knowledge and an assessment of their present and future circumstances, as well as the likely consequences of their actions. Developing his theory on these assumptions, Karl Popper was the first to introduce the term *situational analysis* (situational logic) into science in his book *The Poverty of Historicism* in 1957. Ever since, situational analysis and its derivatives have been used, according to Hoover (2016), in various fields from military strategy, to psychology and social sciences – sometimes closely related to Popper's original usage, and sometimes in a quite different sense (author's note).

likewise. The method belongs to the so-called situational (or environmental) analyses, and takes into account both the internal and external aspects influencing the current position of the object of analysis. Internal aspects include: (i) Strengths – S and (ii) Weaknesses – W, while the external aspects include (iii) Opportunities– O and (iv) Threats– T. Professor *Ken Andrews* from the *Harvard Business School* was one of the first strategy theorists to "formally describe the concept of strategic relationships between the company's internal environment (resources and capabilities) and the external environment." (Bensoussan & Fleisher, 2013). Besides numerous advantages, the analysis also has some limitations, which primarily relate to possible subjectivisation of input data and poor interpretation and drawing of conclusions from the analysis. As Mintzberg (1994) points out: "Testing of strengths, weaknesses, opportunities and threats, the old SWOT theory, is rarely effective as it is rooted in the existing perception of the organisation." The literature on the SWOT analysis is widely available, and for the purposes of this work, one possible systematic overview of the advantages and limitations of this method is presented for the purposes of this paper in Table 1.

Table 1. Advantages and limitations of the SWOT analysis

Advantages	Limitations
Simple and flexible	Insufficiently effective and operative
Suitable for integration into other models and analyses	Limited and significantly influenced by the current perception of the organisation
Low implementation costs	Although adequately performed, it is not efficiently applied (generated data are inadequately interpreted)
Used at multiple organisational levels	Non-prescriptive
When adequately performed, it provides a solid base for strategy formulation	No priorities - weights of identified factors
Widely available literature on the application of the SWOT analysis (examples, experiences, instructions)	Potentially subjective bias when generating input data

Source: Author's systematization

SWOT analysis limitations that fundamentally arise from its qualitative nature can be overcome by combining the SWOT method as the first step followed by methods that are more quantitative (TOWS matrix, IE matrix, BCG matrix, etc.), experience and expertise of the person performing the analysis and a stronger combining of quantitative and qualitative methods in processing of SWOT input data.

The TOWS matrix was developed as a result of the identified limitations of the SWOT analysis, which based on SWOT develops a more detailed and objective solution model. The TOWS matrix was introduced by *Weihrich* as an extension of the developed SWOT analysis in order to reinforce the quantitative aspect of the model that generates defined potential operational strategies. As Salmi & Hasnan (2015) point out "TOWS is used for analyzing external

environment (threats and opportunities), along with internal environment (weaknesses and strengths) for drawing strategies." The TOWS matrix matches up external opportunities and threats against internal strengths and weaknesses, resulting in four sets (combinations) of possible strategies. These four TOWS matrix combinations (strategies) are: (i) maxi-maxi; (ii) maxi-mini; (iii) mini-maxi and (iv) mini-mini, as shown in Figure 1 below.

Figure 1. Matrix of TOWS strategic options

	External opportunities (O)	**External threats (T)**
Internal strengths (S)	**SO** "Maxi-Maxi Strategies" *Strategies using internal strengths to maximize external opportunities*	**ST** "Maxi-Mini Strategies" *Strategies using internal strengths to minimize the impact of external threats*
Internal weaknesses (W)	**WO** "Mini-Maxi Strategies" *Strategies minimizing the impact of internal weaknesses by maximizing external opportunities*	**WT** "Mini-Mini Strategies" *Strategies that emphasize activities for minimizing internal weaknesses to reach a better position to defend from or avoid external threats*

Source: Author's systematization according to Weihrich (1982)

The TOWS matrix is primarily used for the analysis and planning in the real-sector organisational systems subject to market competition, whereas its application in the public-sector management is not very significant. The matrix is a variation of the SWOT analysis, based on the defined strategic components of the SWOT matrix, but links them in a way that, according to Božac Gonan (2008) "generates several strategic initiatives for each of the four matrix quadrants which are then analysed (for example, based on the criteria important, urgent) and some of them implemented". The advantages and limitations of the TOWS analysis are given in Table 2.

Table 2. Advantages and limitations of the TOWS analysis

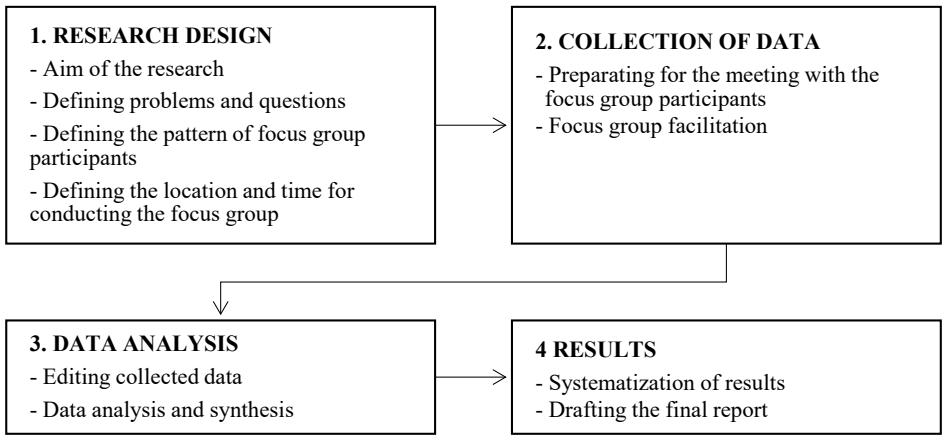
Advantages	Limitations
Unlike the SWOT analysis, it matches up the components of the matrix	In case there are too many components, the analysis may generate an uncritically high number of overlapping options
Cost-effectiveness analysis is in the basis of the analysis, which produces positive quantitative features for the future chosen strategic option	Does not provide an answer to the question on what the strategic advantages of the organisation are
Prescriptive when it comes to the selection of strategic direction	Depends on the quality of the previously performed SWOT, PEST or other similar analysis
Widely available literature on the application; connected to the SWOT matrix as its improvement	

