ORDERING AND SELECTION OF ELEMENTS OF THE SWOT MATRIX USING A MULTI-CRITERIA APPROACH AND A GROUP DECISIONS

Augusto Chebel Machado, RA: 231762
a231762@dac.unicamp.br
Emerson José Ferri
ejferri@unicamp.br
Lucas Tramonte, RA: 182697
l182697@dac.unicamp.br

State University of Campinas, Faculty of Applied Sciences Rua Pedro Zaccaria, 1300, Limeira - SP

SUMMARY

The project proposes the application of multi-criteria methods to order the alternatives listed for the SWOT matrix, used in one of the phases of Unicamp's Strategic Planning. In each quadrant, for each decision-maker, a method was developed based on the use of the PROMETHEE-II ordering strategy to define preferences. In a second analysis, based on the individual rankings, an ordering is suggested for the group, using the Borda and Condorcet methods.

KEY WORDS. Strategic Planning, SWOT, PROMETHEE, Borda, Condorcet. Topics (Multicriteria Decision Support, Group Decisions).

ABSTRACT

The project proposes the application of multi-criteria methods for ordering the alternatives listed for the formation of the SWOT matrix, used in one of the phases of Unicamp's Strategic Planning. In each of the quadrants, for each decision maker, a method based on the use of the PROMETHEE-II ordering strategy was developed to define preferences. In a second analysis, based on the individual rankings, an ordering for the group is suggested, using the Borda and Condorcet methods.

KEYWORDS. Strategic Planning, SWOT, PROMETHEE, Borda, Condorcet.
Paper Topics (Multicriteria Decision Aid, Group Decision-making)

1. Introduction

1.1. Background and Motivation

Strategic Planning practices have been adopted by various institutions, both private and public; for the public sector, it is necessary because "*government actions, in theory and in practice, must be preceded by a conscious reflective process prior to their execution, this is the essence that motivates the act of planning and formulating strategies*" [Toni, 2021]. But most of the theoretical-methodological frameworks are developed for and by the private sector and do not address, at least in a consistent way, the need for collective construction and considering political agendas that public administration requires.

Since 2004 [Atvars and Serafim, 2020], Unicamp has been carrying out Strategic Planning both at institutional level and at the level of administrative units and bodies and, in order to prepare it, it has adopted a model that includes four (4) main phases that are worked on in sequence (Identity, Diagnosis, Strategic Map and Strategic Indicators). All of them are carried out in groups (with representatives of the categories that make up the unit that is drawing up its planning and, in some cases, external actors) and their products are the results of this group's decisions.

From the "Diagnosis" stage, which was carried out to draw up the SWOT matrix[1] , decision-making involves many alternatives and various actors (decision-makers); it therefore requires the group to rank the alternatives in order to compose this matrix.

In this way, multi-criteria decision support analysis methods can help with this stage. Some applications have already been found in the literature, such as the application of AHP with SWOT (known as A'WOT) [Kangas, Pesonen, Kurttila and Kajanus, 2001] or the application of the TOPSIS method [Alptekín, 2013] or the PROMETHEE II method [Živkovic´, Nikolic´, Savic ´, Djordjevic' and Mihajlovic', 2017].

1.2. SWOT

SWOT analysis is a simple tool, which makes it easy to use in group workshops where there are no specialists, to help decision-makers define strategies by cross-referencing the internal environment (strengths and weaknesses) with the external environment (opportunities and threats). Thus, defining which elements will make up the SWOT matrix is essential to ensure that appropriate strategies are proposed.

For this reason, the "Diagnosis" stage is carried out, in which the elements of the internal environment (strengths and weaknesses) of the body and the external environment (opportunities and threats) that could have an impact on the body are collectively surveyed.

[1] Acronym for the English words Strengths, Weaknesses, Opportunities and Threats. It is therefore known as the SWOT matrix in Portuguese.

alternatives need to be sorted and selected, otherwise there would be too many alternatives to deal with, and also because of the focus that Strategic Planning requires

That said, the focus of this paper is to propose a group decision-making method for ordering and selecting which elements (which we will call alternatives) of strengths, weaknesses, threats and opportunities will make up the SWOT matrix that will serve as input for defining strategies. Figure 1 shows the organization of the SWOT matrix.

Figure 1- SWOT Matrix.

