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Diagnostics of innovation management and innovation capacity of a business entity

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Abstract The paper deals with the formulation of a set of mutually applied methods for diagnosing and evaluating the innovation capacity and innovation vitality of companies from the SME segment. The aim is to create a simple and clear set of support tools for such companies, by which the companies are able to assess in practice their own state and level of development and opportunities in innovation and thus obtain a relatively clear informative value about the state of the company and opportunities to improve management and governance. Specifically, it solves the application of basic evaluation methods on the model of the SME company, namely the Comprehensive Audit of Innovative Management of the Company and Diagnostics of the State and Level of the Dimension of Management Innovation and presents ready-made solutions in this topic. The practical benefit is the creation and application of a group of methods and diagnostics as a specific guide of the sequence of steps that are necessary for the development of a given specified model type of company.

Key words evaluation, innovation, project, capacity, vitality, dimension

1. INTRODUCTION

Nowadays, the business environment is defined as a state where each company must be able to live with the risk of success in a turbulent environment, have an early warning and problem recognition system, crisis rescue scenarios and established rules for flexible chaos management and operational efficiency in business management. Current business practice is characterized as the transition from production companies to innovation companies with accelerating and alternating periods of stagnation and crisis and subsequent prosperity and growth. Imitation is the first impulse for one's own activity and a breakthrough in innovative thinking (Godin, 2018), but in business not imitators win, but those who create new things and open up a new market and achieve mastery. Although most managers now recognize modern approaches to managing companies such as innovation and total quality management of production, they are still dissatisfied with the way of management and the degree of success and profit. Innovation policy-making approaches tend to refer to the legislative and knowledge bases and specifics of a particular country or region and the rules of innovation in a given economic policy and business practice, and a significant gap can be seen here in current research and support for small and medium-sized enterprises (SMEs). The tools and procedures described by the authors for the management and innovation capacity and vitality of companies are not applied or known here (Adair, 2004), (Burnett, 2005), but there is no simple clear way of self-diagnosis, flexible interventions in self-management and real setting up an offer - demand - oriented updated marketing product mix for companies with the perspective of setting its competitiveness and efficiency.

2. INNOVATIVE CAPACITY AND INNOVATIVE VITALITY OF THE COMPANY

Companies overcome problem situations, and it is true that the existence of problems is a legal phenomenon due to the company's links to the environment, social environment, processes that take place in a company, potential risks, production quality assurance and requirements to ensure the company's target behaviour.

The currently available knowledge database for SME management is inhomogeneous, extensive and disorganized and the available working procedures and methods for evaluating and managing one's own company and its results and problems are used and perceived by managers only in isolation and only partial, unconceptual interventions and problem solving are applied. In practice, this means that with the increasing technical level of management tools, their use decreases. Technological development does not correspond to the real needs and expectations of business practice and the market in a given segment of SMEs. Well-known and advanced tools for managing and supporting innovation in the company (such as various strategic analyses, statistical monitoring and evaluation of activities and business results, etc.) are either too specialized, expensive, complicated or even lengthy and too broad-spectrum to be used in practice and especially dynamically in the environment of SMEs. (Tichý, Novotný, 2020)

It is demonstrable (CANTWELL, 1989), that the real value of many solutions, manuals and procedures and their interrelationship and impact on a company at risk gets as an organic set lost. It is obvious that system solutions are not approached in management practice "systematically and systemically", so nowadays the concept of systemicity has become only a kind of cliché and today's companies are trapped in the paradigm of the past, which protects them from greater flexibility and dynamism." (Štiavnický, 2010) When managers solve a company problem today, they actually invest all their efforts in its outputs/consequences and not in inputs/causes, and thus the whole effect of the solution is lost and this is often at a given stage and time literally unimaginably big problem, threatening the future existence of a business entity.