Source: Author's systematization

Although the TOWS matrix is more operational and objective than the SWOT matrix, it still partially depends on the subjective nature of the previous steps, particularly if it is preceded by a SWOT analysis. In that sense, the limitations of the TOWS matrix can be minimized by applying specific quantitative tools in deriving the final form (AHP multi-criteria decision-making method or similar tools).

Focus group belongs to the group of qualitative research methods characterized by inductive approach (observation, forms, etc.) and is based on a group discussion related to a given topic.[3] As the method is suitable for scientific research which is generally focused on studying group processes, group norms and views, it is particularly applicable for generating input data for the SWOT analysis. The standard process flow for conducting a focus group is shown in Figure 2.

Figure 2. Standard steps for conducting a focus group



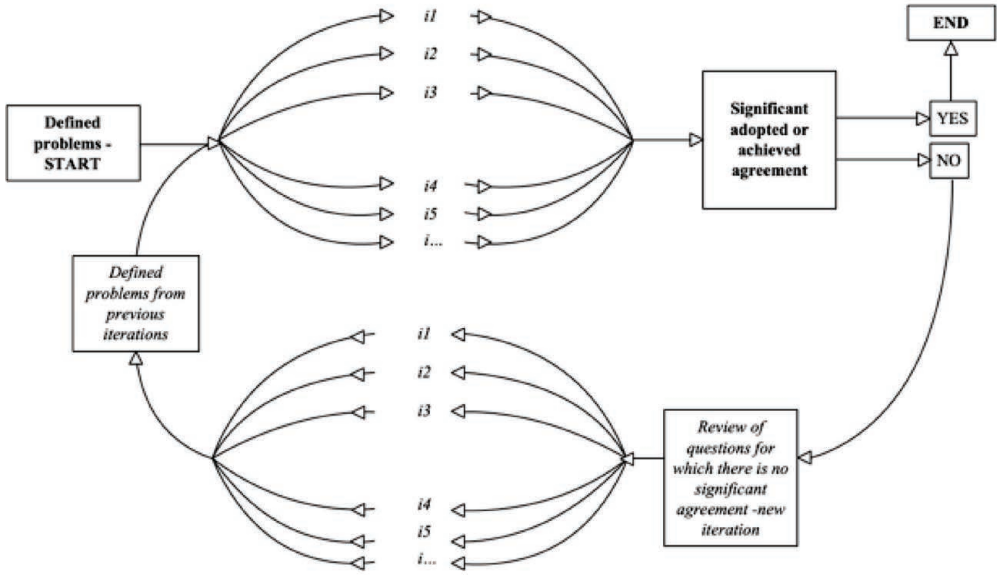
Source: Author's systematization

[3] The origins of the method are linked to a group of researchers at Columbia University in the 1940s (author's note).

With regard to the sampling of research features, Skoko & Benković (2009) point out that they direct researchers towards non-probabilistic sampling strategies, such as intentional, theoretical sampling, snowballing and often quota sample. These features perfectly correspond to the situational analysis in regional economics which relies on a sample from a given region and a section (sample) of stakeholders in that region (population, economy, politics, etc.), that is, where the strategic situational analysis requires that the process begins with selecting the subjects based on specific attributes relevant to the analysis.

The Delphi method is particularly acceptable when it comes to the process of identification and prioritization of problems in strategic decision-making.[4] It is classified as a development forecasting method that relies on the opinions of experts in a specific area. Today it is often used in modern research, primarily military, but also for economic, political, technological, medical and other purposes. The method is designed as a process of communication of a group of select experts with the aim of achieving a convergence of opinions (Figure 3), where the ultimate goal is not to achieve the full overlap of panel experts' final opinions, but to, as Sutherland (2002) emphasizes, "based on the subjects' opinions, even if conflicting, possible solutions to a problem can be formed."

Figure 3. Standard form of the Delphi methodology



Source: Author's systematization

Conducting the Delphi method is relatively hard, and a great deal of attention and care should be given to the selection of experts and the preparation of questions, which are also the main limitations of the method. On the other hand, the method's primary strength according

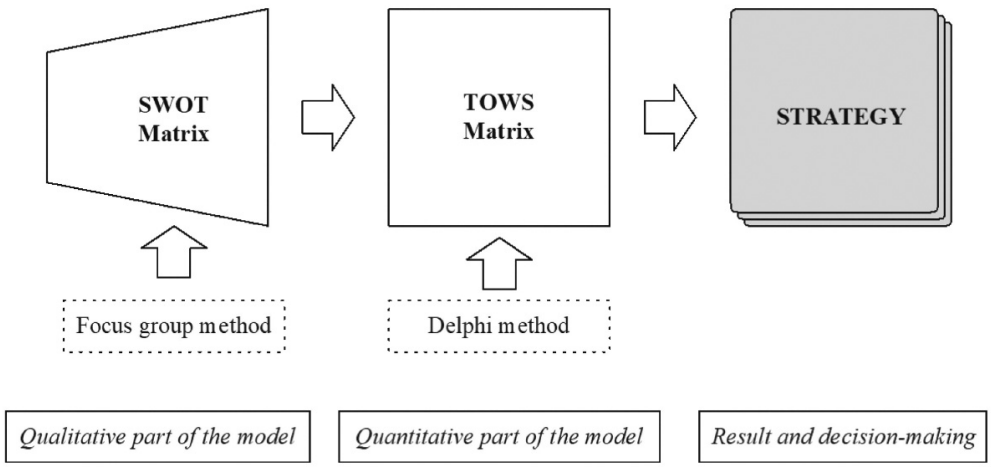
[4] The method was originally developed at the American RAND Organisation's centre for strategic studies in Santa Monica, California in the early 1950s (author's note).