Matriz SWOT	OPORTUNIDADES Lista levantada: O1; O2; O3;	AMEAÇAS Lista levantada: A1; A2; A3;
FORÇAS Lista levantada: - F1; - F2; - F3;	INVESTIR Quais objetivos estratégicos podemos propor aproveitando as oportunidades combinada com nossas forças? Exemplo: F1xO1 = proposta de objetivo estratégico 1)	DEFENDER Como podemos utilizar nossas forças para bloquear as ameaças e assegurar resultado? Exemplo: F2xA1 = proposta de objetivo estratégico 2
FRAQUEZAS Lista levantada: - f1; - f2; - f3;	DECIDIR Quais fraquezas podemos melhorar para poder aproveitar as oportunidades e gerar resultado? Exemplo: f1xO2 = proposta de objetivo estratégico 3	CONTROLE DE RISCOS/DESINVESTIR Decidir quais fraquezas precisamos melhorar de forma a conter as ameaças e assegurar resultado? f2xA2 = proposta de objetivo estratégico 4

Source: Author (2022).

1.3. PROMETHEE method

The PROMETHEE method is part of a non-compensatory approach to ranking methods, in which the idea is to make the alternatives compete with each other on each criterion, for subsequent weighting.

For each criterion, it is necessary to determine the preference function that will model the preference matrix, which depends on the distance d between the alternatives:

$$P_j(a, b) = F_j[d_j(a, b)] = F_j[g_j(a) - g_j(b)] . \quad (1)$$

With this in mind, the preference function can take different forms, depending on how the decision-maker models the problem. As an example, you can define a function that for any distance between the alternatives there will be a preference between them, which is called the 'usual function', or a function that has thresholds q and p so that the preference between the alternatives is linear between these values, called the 'linear function'.

Aggregation using the PROMETHEE method is carried out using the value obtained for the preference, weighted by the weight of each criterion, which makes it possible to generate the M preference matrix, which indicates the degree to which each alternative is preferable to another, weighted by the weights of each sub-criterion.

Once the M matrix has been established, the positive and negative flows of the alternatives can be defined. These flows make it possible to calculate the net flow of the method, which expresses a preference for one alternative over another if the flows are discrepant, and an indifference if the flows are equal [Ishizaka and Nemery, 2013].

1.4. Group decisions

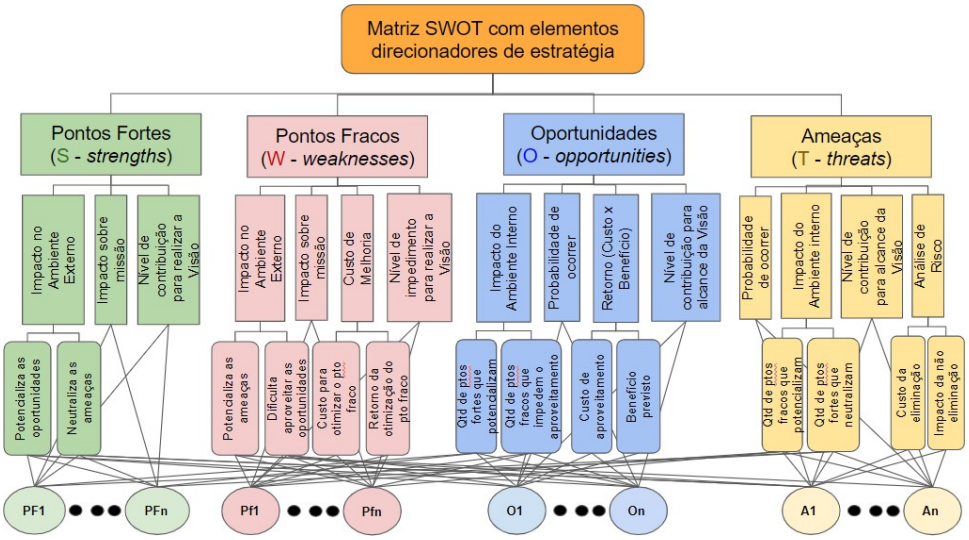
Finally, after the flows have been determined using the PROMETHEE method, the rankings obtained can be considered using group decision methods, so that the assessment of several decision-makers is included in the final ranking. In this context, the first method that can be used is called the Borda method, which consists of assigning scores to the alternatives, weighted by the number of decision-makers, so that the inclusion or exclusion of an alternative can alter the final ranking. In contrast, the second method, called the Condorcet Method, has a binary comparison structure between the candidates, so that the alternative with the highest number of preferences over the others is called the 'Condorcet winner', and is therefore not sensitive to the exclusion or inclusion of an alternative [Ishizaka and Nemery, 2013].

2. Structuring, choice of criteria and statement of alternatives

Structuring the problem is fundamental to understanding and defining the best approach to resolving it, considering the public nature of the issue and the collective impact of the decision. In order to select the most suitable set for each of the quadrants of the SWOT matrix (Strengths, Weaknesses, Opportunities and Threats) from a large number of alternatives, it was deemed necessary to define criteria and sub-criteria that could correlate each of the lists of interest, in order to reduce the number of evaluations required by each decision-maker. Thus, for each ranking, a conceptual map was drawn up to illustrate the criteria and sub-criteria[2] that make them up, as shown in Figure 2.