The company's innovative capacity is given by competitive advantages in the field of quality, efficiency and flexibility. The company itself, as a producer and at the same time a successful innovator, has the ability to explore the unknown and can continuously, quickly and easily operate in the market through innovations at a price advantage from competitors. (Lawson, Samson, 2001) The innovative vitality of a firm is its ability to demonstrate a state where it exists today without its present existence limiting its future existence beyond what is necessary. It is therefore a system of functioning of the company, which strives to be a sustainable success. (Plamínek, 2014) The innovative factor of vitality responds to the company's ability to determine how long it will last in the catchment market of business and product operations in practice, while the very existence of the company in real time and environment wears and consumes itself and whether its results are permanent or temporary, successful or unsuccessful, literally in vain and unnecessary, or effectively and ecologically clean, beneficial or dangerous, it is about considering whether the company exists in accordance with the environment or in conflict with it. (Novotný, 2018)

3. COMPREHENSIVE AUDIT OF INNOVATIVE COMPANY MANAGEMENT

The methodology and sequence of calculation steps, creation of tables, graphs, etc. are presented for each individual analysis, audit and diagnostics in this contribution. The order and content of individual steps of analysis are harmonized with individual essential areas of business of the sample subject, which ensures the logical connection of findings and measurements with the results and directions for future development and strengthening of vitality and internal innovation strength and capacity of the company.

In order to design procedures and implement strategic analysis in the creation of a new future strategy of innovation and quality of the researched company, it is necessary to perform the Audit of Innovation Management as a specific method of strategic analysis. Audit is understood as a mechanism to facilitate the creation of a company evaluation structure and its strategy related to innovation. In business practice, these are processes associated with organizational culture, sales techniques, project management at the customer and the acquisition of knowledge and management dynamics. A set of factors that currently significantly affect the success or failure of innovation in the company and the accepted scale of evaluation needs to be determined. It is thus possible to create a profile of the current innovation performance, resulting (in conjunction with the conclusions separately conducted primary and secondary SWOT analysis) formulating the principles of a new innovative approach as a key element for strategic management and planning in the product program of the company and its strategy for the future. All detected and measured data are plotted in the pentagram and after marking the shares for the individual control areas and connecting the individual values of the shares in the figure with lines.

To support or verify the reality of the findings from the pentagram in the audit of innovation management, each capable management of the company will also measure the innovation capacity of new products, and especially products or engineering and consulting services in the form of a radar graph - Fig. 2. This rating system was developed and first applied through 100 companies in the US and the UK, and has been progressively validated in almost twenty case studies with 18 sample leader companies. (ŠÚ SR, 2019) For the needs of small and medium-sized companies and according to already known business programs and segments, it is possible to use our conditions from the information database of the Slovak Statistical Office (ŠÚ SR, 2018), (ŠÚ SR, 2019) and create a pie chart (radar form) with selected main items. These are listed below in the text in the overview: Commentary on the radar graph, also as statement no. 1 to 40, in tab. 1 and 2, with each statement already assigned a value of 1 to 7 points.

Tab. 1: A set of evaluation statements

No.	Statement	Points
1.	People have a clear idea of how innovation helps to compete	3
2.	A process is in place to help effectively manage new products and bring them to market	3
3.	The organizational structure of the company does not limit innovations in any way	4
4.	There is a strong focus on staff development and training	2
5.	There are good relations with consultants and cooperating companies	5
6.	The company's innovation strategy is clearly communicated, everyone knows the improvements	1
7.	Innovative ideas and projects are usually completed on time and on budget	3
8.	People work well together within the company and its teams	4
9.	The time is devoted to the evaluation of projects in order to learn and improve	1
10.	The company is able to identify and perceive the needs and expectations of customers	6
11.	People know what is distinguishing competence and giving a competitive advantage	4
12.	There is an effective mechanism for everyone to perceive customer needs	6
13.	People are involved in ideas to improve products and processes	3
14.	Good cooperation with universities and research in order to develop knowledge	2
15.	The art of always learning from your own mistakes	4
16.	Looking to the future in a structured way to visualize future threats and opportunities	5
17.	There are effective mechanisms for change from idea to successful implementation	6
18.	The structure of the company helps to make quick decisions	7
19.	There is close cooperation with customers on new concepts	7
20.	The company's products and processes are systematically compared with available competition	5
21.	Top management has a common vision for development through innovation	2
22.	New products and activities are systematically sought	2
23.	Communication is effective and works from top to bottom and vice versa, as well as between components	3
24.	Cooperation with other companies on the development of new products	1
25.	Meetings with other companies for the exchange of experiences and mutual learning	2
26.	There is support for innovation by management	3
27.	A mechanism is chosen for the time sequence of teams in cooperation on projects	3
28.	Reward system encourages innovation	3
29.	Efforts to create an external network of consultants with special knowledge	3
30.	Ability to record and generalize acquired knowledge for others in the team	4
31.	There are established processes for assessing new events in practice and in the field of operation	2
32.	The company has a clear system for choosing innovative projects	4
33.	A climate is created for new ideas and an opportunity for people to apply themselves in the company	4
34.	Cooperation with local and regional educational institutions for professional skills	5
35.	Ability to learn from other organizations	3
36.	There is a clear link between innovation projects and the company's overall strategy	3
37.	There is enough flexibility in the system to allow development to implement small, fast projects	4
38.	Teams work well	6
39.	There is cooperation with major customers on the development of innovative products	2
40.	Indicators and evaluations are applied to help improve innovative management	3