to Gordon (1994) is its ability to coolly and objectively explore (without communication between the participants) issues that require strong critical examination. In that sense, the Delphi method plays an important role in the model examined in this paper since it provides, in addition to qualitative inputs, an external expert review of the input data generated by the stakeholders at the regional level (expert objection to the data generated by regional policy stakeholders that was collected in the focus group).

3. METHODOLOGICAL FRAMEWORK FOR THE PLANNED SIMULATION MODEL

The approach using different variations of the quantified SWOT/TOWS matrix has been recorded in literature, as well as applied in the real sector.[5] The model that is being developed in this paper is specific as it is the quantified SWOT/TOWS matrix that is modified to the public-sector environment i.e. to the regional level of subnational state. The methodology of the modelling and the model structure are presented in Figure 4.

Figure 4. Methodological framework and structure of the new model



Source: Author's systematization

As is evident from Figure 4, first a SWOT analysis in its basic form of the local (regional) self-government will be performed by applying the focus group method (qualitative part of the model). The SWOT analysis will then be transformed into a quantitative TOWS matrix applying the Delphi method in order to define the weighting of the advantages and limitations from the SWOT matrix (the quantitative part of the model). Finally, the optimal strategy will be formulated based on the results obtained from the developed TOWS matrix.

[5] For more refer to e.g.: *Application of a quantification SWOT analytical method* (Chang & Huang, 2006); *Improved SWOT Approach for Conducting Strategic Planning in the Construction Industry* (Lu, 2010); *Key influential factors for establishing and developing intermodality in Baltic Adriatic corridor* (Chakuu & Dza, 2015) and other (author's note).

Corresponding main components S, W, O and T from the SWOT matrix can be defined as (1):

$$S = \{S_1, S_2, S_3, \ldots, S_i\} \text{ etc.} \quad (1)$$

Weights from the Delphi analysis can be defined as (2):

$$w_s = \{w_{s1}, w_2, w_{s3}, \ldots, w_s\} \text{ where } \sum_{k=si}^{si} ws = 1 \text{ etc.} \quad (2)$$

where:
1 = maximum significance of a component (the highest weight)

Interactions (sections) between the corresponding SWOT components can be defined as 0 and 1, where 0 means that there is no relationship between the components or the relationship is very weak, while 1 represents complete or significant connection between the components. To demonstrate the connection between the main components of the matrix in mathematical terms, we can define it by introducing the coefficient *r* in the expression (3):

$$0 \leq r \leq 1 \quad (3)$$

where:
r = 1 – full interaction
r = 0 – no interaction

When the components from expressions (1) to (3) are added to the corresponding matrix, we obtain four solutions from four TOWS matrix iterations, namely S–O, S–T, W–O i W–T. The example of the calculation of the S–O matrix solution is given in Table 3.

Table 3. Example of the calculation of the S-O TOWS matrix with weights

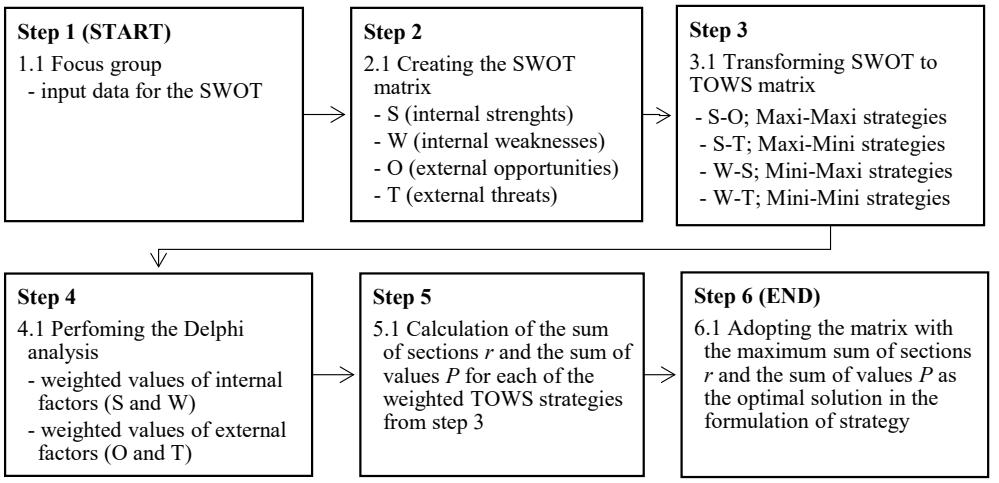
STRENGTHS/ OPPORTUNITIES (SO)	O1	O2	O3	O_i	W_{si}	r_{so}	$Pws = W_{si} \times r_{so}$
S1	r_{11}	r_{12}	r_{13}	…	w_{s1}	$\sum = r_{1i} \leq 1$	$w_{s1} \times \sum = r_{1i} \leq 1$
S2	r_{21}	r_{22}	r_{23}	…	w_{s2}	$\sum = r_{2i} \leq 1$	$w_{s2} \times \sum = r_{2i} \leq 1$
S3	r_{31}	r_{32}	r_{33}	…	w_{s3}	$\sum = r_{3i} \leq 1$	$w_{s3} \times \sum = r_{3i} \leq 1$
S_i	…	…	…	…	…	…	…
W_{oi}	w_{o1}	w_{o2}	w_{o3}	…		***∑rSO***	***∑Pws***
r_{os}	$\sum = r_{i1} \leq 1$	$\sum = r_{i2} \leq 1$	$\sum = r_{i3} \leq 1$	…	***∑rOS***		
$Pwo = W_{oi} \times r_{os}$	$w_{o1} \times \sum = r_{i1} \leq 1$	$w_{o2} \times \sum = r_{i2} \leq 1$	$w_{o3} \times \sum = r_{i3} \leq 1$	…	***∑Pwo***		
Sum of sections ∑r						***∑r = ∑rSO + ∑rOS***	
Sum of values ∑P							**∑P = ∑Pws + ∑Pwo**