[2] A detailed explanation of the criteria and sub-criteria can be found in the document GUIDE DEFINITIONS ELEMENTS, CRITERIA AND SUBCRITERIA FOR EVALUATING THE ALTERNATIVES THAT MAKE UP THE SWOT MATRIX

Figure 2 - Tree of criteria, sub-criteria and alternatives



Source: Author (2022).

Thus, each of the orderings made will take into account factors that are relevant to the agency's strategic planning, such as cost, return, impact and risk criteria, among others, while at the same time seeking to extract the maximum benefit from the surveys of alternatives carried out (through the quantitative sub-criteria). The aim is always to maximize what contributes most to its Mission and Vision, with the least effort (investment) required.

The alternatives were raised at a Strategic Planning workshop ("Diagnosis" phase) held in November/22 at Unicamp's DEPI administrative body (Executive Directorate for Integrated Planning) with a group of 27 civil servants from the body.

For each quadrant of the SWOT matrix, the set of alternatives selected is shown in Tables 1, 2, 3 and 4.

Table 1 - Alternative Strengths

S - Pontos Fortes	
S1	Qualidade técnica dos profissionais
S2	Equipe e ambiente
S3	Incetivo à capacitação
S4	Ações geram impacto na Comunidade
S5	Incentivo à novas iniciativas
S6	Conhecimento abrangente e disseminável
S7	Profissionais engajados
S8	Autonomia e confiança na tomada de decisões
S9	Comunicação interna
S10	Boa infraestrutura e boas condições de trabalho
S11	Clareza e detalhamento dos procedimentos e processos padronizados
S12	Bom atendimento
S13	Visão sistemica
S14	Papel atuante como suporte à tomada de decisões na universidade
S15	Boa comunicação com usuários
S16	Coerência na composição da DEPI frente a estrutura organizacional da Unicamp

Source: Author (2022).

Table 2 - Alternative Weaknesses

W - Pontos Fracos	
W1	Processos de trabalhos pouco definidos
W2	Comunicação institucional deficiente
W3	Separação fisica das equipes
W4	Falta de pessoal
W5	Talentos pouco explorados
W6	Falta de sistema de informação adequado ao processo atual
W7	Falta de conhecimento do usuário sobre os serviços prestados
W8	Falta de integração entre os setores da DEPI
W9	Oferecer poucos treinamentos na universidade dado o conhecimento que possui
W10	Falta de clareza dos objetivos a serem alcançados
W11	Indefinição sobre a área de projetos de empreendimentos
W12	Demora no retorno de algumas solicitações
W13	Falha de comunicação interna entre as equipes

Source: Author (2022).

Table 3 - Alternative Opportunities

O - Oportunidades	
O1	Uso da tecnologia BIM
O2	Crescimento do tema sustentabilidade
O3	Melhoria do trabalho com uso das TIC
O4	Lei de licitações 14.133 otimizando o processo de licitações a partir de 2023
O5	Amparo e segurança legal
O6	Inovação do ambiente universitário
O7	Valorização e reconhecimento das competências independentemente das caraterísticas físicas
O8	Fundo patronos, nova via de financiamento das ações da DEPI
O9	Representação em órgãos externos
O10	Eventos da Universidade
O11	Interesse de agentes externos para novas parcerias
O12	Recursos para projetos obras e ações

Source: Author (2022).

Table 4 - Threat Alternatives

T - Ameaças	
T1	Resistência da comunidade universitária à políticas de planejamento e gestão integradas
T2	Crescimento da demanda além da capacidade operacional
T3	Baixa qualidade das empresas/ produtos/ serviços contratados
T4	Perda de talentos
T5	Implicações orçamentárias
T6	Dificuldade de interface com outras áreas técnicas e administrativas da Unicamp
T7	Vulnerabilidade dos sistemas automatizados podem causar vazamento de dados
T8	Interesses pessoais acima das desições técnicas
T9	Incertezas de critérios e volume de recursos para política de progressão de carreira na universidade
T10	Mudança no cenário politico
T11	Revogação e ou abrandamento das legislações vigentes
T12	Despreparo para trabalhar a inclusão podendo gerar conflitos internos
T13	Obstrução da procuradoria geral da universidade
T14	Falta de infraestrutura e resistência a automatização dos processos
T15	Deterioração do patrimônio edificado da Unicamp
T16	HIDS: o início da ocupação da fazenda argentina trará alta demanda dos serviços da DEPI (obras e sustentabilidade)
T17	Intrusão do novo governo do estado de São Paulo na autonomia orçamentária da universidade
T18	Ameaças sanitárias

Source: Author (2022).

3. Methodology and Implementation

The proposed method works with independent criteria and sub-criteria for each ranking, but which have some level of relationship, so that information can be reused during the stages. This property is important since, when dealing with opportunities or threats, for example, strengths and weaknesses can be used to contribute to the assessment, and the reverse is also applicable.