Total maximum number of points = 280, achieved number of points = 143, percentage = 51%.

Note: when allocating points for individual statements, the method of brainstorming and collective evaluation by employees of the company's project teams was applied in the conditions of specific mapping, measurement and evaluation of results according to experiments performed by the author, published in the previous period.

The data processing methodology is as follows:

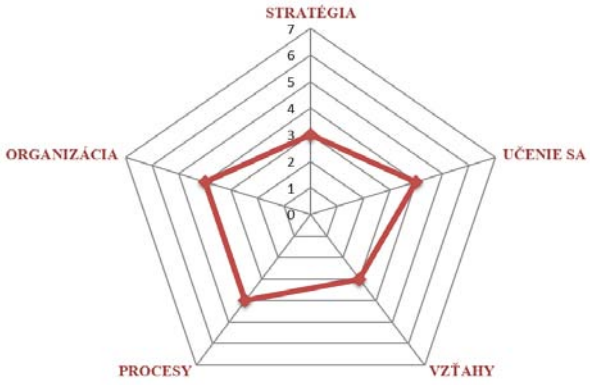
1. Compilation of a set of control questions and subsequently grouping them into five areas of innovation management (Tab. 1).
2. Questions are actually used statements from many years of managerial practice and each is assigned an evaluation: 1 point if this is not true, up to 7 points if this is exactly the case.
3. The questions and their scoring are arranged in five columns (for the areas of innovation management), namely: Strategy, Processes, Organization, Relationships, Learning (Tab. 2).
4. The sum of the points in each column is divided by 8 (for technical reasons, 40 questions and 5 columns are specified).
5. The results of the sums from the individual columns are plotted in the so-called theoretical pentagram (pentagon with the length of the vertices - 7 divisions from the centre) and we compare the point results with the so-called ideal score. The differences show positive as well as negative values of the profile of the level of innovative management of the evaluated company (Fig. 1).

Tab. 2: Evaluation and summarization of the results of the audit of innovation management

	Statement number	Points	Statement number	Points	Statement number	Points	Statement number	Points	Statement number	Points
	1	3	2	3	3	4	5	2	4	5
	6	1	7	3	8	4	10	1	9	6
	11	4	12	6	13	3	14	2	15	4
	16	5	17	6	18	7	19	7	20	5
	21	2	22	2	23	3	24	1	25	2
	26	3	27	3	28	3	29	3	30	4
	31	2	32	4	33	4	34	5	35	3
	36	3	37	4	38	6	39	2	40	3
Areas of innovation management	**strategy**		**processes**		**organization**		**relationships**		**learning**	
Sum	23		31		34		23		32	
Share / 8	2.9		3.9		4.3		2.9		4	

Source: Own construction, data tab. 1.

Fig. 1: Theoretical pentagram with score designation



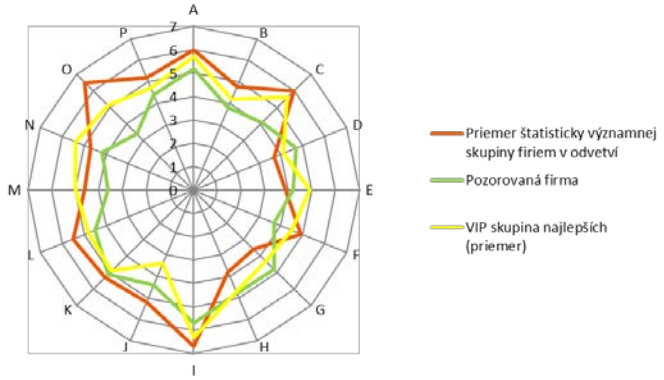
Source: Own construction.