Source: Author's systematization

The optimal result is the matrix that, out of the four matrices examined (S–O, S–T, W–O and W–T), has the maximum sum of sections Σr and the sum of values ΣP.

The modelling steps can be systematized as shown in Figure 5.

Figure 5. Modelling steps



Source: Author's systematization

As demonstrated, the modelling algorithm has six steps. The model will be further developed according the presented methodology. Due to the theoretical nature of this paper, it is necessary to first define modelling assumptions and limitations.

For the purposes of the simulation, first the modelling objective and then other key components of the model were defined. The defined objective concerns the possible options and questions related to the strategic planning of the reform of Croatia's subnational level, namely: Which main strategy option to choose as the approach to the implementation of reform of Croatia's subnational level?

A conceptual simulation model is developed in the paper, simulating the model components, relationships between these components, types of data required, their interactions and possible interpretation of results, in order to reach the defined objective.[6] The simulation model assumptions are given in Table 4 below.

Table 4. Model assumptions

Model component	Assumptions and limitations	Source in the real system
Modelling objective	Author's systematization	Public-sector problems and needs
Input data for the SWOT matrix	Author's systematization	Focus group
Delphi weights for the TOWS matrix	Author's systematization	Delphi method

Source: Author's systematization

[6] Simulation model – describes the behaviour of a system using a set of assumptions (author's note)

The input data for the SWOT matrix and the weights for the TOWS matrix used in modelling were assumed and not collected through appropriate statistical or empirical research. The structure of such assumed data is qualitative and quantitative, appropriate for verifying the functioning of the model, and the derived model has no limitations in terms of procedure of structure of the results. The limitation of the model lies in the interpretation of the final result of the simulation model that does not represent a sample of the actual environment due to the lack of objectivization of the input data.[7]

4. EMPIRICAL FINDINGS

Before embarking on the quantitative exercise, it's crucial to offer a concise overview of the regulatory and institutional framework of the Croatian regional planning system. According to Simovic (2022), Kosor (2017), and Bajo & Puljiz (2017), Croatia has grappled with an underdeveloped and chaotic strategic planning system since its inception as an independent nation. The New Law on the System of Strategic Planning and Management Development of the Republic of Croatia (NN 123/17) faced the challenging task of coordinating over 200 strategic documents at the national level and more than 1700 at the local level. There was a significant lack of coordination, both vertically and horizontally, among these documents and tiers of government. The new framework established by this regulation introduced a system of strategic planning, encompassing both organizational and information processes. Although the revised system offers a clear institutional structure, it remains guided by discretionary objectives, often lacking justification based on analytical validity. The empirical model introduced in this research offers a potential methodological tool for such evaluations.

The simulation model is created using the selected methodology and model assumptions.

Step 1 and 2: SWOT analysis supported by the focus group – qualitative aspect of the model

The SWOT analysis shown in Figure 6 was performed based on the adopted modelling assumptions, which are also related to the author's earlier research work and findings.

[7] For the application of the model the main input data must be tested using appropriate scientific methods (statistical or empirical research) i.e. the focus group and the Delphi method as proposed by the model.

Figure 6. SWOT analysis of the state of Croatia's regional system – basic form

	POSITIVE		NEGATIVE	
INTERNAL FACTORS	STRENGTHS (S)		WEAKNESSES (W)	
	S1	Smaller population and smaller state territory enables efficient organization	W1	Lack of political will to make a decision on nation-wide reform
	S2	Scientific and professional public support of reform	W2	Centralization of function at the state level
	S3	Sufficient time to prepare the implementation of the reform with regard to the next EU financial perspective	W3	Increasing system fragmentation
	S4	Favourable existing nodal (functional) system	W4	Lack of investment potential of counties and cities/municipalities
	S5	Major urban centres ready to take on greater responsibility	W5	Backlogs in the education system as support to growth and development
	S6	Funding from EU regional development funds	W6	Poor national system of strategy planning and coordination
EXTERNAL FACTORS	OPPORTUNITIES (O)		THREATS (T)	
	O1	EU trends – strong urbanization and strengthening of urban centres as the drivers of development (finance, collaboration, knowledge, etc.)	T1	Strong resistance of political elites at the subnational level
	O2	Manageable state of Croatia's public finances	T2	Significant number of employees in the counties - social aspect of the reforms
	O3	Development of the Croatian IT sector in support of the process of reform	T3	Negative demographic trends
	O4	Reduction of operating costs of public administration - job sharing, optimization and economizing	T4	Problems in the transport network and connections of different parts of Croatia
	O5	Strengthening of polycentric development in support of rural areas	T5	Non-uniform spatial distribution of population and settlements
	O6	Increasing quality of strategic planning	T6	Rural areas lagging in development

Source: Author's systematization

Qualitative internal and internal positive and negative factors were defined in accordance with the standard methodology for creating the SWOT matrix and the methodological framework adopted in this paper.