The decision-maker therefore acts in the evaluation of the alternatives for each quadrant of the SWOT matrix, according to the precepts established. They participate in two stages: filling in the four correlation matrices and verbally judging the alternatives on the qualitative criteria.

The first stage refers to the number of correlations between each strength, weakness, opportunity and threat. The matrices are filled in so that 1 means there is a correlation and 0 means there is not. Figures 3, 4, 5 and 6 show what is proposed.

Figure 3 - Correlation for Strengths x Opportunities

Pontos Fortes x Oportunidades					
	O1	O2	...	Om	
S1					$\sum_{j=1}^{m} SO_{ij}, \forall\, i = 1,2,\dots,n$
S2					
...					
Sn					
	$\sum_{i=1}^{n} SO_{ij}, \forall\, j = 1,2,\dots,m$				

Source: Author (2022).

Figure 4 - Correlation for Strengths x Threats

Pontos Fortes x Ameaças					
	T1	T2	...	Tm	
S1					$\sum_{j=1}^{m} ST_{ij}, \forall\, i = 1,2,\dots,n$
S2					
...					
Sn					
	$\sum_{i=1}^{n} ST_{ij}, \forall\, j = 1,2,\dots,m$				

Source: Author (2022).

Figure 5 - Correlation for Weaknesses x Opportunities

Pontos Fracos x Oportunidades					
	O1	O2	...	Om	
W1					$\sum_{j=1}^{m} WO_{ij}, \forall\, i = 1,2,\dots,n$
W2					
...					
Wn					
	$\sum_{i=1}^{n} WO_{ij}, \forall\, j = 1,2,\dots,m$				

Source: Author (2022).

Figure 6 - Correlation for Weaknesses x Threats

Pontos Fracos x Ameaças					
	T1	T2	...	Tm	
W1					$\sum_{j=1}^{m} WT_{ij}, \forall\, i = 1,2,\dots,n$
W2					
...					
Wn					
	$\sum_{i=1}^{n} WT_{ij}, \forall\, j = 1,2,\dots,m$				

Source: Author (2022).

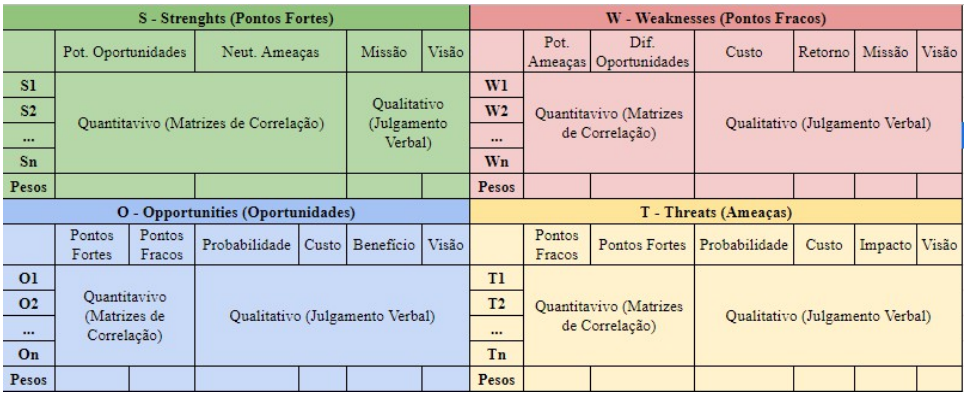
With this first phase completed, we were able to extract the information regarding the number of strengths and weaknesses that relate to each opportunity and threat; as well as the number of opportunities and threats linked to each strength and weakness, through the sums of the rows and columns of each matrix. This information is each decision-maker's assessment of the method's quantitative criteria/subcriteria.

The second stage consists of filling in the verbal assessments of the qualitative criteria/subcriteria, using a 5-point scale (Very High, High, Medium, Low and Very Low), for each quadrant of the SWOT matrix.

Operationally, spreadsheets were used to collect these initial stages. An editable spreadsheet was made available for the decision-makers to provide their evaluations.

After the two stages have been completed by the decision-maker, the answers are compiled and placed in the four decision matrices of interest (SWOT), so that the multi-criteria methods can be applied. Figure 7 shows the matrices mentioned as the end result of the decision-maker's participation.

Figure 7 - Decision matrices for each quadrant of the SWOT matrix



Source: Author (2022).

With this in mind, an example of the decision matrix for strengths can be seen in Table 5, and the same procedure was repeated to obtain the decision matrix for weaknesses, opportunities and threats for all four decision-makers.

Table 5 - Strengths decision matrix for a decision-maker.