Evaluation of the theoretical pentagram - after marking the shares for individual areas of management and connecting the individual values of shares in the figure with lines, the following conclusion can be drawn: Compared to the ideal state - when the pentagram should be bounded at the level of the lines of the values of number 7, the fact is that the real innovation state - the score for the company is in the line and inside the field between points 4 and 3, best for processes, learning and organization and weaker in strategy and relationships. It can be stated that the real status is weak and reaches only about 50 % of the possibility of innovative

development of the company, which needs significant innovative measures in the future.

The radar graph (see Fig. 2) shows the position of the observed small company (green) and a comparison of its occupancy field can be seen against the calculated average of all companies in the industry according to available statistics (orange) and following the results from pentagram. At the same time, the radar graph plots the average of the findings of the four best, exceptional (so-called VIP) companies in the industry and their results (yellow).

Fig. 2: Radar graph



Source: Own construction.

Where: A - customer focus, B - strategy formulation, C - clear strategic goal, D - key competencies, E- technological capabilities, F - planning and development, G- needs and order management, H - documentation, I - innovation and improvement, J - external partners, K - project orientation, L - team work, M - motivation and remuneration, N - organizational structure, O - financial background, P - system integration.

The finding for the company's management is the fact that there is not a big difference between its results and the average of the whole industry, which is good even if there are bigger differences given mainly by individual specifics (for example items C, D, F, I, L, O) and the existing management approach. It is therefore necessary to emphasize the development or maintenance of these factors.

At the same time, it is possible to find out the lag of the company behind the leaders in the given business sector (e.g. items E, J, L, M, N) where it is possible to copy the following in the future, although not always what is suitable for one company is worth doing in another company. Therefore, it is obligatory to monitor and gradually overcome, in particular, the data of the entire group of companies in the sector. It may also be interesting to compare the examined type of small or medium-sized company to determine the field of innovation potential, i.e. the company's ability to make a reasonable effort in key factors.

4. DIAGNOSTICS OF THE STATE AND LEVEL OF THE DIMENSION OF INNOVATION MANAGEMENT

As a starting point for diagnosing the state and level of the dimension of innovation becomes a detailed strategic SWOT analysis of the company with data (Table 3), which are reproduced here as a set of finished results according to the valuation of individual factors and their parameters (Novotný, 2018). SR, 2018), (ŠÚ SR, 2019) with subsequent evaluation by the researched company itself and also by top innovators, from which the average is then calculated and the position of innovation management is determined.

To perform the appropriate diagnostics, a set of measurements and determination of parameters from selected factors (a total of 30 data) within the already independently performed SWOT analysis will be effectively used, individually for each component, i.e. strengths, weaknesses, opportunities and threats. Then a comparative evaluation will be performed, i.e. the data from the SWOT are given for individual parameters and their respective evaluation with 1 - 2 - 3 points for the examined subject and subsequently (table no. 3) a comparison with the preliminary results of the so-called top innovators who have a point value specified uniformly as a standard for each parameter 3 points.