Step 3. Transforming SWOT to TOWS matrix

The developed TOWS matrix model of the state of Croatia's regional (local) self-government is presented in Figure 7. Internal and external factors are the input data which are based on the basic form of the SWOT analysis (Figure 6). However, in the TOWS matrix the model is developed through four combinations of components that yield four possible strategies.

Figure 7. TOWS matrix of the state of Croatia's regional system

INTERNAL FACTORS / EXTERNAL FACTORS	STRENGTHS (S)			WEAKNESSES (W)		
	S1		Smaller population and smaller state territory enables efficient organization	W1		Lack of political will to make a decision on nation-wide reform
	S2		Scientific and professional public support of reform	W2		Centralization of function at the state level
	S3		Sufficient time to prepare the implementation of the reform with regard to the next EU financial perspective	W3		Increasing system fragmentation
	S4		Favourable existing nodal (functional) system	W4		Lack of investment potential of counties and cities/municipalities
	S5		Major urban centres ready to take on greater responsibility	W5		Backlogs in the education system as support to growth and development
	S6		Funding from EU regional development funds	W6		Poor national system of strategy planning and coordination
OPPORTUNITIES (O)	***S-O Maxi-Maxi Strategies***			***W-O Mini-Maxi Strategies***		
O1 EU trends – strong urbanization and strengthening of urban centres as the drivers of development (finance, collaboration, knowledge, etc.)	**S4; S5**	**O1**	Use the favourable existing nodal (functional) system to strengthen urban centres as the drivers of development	**W1**	**O1**	Use the EU funds argument to strengthen the position for adopting the decision on reform
O2 Manageable state of Croatia's public finances	**S3**	**O2**	Option of securing funds for the national part of EU project financing	**W1**	**O2**	Use the state of public finances to reduce resistance and compensation measures in the reform process
O3 Development of the Croatian IT sector in support of the process of reform	**S1**	**O3**	The IT industry potential can be exploited for digital transformation of the regional state - smaller territory and population enable operational efficacy and better control and management of processes (smart city, etc.)	**W6; W3**	**O3**	Improve the planning and coordination system by developing IT industry. The need for system fragmentation is reduced
O4 Reduction of operating costs of public administration - job sharing, optimization and economizing	**S1;S2**	**O4**	Optimization and economizing can be implemented more efficiently on a smaller number of system units	**W4**	**O4**	Reduction of public administration's operating costs frees up the funds for strengthening investment potential
O5 Strengthening of polycentric development in support of rural areas	**S1; S4**	**O5**	Smaller state enables better organization for the purpose of reducing regional inequalities	**W2**	**O5**	Strengthening polycentric development and the capabilities to take over powers reduces system centralization
O6 Increasing quality of strategic planning	**S6**	**O6**	Increasing the quality of strategic planning enables better implementation of projects, particularly in terms of utilizing EU funds	**W4**	**O6**	Increasing quality and objectivization of strategic planning can help to identify and initiate activities aimed at reducing regional inequalities
THREATS (T)	***S-T Maxi-Mini Strategies***			***W-T Mini-Mini Strategies***		
T1 Strong resistance of political elites at the subnational level	**S2**	**T1**	Use scientific arguments to influence the resistance of political elites	**W1**	**T1**	Strengthen scientific and expert arguments to reduce resistance to reforms
T2 Significant number of employees in the counties - social aspect of the reforms	**S5**	**T2**	A reform involving major organizational changes leads to problems related to the optimization of human resources. Some of the potentially redundant employees on the level of counties can be directed to new main management levels (cities and municipalities) and to meeting the real sector's requirements for human resources (retraining, etc.)	**W4**	**T2**	Strengthen development and investment potential of cities/municipalities through better use of EU funding, thereby enabling quality social and transition programmes
T3 Negative demographic trends	**S5**	**T3**	Major centres established during the first stage and new developing centres are strongly connecting to the environment, and by providing quality service increase the quality of living in the units with critical demography to reduce permanent migrations	**W4**	**T3**	Solve operational problems faster by emphasizing the need for stronger development of the potential of cities/municipalities in order to boost demographic trends
T4 Problems in the transport network and connections of different parts of Croatia	**S5**	**T4**	Strengthen the transport network to improve the connection between the centres and the periphery, to encourage daily migrations instead of permanent migrations	**W6**	**T4**	Planning at the regional level must be strongly directed at improving the centre-periphery communication
T5 Non-uniform spatial distribution of population and settlements	**S4**	**T5**	The existing nodal (functional) system must be integrated with the periphery to improve spatial distribution of population and settlements	**W4**	**T5**	Strengthening the growth and development of the regional state leads to growing demand for workforce and increases mobility
T6 Rural areas lagging in development	**S6**	**T6**	Major urban centres and new developing centres must take on the functions supporting the surrounding rural areas using dedicated EU funding	**W6**	**T6**	Investing in education of citizens and entrepreneurs as support to rural development

Source: Author's systematization

The TOWS matrix combinations generate four groups of possible strategies that also propose activities for implementing the chosen strategy. Thus, at this stage of model development, four possible strategies have been outlined. The question that now arises is how to choose, as objectively as possible, the one strategy that is the most appropriate for the examined

problem. To that end, the matrix is additionally quantified by introducing the Delphi analysis, which provides a clearer situation for making necessary conclusions.

Step 4. Delphi analysis and adoption of weighted values of matrix components (weights)

Using the Delphi analysis, weighted values (weights) are assigned to the corresponding main SWOT matrix components. The maximum weight of each of the main matrix components can be 1, and the weight of each individual factor within the main component (e.g. S = {S_1, S_2, S_3,..., S_i} etc.) can range from 0 to 1, where 1 signifies maximum significance of the component. Table 5 shows the results of weighting of the internal factors – the weight value is derived from the Delphi method as defined by the model assumptions.