Alternativas/Critérios	Pot. Oport	Neut. Ameaça	Missão	Visão
Qualidade técnica dos profissionais	4	4	Alto	Muito Alto
Equipe e ambiente	3	7	Alto	Médio
Incetivo à capacitação	9	5	Alto	Alto
Ações geram impacto na Comunidade	8	4	Médio	Alto
Incentivo à novas iniciativas	10	11	Baixo	Alto
Conhecimento abrangente e disseminável	7	6	Médio	Médio
Profissionais engajados	9	17	Alto	Muito Alto
Autonomia e confiança na tomada de decisões	4	11	Médio	Médio
Comunicação interna	2	11	Alto	Alto
Boa infraestrutura e boas condições de trabalho	4	4	Alto	Alto
Clareza e detalhamento dos procedimentos e processos padronizados	2	8	Alto	Médio
Bom atendimento	1	4	Muito Alto	Alto
Visão sistemica	0	14	Médio	Muito Alto
Papel atuante como suporte à tomada de decisões na universidade	6	14	Médio	Alto
Boa comunicação com usuários	1	9	Alto	Alto
Coerência na composição da DEPI frente a estrutura organizacional da Unicamp	4	5	Alto	Médio

Source: Author (2022).

The weights of each criterion used in the matrices are dealt with in a separate and distinct manner and are not the responsibility of the decision-makers, due to their large number and the difficulty of reaching a consensus. For this reason, the weights are arbitrated by a second group of people (experts on the subject), who provide their assessments and weightings for each criterion and sub-criterion. In the end, the simple average of the weights provided by the group is adopted. Four people were considered at this stage, who were given an electronic spreadsheet for assignment and evaluation.

The individual and final weights assigned to each quadrant of the SWOT matrix are shown in Tables 6 and 7.

Table 6 - Calculation and determination of weights for External Environment (Opportunities and Threats)

	Critérios/Subcritérios	Esp.1	Esp. 2	Esp. 3	Esp. 4	Pesos
Oportunidades	Qtd de pontos fortes que alavancam	0,24	0,28	0,08	0,24	**0,21**
	Qtd de pontos fracos que impedem aproveitamento	0,06	0,12	0,12	0,06	**0,09**
	Probabilidade de ocorrer	0,1	0,1	0,2	0,1	**0,13**
	Custo de aproveitamento previsto	0,075	0,1	0,18	0,1	**0,11**
	Benefício previsto	0,175	0,1	0,12	0,1	**0,12**
	Nível de contribuição para alcance da Visão	0,35	0,3	0,3	0,4	**0,34**
Ameaças	**Critérios/Subcritérios**	Esp.1	Esp. 2	Esp. 3	Esp. 4	**Pesos**
	Qtd de pontos fracos que potencializam	0,12	0,28	0,14	0,18	**0,18**
	Qtd de pontos fortes que neutralizam	0,18	0,12	0,06	0,12	**0,12**
	Probabilidade de ocorrer	0,2	0,2	0,2	0,1	**0,18**
	Custo de eliminação	0,08	0,04	0,12	0,08	**0,08**
	Impacto de não eliminação	0,12	0,06	0,18	0,12	**0,12**
	Nível de impedimento para realização da Visão	0,3	0,3	0,3	0,4	**0,32**

Source: Author (2022).

Table 7 - Calculation and determination of weights for Internal Environment (Strengths and Weaknesses)

	Critérios/Subcritérios	Esp.1	Esp. 2	Esp. 3	Esp. 4	Pesos
Pontos Fracos	Qtd que potencializa as ameaças	0,13	0,05	0,07	0,12	**0,09**
	Qtd que dificulta o aproveitamento das oportunidades	0,07	0,05	0,03	0,08	**0,06**
	Custo para otimizar o ponto fraco	0,07	0,12	0,18	0,12	**0,12**
	Retorno da otimização do ponto fraco	0,13	0,08	0,12	0,08	**0,10**
	Impacto sobre a Missão do orgão	0,2	0,3	0,1	0,3	**0,23**
	Nível de impedimento para realização da Visão	0,4	0,4	0,5	0,3	**0,40**
Pontos Fortes	**Critérios/Subcritérios**	Esp.1	Esp. 2	Esp. 3	Esp. 4	**Pesos**
	Qtd que potencializa as oportunidades	0,09	0,1	0,09	0,15	**0,10**
	Qtd que neutraliza as ameaças	0,21	0,1	0,21	0,15	**0,17**
	Impacto sobre a Missão do orgão	0,2	0,4	0,1	0,3	**0,25**
	Nível de contribuição para realização da Visão	0,5	0,4	0,6	0,4	**0,48**

Source: Author (2022).

Once the decision matrices had been filled in and the weights determined, the PROMETHEE-II method was used to obtain the rankings of the lists in each quadrant, using the net flow as a parameter. For the quantitative criteria, which referred to the number of strengths and weaknesses related to opportunities and threats, and vice versa, the linear preference function was adopted, with thresholds at $q = 1$ and $p = 4$.