Tab. 3: A set of detected parameters and company data for diagnostics

Strengths	**Sequence No.**	**Researched company**	**Top innovators**
Good name of the company	1	1	3
Tradition, results from projects	2	1	3
Expertise and loyalty of employees	3	3	3
Stable working capital	4	3	3
Verified external team	5	3	3
Own publication work / presentations	6	2	3
Own research and development	7	2	3
Established typology and customer portfolio	8	1	3
Complexity of the main program	9	1	3
AVERAGE: %	**62.9**	**17**	**3**
Weaknesses	**Sequence No.**	**Researched company**	**Top innovators**
The company is not on foreign markets	10	1	3
Prioritizing expertise over business	11	3	3
Schematic formal performances	12	2	3
Low innovation and absence of ideas	13	2	3
Pressure on people's mobility and expertise	14	1	3
Irregular recruitment	15	1	3
Challenging search for new jobs	16	2	3
Conservative management of the company	17	2	3
AVERAGE: %	**58.3**	**14**	**24**
Opportunities	**Sequence No.**	**Researched company**	**Top innovators**
Adoption of a strategic partner	18	3	3
Resolution and search for new information	19	2	3
Maintaining a stable team of people	20	3	3
Use of background and stability of the company	21	1	3
Introduction of a new sales technique and organizational culture	22	2	3
Involvement in professional associations	23	1	3
AVERAGE: %	**66.6**	**12**	**18**
Threats	**Sequence No.**	**Researched company**	**Top innovators**
Surprises from the competition	24	1	3
Loss of market position	25	2	3
Loss of people from the team	26	2	3
Deterioration of the company name	27	1	3
Failure to manage the risk of conflict	28	3	3
Changing and confusing legislation	29	1	3
Instability and non-compliance with contracts	30	3	3
AVERAGE: %	**61.9**	**13**	**21**

Source: Own construction.

For each integral part of S - W - O - T, the sums of points for the examined company and also for the top innovators are calculated and the average in % is calculated. A clear table is then created to calculate the innovative management position of the subject and determine the appropriate level of position 1, 2, or 3. The procedure itself is evident from the table, then the coefficient of the new position of the level of innovation management is calculated as the ratio of the sum of the number of evaluations to the sum of the total result. These results are gradually plotted in graphs to clearly show the true state of the dimension of innovation of the company's management.

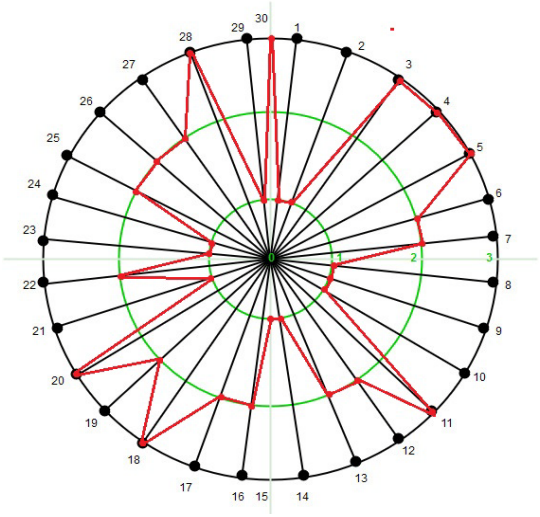
Tab. 4: Calculation of the position of innovation management of the company

Rating:	Number of ratings	Result	Points
Level 1	12	12	1
Level 2	10	20	2
Level 3	8	24	3
SUM	30	56	-

The calculated coefficient of the new position of the innovation management level is 1.86.
Source: Own construction.

The comparative graph of the diagnostics of the dimension of innovation (see Fig. 3) is a circle divided into 30 regular sections (each represents by number the corresponding SWOT factor parameter from Table 3 and contains three concentric circles, each of which actually shows the bean evaluation level 1 - 2 – 3). The corresponding point rating is drawn for each section in the diagram, thus creating an irregular graphic polygon (a star with many rays - marked with a red line) which clearly shows the actual state of the current dimension of innovation of the company's management. It is obvious that the company is excellent in 8 parameters, it is average in up to 11 parameters and it is absolutely weak in even up to 11 parameters, which is not good. Therefore, the dimension of innovation will be determined depending on the decisive existential 4 groups of factors, namely: Needs and expectations, Technology implementation, Reputation and Company development (see Fig. 4).

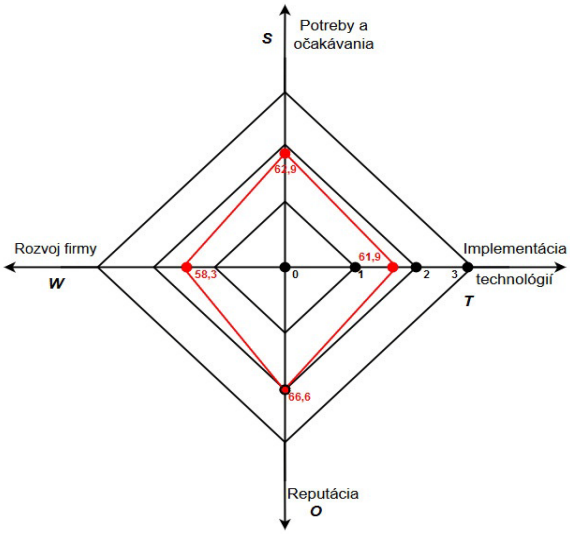
Fig. 3: Comparative graph of innovation dimension diagnostics



Source: Own construction.