Table 5. Weighted values of internal S-W components of the TOWS matrix for Croatia's regional level – the Delphi analysis results

	Internal factors	Delphi weight		Internal factors	Delphi weight
	STRENGTHS (S)	**1**		**WEAKNESSES (W)**	**1**
S1	Smaller population and smaller state territory enables efficient organization	0,1	**W1**	Lack of political will to make a decision on nation-wide reform	0,3
S2	Scientific and professional public support of reform	0,1	**W2**	Centralization of function at the state level	0,1
S3	Sufficient time to prepare the implementation of the reform with regard to the next EU financial perspective	0,2	**W3**	Increasing system fragmentation	0,1
S4	Favourable existing nodal (functional) system	0,1	**W4**	Lack of investment potential of counties and cities/municipalities	0,2
S5	Major urban centres ready to take on greater responsibility	0,2	**W5**	Backlogs in the education system as support to growth and development	0,2
S6	Funding from EU regional development funds	0,3	**W6**	Poor national system of strategy planning and coordination	0,1

Source: Author's systematization

The same methodology that was applied to the internal factors was used for the weighting of the external factors of the TOWS matrix for Croatia's local (regional) self-government (Table 6).

Table 6. Weighted values of external O-T components of the TOWS matrix for Croatia's regional level – the Delphi analysis results

	External factors	Delphi weight		External factors	Delphi weight
	OPPORTUNITIES (O)	**1**		**THREATHS (T)**	**1**
O1	EU trends – strong urbanization and strengthening of urban centres as the drivers of development (finance, collaboration, knowledge, etc.)	0,3	**T1**	Strong resistance of political elites at the subnational level	0,2
O2	Manageable state of Croatia's public finances	0,1	**T2**	Significant number of employees in the counties - social aspect of the reforms	0,1
O3	Development of the Croatian IT sector in support of the process of reform	0,2	**T3**	Negative demographic trends	0,3
O4	Reduction of operating costs of public administration - job sharing, optimization and economizing	0,1	**T4**	Problems in the transport network and connections of different parts of Croatia	0,1
O5	Strengthening of polycentric development in support of rural areas	0,2	**T5**	Non-uniform spatial distribution of population and settlements	0,1
O6	Increasing quality of strategic planning	0,1	**T6**	Rural areas lagging in development	0,2

Source: Author's systematization

Step 5. Calculations of interactions of the quantified TOWS matrices

The next step involves the identification of relationships (interactions) between the four groups of individual factors. The complexity of interactions is marked with 0 and 1, where 0 means no or very weak interaction, and 1 means there is a relationship between the factors. All interactions are presented in the form of a table containing the main components (S, W, O and T), corresponding weights *(w)*, number of interactions *(r)* and weighted result ($P = w_{ii} \times r_{ii}$), as well as the sum of sections Σr and the sum of values ΣP.

The calculations for all interactions resulting from the S–O, S–T, W–O and W–T relationships is shown in Tables 7 to 10 below.

Table 7. S–O interactions of the TOWS matrix for regional Croatia

STRENGTHS/OPPORTUNITIES (SO)	O1	O2	O3	O4	O5	O6	w	r_{so}	Pws
S1	0	0	1	1	1	0	0,1	3	0,3
S2	0	0	0	1	0	0	0,1	1	0,1
S3	0	1	0	0	0	0	0,2	1	0,2
S4	1	0	0	0	1	0	0,1	2	0,2
S5	1	0	0	0	0	0	0,2	1	0,2
S6	0	0	0	0	0	1	0,3	1	0,3
w	0,3	0,1	0,2	0,1	0,2	0,1		***9***	***1,3***
r_{os}	2	1	1	2	2	1	***9***		
Pwo	0,6	0,1	0,2	0,2	0,4	0,1	***1,6***		
Sum of sections	∑r							**18**	
Sum of values	∑P								**2,9**

Source: Author's systematization

Table 7 shows S–O relationships, i.e. interactions between all strengths (S) and opportunities (O). Strengths S1 and S4 have the highest number of interactions with the opportunities. The sum of all sections is 18, while their weighted result is 2.9.

Table 8. S–T interactions of the TOWS matrix for regional Croatia

STRENGTHS/THREATS (ST)	T1	T2	T3	T4	T5	T6	w	r_{st}	Pws
S1	0	0	0	0	0	0	0,1	0	0
S2	1	0	0	0	0	0	0,1	1	0,1
S3	0	0	0	0	0	0	0,2	0	0
S4	0	0	0	0	1	0	0,1	1	0,1
S5	0	1	1	1	0	0	0,2	3	0,6
S6	0	0	0	0	0	0	0,3	0	0
w	0,2	0,1	0,3	0,1	0,1	0,2		***5***	***0,8***
r_{ts}	1	1	1	1	1	0	***5***		
Pwt	0,2	0,1	0,3	0,1	0,1	0	***0,8***		
Sum of sections	∑r							**10**	
Sum of values	∑P								**1,6**

Source: Author's systematization

Table 8 shows S–T relationships consisting of interactions between all strengths (S) and threats (T). Strength S5 achieved the best impact on the threats. The sum of all sections for this matrix is 10, and their weighted result is 1.6. Both values are lower than the S–O matrix values, which means that, with respect to these two matrices, the current strengths have a better impact on the strengthening of potential opportunities than on reducing recent threats (proactive matrix).