For the other criteria, the usual preference function was chosen, as it is a more subjective, less quantifiable judgment.

Once the individual rankings of each of the decision-makers had been obtained, according to their own assessments, depending on the community nature of the decision, a group decision-making method was used to define the final ranking of the group of people. The Borda and Condorcet methods were used to add value to each of the alternatives in each quadrant of the SWOT matrix.

With the weights and decision matrices filled in, the *Python* programming language was used to aggregate the results. Using the code developed, it was possible to import the decision matrices of each decision-maker, determine the desirable preference functions for each criterion/subcriterion, calculate the preference matrices and obtain the net flows of each of the alternatives, using the PROMETHEE-II method, for all the quadrants of the SWOT. Aggregation was also carried out using group decision methods.

4. Results and Discussion

With the decision-makers' evaluations collected and implemented in the proposed algorithm, the preferences of each decision-maker were ranked for each quadrant of the SWOT matrix. For all the quadrants (Strengths, Weaknesses, Threats and Opportunities), shown below, it can be seen that the Borda and Condorcet methods are very close in their results, but when compared with the result of the simple vote carried out to order and select the items by the group on 17/11/22, the relationship is very discrepant.

The proximity between the Borda and Condorcet methods is due to the fact that, when comparing individual rankings, in general, there are no major discrepancies ("preference" and "rejection"); in this way, the ranking by "score" (Borda method) is close to the "collective preferences" (Condorcet method).

However, in the case of the "Threat" alternatives, the Condorcet method was able to sort up to the 8th element, with the other items tied in the next position. The Borda method therefore proved to be a better alternative for this case, as it was possible to sort all the cases.

With regard to the simple voting method, it is necessary to consider some factors that may explain the discrepancy:

- the simple vote was carried out by 27 people, while the proposed method was carried out with a sample of four people from this group and it cannot be said that these participants represent the diversity of opinion of the group;

- in the simple vote, each participant can vote for up to 3 alternatives from the internal environment and 3 alternatives from the external environment during the workshop (a task that takes around 15 minutes), consequently there is no careful analysis of each item, possibly leading to a vote for pre-established preferences (which takes more into account personal interests);
- as the simple vote is open, everyone has access to the alternatives with the most votes and this can lead to the participant being directed so as not to "lose" the vote, so we have some items with many votes and many items with no votes;

Tables 8, 9, 10 and 11 show the alternatives with the individual rankings (D1 to D4), the Borda Method, the Condorcet Method and the simple vote taken by the DEPI workshop participants on 17/11/22 for each of the quadrants of the SWOT matrix.

Table 8 - Ranking of "Weaknesses"

#	Descrição	D1	D2	D3	D4	Borda	Condorcet	Of. 17/nov
Pf1	Falta de clareza dos objetivos a serem alcançados	1	3	1	7	2	1	-
Pf2	Processos de trabalhos pouco definidos	2	1	2	1	1	2	1
Pf3	Falta de sistema de informação adequado ao processo atual	3	2	12	3	3	3	5
Pf4	Comunicação institucional deficiente	4	7	9	6	6	6	2
Pf5	Falta de integração entre os setores da DEPI	5	4	4	11	4	4	-
Pf6	Falta de pessoal	6	12	10	8	11	9	4
Pf7	Oferecer poucos treinamentos na universidade dado o conhecimento que pos	7	9	11	2	8	7	-
Pf8	Falha de comunicação interna entre as equipes	8	10	7	10	10	11	-
Pf9	Falta de conhecimento do usuário sobre os serviços prestados	9	11	3	5	7	8	5
Pf10	Indefinição sobre a área de projetos de empreendimentos	10	5	5	4	5	5	-
Pf11	Talentos pouco explorados	11	8	6	9	9	10	5
Pf12	Demora no retorno de algumas solicitações	12	6	8	12	12	12	-
Pf13	Separação física das equipes	13	13	13	13	13	13	3

Source: Author (2022).

Table 9 - "Strengths" ranking

#	Descrição	D1	D2	D3	D4	Borda	Condorcet	Of. 17/nov
PF1	Profissionais engajados	1	11	1	2	2	1	-
PF2	Qualidade técnica dos profissionais	2	1	2	1	1	2	1
PF3	Incentivo à novas iniciativas	3	6	10	8	3	6	-
PF4	Visão sistemica	4	2	3	6	4	3	-
PF5	Conhecimento abrangente e disseminável	5	8	16	3	5	7	-
PF6	Papel atuante como suporte à tomada de decisões na universidade	6	4	8	11	6	4	-
PF7	Ações geram impacto na Comunidade	7	9	11	4	7	8	4
PF8	Autonomia e confiança na tomada de decisões	8	3	15	13	8	9	-
PF9	Clareza e detalhamento dos procedimentos e processos padronizados	9	12	12	10	9	10	-
PF10	Comunicação interna	10	14	4	14	10	11	-
PF11	Coerência na composição da DEPI frente a estrutura organizacional da Unicamp	11	7	14	7	11	12	-
PF12	Incetivo à capacitação	12	5	6	5	12	5	3
PF13	Equipe e ambiente	13	10	13	12	13	13	2
PF14	Boa comunicação com usuários	14	13	7	9	14	14	-
PF15	Boa infraestrutura e boas condições de trabalho	15	15	9	15	15	15	-
PF16	Bom atendimento	16	16	5	16	16	16	-

Source: Author (2022).

Table 10 - "Opportunities" ranking

#	Descrição Oportunidade	D1	D2	D3	D4	Borda	Condorcet	Of. 17/nov
O1	Crescimento do tema sustentabilidade	1	1	1	2	1	1	2
O2	Recursos para projetos obras e ações	2	6	2	6	2	2	-
O3	Uso da tecnologia BIM	3	3	3	7	3	3	1
O4	Melhoria do trabalho com uso das TIC	4	7	6	11	7	6	3
O5	Eventos da Universidade	5	5	11	1	5	4	-
O6	Interesse de agentes externos para novas parcerias	6	4	7	5	6	7	-
O7	Representação em órgãos externos	7	10	12	12	12	10	-
O8	Fundo patronos, nova via de financiamento das ações da DEPI	8	9	9	8	10	8	-
O9	Valorização e reconhecimento das competências independentemente das caraterísticas físicas	9	11	8	10	11	11	-
O10	Inovação do ambiente universitário	10	2	5	3	4	5	-
O11	Lei de licitações 14.133 otimizando o processo de licitações a partir de 2023	11	8	4	9	8	9	4
O12	Amparo e segurança legal	12	12	10	4	11	12	4

Source: Author (2022).