Table 9. W–O interactions of the TOWS matrix for regional Croatia

WEAKNESSES/OPPORTUNITIES (WO)	O1	O2	O3	O4	O5	O6	w	r_{wo}	Pww
W1	1	1	0	0	0	0	0,3	2	0,6
W2	0	0	0	0	1	0	0,1	1	0,1
W3	0	0	1	0	0	0	0,1	1	0,1
W4	0	0	0	1	0	1	0,2	2	0,4
W5	0	0	0	0	0	0	0,2	0	0
W6	0	0	1	0	0	0	0,1	1	0,1
w	0,3	0,1	0,2	0,1	0,2	0,1		*7*	***1,3***
r_{ow}	1	1	2	1	1	1	*7*		
Pwo	0,3	0,1	0,4	0,1	0,2	0,1	***1,2***		
Sum of sections	∑r							**14**	
Sum of values	∑P								**2,5**

Source: Author's systematization

Table 9 and Table 10 below examine the relationships between the weaknesses (W) and opportunities (O) and threats (T) respectively. In the W–O matrix, the weaknesses that can be best impacted by opportunities are weaknesses W1 and W4. The sum of all sections of the relationships is 14, while their weighted value amounts to 2.5.

Table 10. W–T interactions of the TOWS matrix for regional Croatia

WEAKNESSES/THREATS (WT)	T1	T2	T3	T4	T5	T6	w	r_{wt}	Pww
W1	1	0	0	0	0	0	0,3	1	0,3
W2	0	0	0	0	0	0	0,1	0	0
W3	0	0	0	0	0	0	0,1	0	0
W4	0	1	1	0	1	0	0,2	3	0,6
W5	0	0	0	0	0	0	0,2	0	0
W6	0	0	0	1	0	1	0,1	2	0,2
w	0,2	0,1	0,3	0,1	0,1	0,2		*6*	***1,1***
rtw	1	1	1	1	1	1	*6*		
Pwt	0,2	0,1	0,3	0,1	0,1	0,2	*1*		
Sum of sections	∑r							**12**	
Sum of values	∑P								**2,1**

Source: Author's systematization

Table 10 shows the relationships between the weaknesses (W) and threats (T). The Mini-Mini strategy (W–T) emphasizes activities aimed at reducing weaknesses (W) in order to secure a better position to defend from or avoid threats (T). The sum of sections is 12, while the weighted sum of values is 2.1. Compared to the result of the W–O matrix, it is evident that the option of choosing activities aimed at reducing weaknesses in order to better avoid the threats is less favourable, i.e. that maximizing opportunities in order to overcome weaknesses represents a better strategic solution.

Step 6. Adopting the optimal matrix (strategy) i.e. solution to the problem

The overview of the sums of all relationships (interactions) and the corresponding values for each of the TOWS relationship given in Tables 7 to 10 is presented in Table 11.

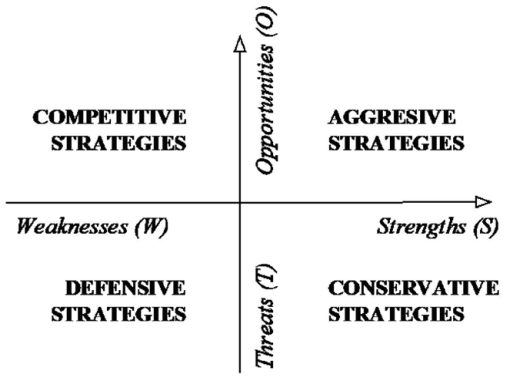
Table 11. Results of all TOWS matrix interactions with corresponding values

	Sum of sections ∑r	Sum of values ∑P
S/O	18	2,9
S/T	10	1,6
W/O	14	2,5
W/T	12	2,1

Source: Author's systematization

Results presented in Table 11 are interpreted with reference to "four optional strategies derived from the relationships of the main factors: (i) Competitive strategies; (ii) Aggressive strategies; (iii) Defensive strategies and (iv) Conservative strategies." (Czajkowska, 2016). Optional directions of the main strategies are shown in Figure 8.

Figure 8. Optional directions of the main strategies



Source: Czajkowska (2016)

At the end of the procedure the result of the TOWS matrix is obtained from the set of values that have the highest number of all interactions (Table 12).

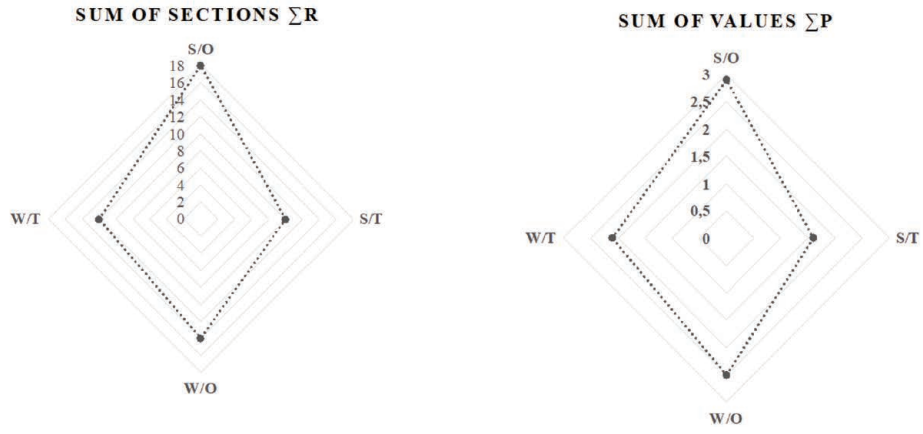
Table 12. TOWS matrix of the set of solutions to the problem of reform of Croatia's local (regional) self-government

	OPPORTUNITIES (O)	**THREATS (T)**
STRENGTHS (S)	**Aggressive strategy (SO)**	**Conservative strategy (ST)**
	∑r 18	∑r 10
	∑P 2,9	∑P 1,6
WEAKNESSES (W)	**Competitive strategy (WO)**	**Defensive strategy (WT)**
	∑r 14	∑r 12
	∑P 2,5	∑P 2,1

Source: Author's systematization

The solutions presented in Table 12 suggest that the S–O quadrant is the candidate for selection of strategy as the S–O solution has most interactions in general and the highest corresponding weight. The next recommended strategy option is the W–O solution, i.e. the competitive strategy. The weakest or the worst solution according to the results of the matrix is the S–T conservative strategy. A diagram of the results is shown in Figure 9 below.