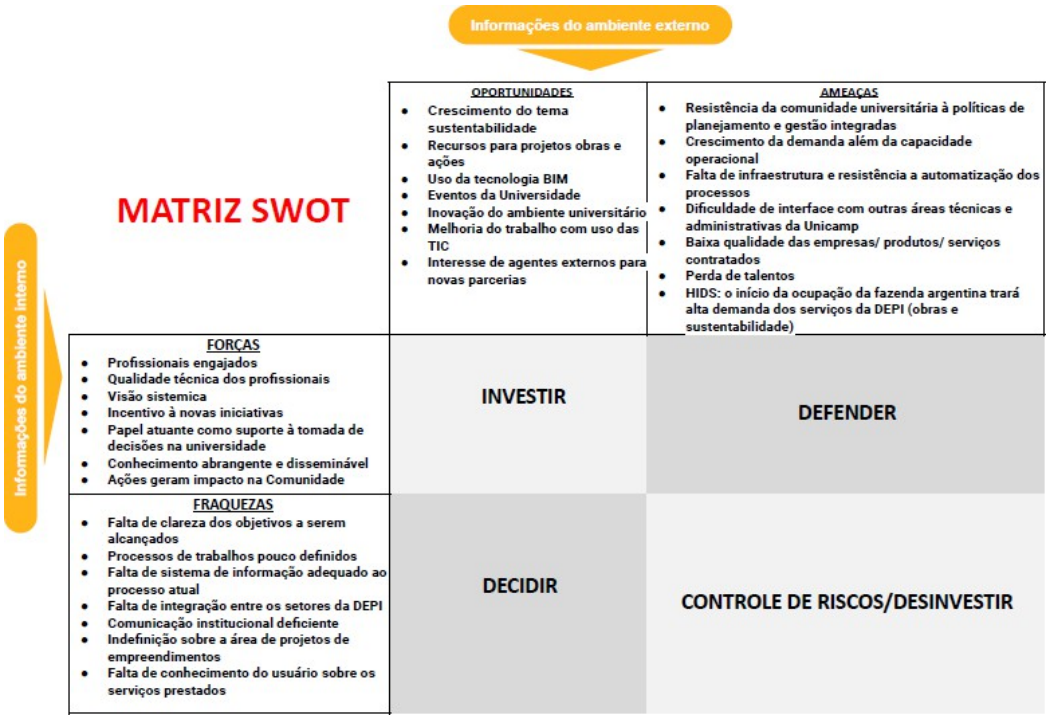
Table 11 - "Threats" ranking

#	Descrição	D1	D2	D3	D4	Borda	Condorcet	Of. 17/nov
A1	Resistência da comunidade universitária à políticas de planejamento e gestão integradas	1	1	3	1	1	1	1
A2	Crescimento da demanda além da capacidade operacional	2	12	1	8	2	2	2
A3	Falta de infraestrutura e resistência a automatização dos processos	3	2	16	14	7	3	-
A4	HIDS: o início da ocupação da fazenda argentina trará alta demanda dos serviços da DEPI (obras e sustentabilidade)	4	5	13	9	6	6	-
A5	Implicações orçamentárias	5	10	7	13	8	-	4
A6	Baixa qualidade das empresas/ produtos/ serviços contratados	6	6	11	5	4	4	3
A7	Dificuldade de interface com outras áreas técnicas e administrativas da Unicamp	7	4	10	6	3	5	4
A8	Intrusão do novo governo do estado de São Paulo na autonomia orçamentária da universidade	8	11	17	3	10	-	-
A9	Mudança no cenário político	9	8	14	7	9	7	-
A10	Ameaças sanitárias	10	15	12	4	13	-	-
A11	Obstrução da procuradoria geral da universidade	11	13	8	15	15	-	-
A12	Incertezas de critérios e volume de recursos para política de progressão de carreira na universidade	12	18	5	11	14	-	-
A13	Perda de talentos	13	9	4	2	5	8	3
A14	Interesses pessoais acima das desições técnicas	14	14	2	10	11	-	-
A15	Deterioração do patrimônio edificado da Unicamp	15	7	6	12	12	-	-
A16	Vulnerabilidade dos sistemas automatizados podem causar vazamento de dados	16	17	18	16	17	-	-
A17	Despreparo para trabalhar a inclusão podendo gerar conflitos internos	17	3	9	17	16	-	-
A18	Revogação e ou abrandamento das legislações vigentes	18	16	15	18	18	-	-

Source: Author (2022).

Thus, using the proposed method, we would have a SWOT matrix for drawing up the strategies, as shown in Figure 8. For this matrix, the first seven alternatives for each quadrant were considered, which in the end coincides with both the Borda and Condorcet methods, since for the SWOT matrix the order has no relevance.

Figure 8 - SWOT matrix with the alternatives ordered by the proposed method



Source: Author (2022).

5. Conclusion

The aim of the project was to present a structured proposal, using multi-criteria methods, to collectively order the elements that make up a SWOT matrix, used in one of the stages of the Strategic Planning process applied by Unicamp. Unlike the bibliographical references consulted, the focus was on assembling the matrix, i.e. defining which alternatives would make up each of the quadrants.

According to the results, the proposal was successful both in terms of methodology, since it was possible to define the elements (weights, criteria, sub-criteria, etc.) and apply the methods, both PROMETHEE-II, for individual ranking, and the Borda and Condorcet methods for ordering the group's preferences, including the application of different weights for decision-makers who are managers of the body in question, which brings the weight of the body manager's "Agenda" into this ordering. It was therefore possible to compare the application of the Borda and Condorcet methods; the former succeeded in sorting in all cases.

Practical application can also be assessed, since the weights and individual rankings were carried out in practice, with civil servants who work in the process and the alternatives are from a real case of a Unicamp body that is in the process of preparing its

Strategic Planning. This generated *feedback* on the material and method, indicating the feasibility of applying it on a real scale.

Finally, a SWOT matrix was generated that is coherent with the organization and its situation, which makes it possible to discuss and define guiding strategies. Even so, the group believes that some tests could be carried out with methods for individual ranking, such as the application of the Choquet Integral, since the independence of criteria / sub-criteria was one of the points of most discussion.

6. Bibliographical references

Alptekín, N. (2013) Integration of SWOT Analysis and TOPSIS Method In Strategic Decision Making Process. Anadolu University Faculty of Business Administration, Turkey.

Atvars, T. D. Z; Serafim, M. (2020) Gestão estratégica Planes: planejamento estratégico - Universidade Estadual de Campinas - UNICAMP 2021-2025 - Campinas, SP: UNICAMP/CGU; BCCL, 2020.

Ishizaka, A.; Nemery, P. (2013) Multi-Criteria Decision Analysis: Methods and Software. 1st Ed. John Wiley & Sons, Ltd: New Delhi, India.

Kangas, J. ; Pesonen, M.; Kurttila, M.; Kajanus, M., (2001) A'WOT: INTEGRATING THE AHP WITH SWOT ANALYSIS. Finnish Forest Research Institute Kannus Research Station.

Toni, J. (2021) Reflections on Strategic Planning in the Public Sector / Jackson de Toni. - Brasília: Enap.

Živkovic', Z.; Nikoli'c, D.; Savic', M; Djordjevic', P.; Mihajlovic', I. (2017) Prioritizing Strategic Goals in Higher Education Organizations by Using a SWOT-PROMETHEE/GAIA-GDSS Model. Engineering Management Department, University of Belgrade, Technical Faculty in Bor - DOI: 10.1007/s10726-017-9533-y