Figure 9. Diagram of the results of the TOWS matrix strategic options



Source: Author's systematization

According to Figure 9, i.e. Table 12, the TOWS matrix solution suggests that when it comes to the approach to the reform of the local (regional) self-government, the recommended option to be selected is the aggressive S–O strategy, which would take advantage of the existing strengths within the local (regional) self-government and the current external opportunities to create a combined effect with a positive influence on the implementation of a strong

reform of Croatia's subnational, regional level. Thus, the results suggest the direction where the internal strengths are used to additionally maximize the external opportunities.

The ultimate question seeks to comprehend the implications of the model's findings for real-world implementation. The primary message is that utilizing the available external funding from EU funds, complemented by robust IT support and development — specifically digitization — can enhance efficiency in supporting polycentric development, especially in more rural areas. Furthermore, leveraging the traditionally strong urban centers by endowing them with greater legal and institutional authority would be pivotal in the future strategic reform of the regional system in Croatia.

5. CONCLUSION

The aim of this paper is to discuss possible improvements of the standard process of strategic planning within regional economics during its first stage, i.e. formulation of the strategy. When preparing strategies at the regional and local level, the methods generally used to formulate the strategy are the situational analysis and the SWOT matrix method, which, despite of its advantages, also has some significant limitations. In order to minimize the limitations of the SWOT matrix, the paper proposes the implementation of the developed model of the SWOT analysis, i.e. the SWOT/TOWS matrix. The entire model additionally stresses the importance of using both qualitative and quantitative input data in the strategic planning at the subnational level, emphasizing the benefits of the Focus group and the Delphi method as auxiliary methods applied to the model.

For the purposes of this research a simulation model was developed, where respective limitations were also defined. The model limitations are related to the quality of implementation of the focus group (sample, chief moderator's expertise), the selection of experts for the Delphi analysis and the moderation of the Delphi method, decision-making upon reaching the satisfactory level of convergence and the process of developing optional actions in the TOWS matrix. Compared to the standard methods for developing strategic documents and analyses within the scope of regional economics planning, the proposed model emphasizes the connection between the real-sector tools and the strategic decision-making processes of the public sector, minimizes the subjectivization of the situational analysis by introducing the Delphi method, utilizing independent expert knowledge, which is also the main contribution of this model. The proposed improved standard SWOT/TOWS model additionally provides a foundation for better communication of public policies to the community, as it is supported by local, but also by external, expert knowledge, boosting the exchange of good practices between different regions.

In conclusion, the simulation model developed in this paper achieved satisfactory outcomes, and could be applied in further research to solving of actual problems in strategic planning within the scope of regional economics. A point of interest for further theoretical research would be a simulation where certain other quantitative methods such as the AHP multi-criteria decision-making method, QSPM (the Quantitative Strategic Planning Matrix), etc.

would be introduced in the model. Furthermore, it is evident that there is considerable scope for conducting further similar research in which advanced models of situational analysis would be developed in the strategic decision-making processes at regional levels, particularly in the part related to the development of strategic plans for growth and development, so that the starting points for making strategic decisions would be as objective as possible.

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SIMULACIJSKI MODEL KVANTIFICIRANE SWOT / TOWS MATRICE U PRIMJERU SITUACIJSKE ANALIZE NA SUBNACIONALNOJ RAZINI

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SAŽETAK

Temeljeći se na ideji konvergencije koncepata i modela koji se koriste za strateško planiranje u realnom sektoru prema primjeni u javnom sektoru cilj ovog rada je razmotriti moguća unapređenja standardnog procesa strateškog planiranja na području regionalne ekonomike i to posebno u situacijskoj analizi kao početnoj fazi procesa. Sukladno navedenom u radu je izveden simulacijski model primjene kvantificirane SWOT/TOWS matrične analize. U modelu su primijenjene kombinacije dvije metode situacijske analize i to SWOT i TOWS matrica, te su dodatno uvedene metode Fokus grupe i Delfi analiza. U odnosu na standardne metode izrade strateških dokumenata i analiza u području planiranja regionalne ekonomike predloženi model naglašava povezanost alata područja realnog sektora sa procesima strateškog odlučivanja javnog sektora, smanjuje se subjektivizacija situacijske analize uvođenjem Delfi metode s utilizacijom ekspertnih i neovisnih znanja što je i glavni doprinos ovog modela. Simulacijski model izveden u radu pokazuje zadovoljavajuće ishode, te bi u nastavku istraživanja bilo moguće model primijeniti u rješavanju realnih problema strateškog planiranja na području regionalne ekonomike. Ograničenja modela vezana su uz kvalitetu izvođenja fokus grupe (uzorak, ekspertiza glavnog moderatora), odabir stručnjaka za Delfi analizu i moderiranje Defli metode, te na proces izrade opcijskih akcija u TOWS matrici. Nalazi iz procesa modeliranja, diskusija modela i otvorena pitanja vezana uz moguća daljnja istraživanja, a sve temeljno na ideji konvergencije alata strateškog planiranja realnog i javnog sektora, predstavljaju i očekivani glavni doprinos ovog rada.

Ključne riječi: *strateško planiranje, regionalna ekonomika, SWOT / TOWS, simulacijski model, Hrvatska*