The graph for determining the dimension of innovation (see Fig. 4) is a composite graph of three concentrically organized regular squares (indicating the level of points 1-2 - 3, drawing the cumulative values (red) of the relevant groups of parameters according to the percentage calculation from Table 3 of SWOT analysis. The graph clearly shows that the irregular square of the actual expression of the dimension of innovation is on average to below the average of the rating, below the rating level 2 and confirms previous findings from other analyses of the average level of the surveyed entity. From the above, it is therefore possible in the conditions of any given company to adopt precise procedures and measures in the future.

Fig. 4: Determining the dimension of innovation



Source: Own construction.

5. SUMMARY OF INNOVATION MANAGEMENT AUDIT RESULTS

In the area of strategy, 40 questions (Table 1) with a rating of 1 (no) - 7 (completely yes) points, while the most points out of the total possible number of 40 x 7 = 280 were 143 points achieved, i.e. 51 %. Of this, the following applies to individual bearing areas (Table 2): The strategy has 23 points and a share of 2.9 (16 %); Processes have 31 points and share 4.3 (22 %) Organization has 34 points and share 4.3 (24 %); Relationships have 23 points and share 2.9 (16 %); and Learning has 32 points and share 4 (22 %). The result from the pentagram (Fig. 1) is: from the field of max. 7, the evaluation everywhere is only between 3 and 4, which is only an average, and at the same time it is best for processes, learning and organization, the weakest for strategy and relationships. Also the graph determining the type of organizational culture shows that the company is more in the direction of external direction in the market culture than the integration in the hierarchy and internal focus of management and control.

6. SUMMARY OF THE RESULTS OF DIAGNOSTICS OF THE STATE AND LEVEL OF THE DIMENSION OF INNOVATION MANAGEMENT

Tab. 3 and Fig. 4 and 5 show the following results: individual average values for groups of parameters from the SWOT analysis (S - 62.9 %; W - 58.3 %; O - 66.6 % T - 61.9 %). The overall average for evaluation is then 62.425 %. The comparison graph of diagnostics shows that out of 30 parameters monitored in the SWOT analysis, the highest rating reaches only 8 parameters, the mean value reaches 11 parameters and the lowest level reaches up to 11 parameters, which shows the value of the cumulatively examined subject only below the average of the total possible maximum value of the dimension. The specific state of evaluation of parameters depending on their number and level of classification is 8 x 3 + 11 x 2 + 11 x 1 = 57 and at the same time considering the maximum possible value of 30 x 3 = 90, this results in 57 : 90 = 0.63, i.e. 63 %. Then the loss of performance is 100 % - 63 % = 37 %.

The dimension itself, plotted in the square graph of the dependences of the four supporting areas, again shows the examined subject only in the limits of average and below average between the evaluation fields 1-2 from the total evaluation band 0-1-2-2.

Fig. 3 in comparison with other companies in the given statistically significant environment of the given industry when marking the so-called VIP groups of the best (their average) in evaluating the main activities of the company and the evaluation field points to the fact that there is not much difference between the company's results and the entire segment of VIP companies, which is good for the company, but it is a significant finding for the whole segment - all companies are usually found on average only in the middle field - the field of average, which always has a serious impact on the evaluation of the given company. For the examined subject out of 16 parameters in the radar graph, only 6 indicators are above the average, 5 are average and 5 are below the average.

7. CONCLUSION

By monitoring of 6 selected key parameters of the innovative potential, the average known position of the researched subject was shown and also that it approaches the ideal future possible shape in a six-edge diagram in three factors, namely in strategy and planning, in organization and human resources and in environmental quality, but in the other three parameters only average values are achieved (technological process, marketing, logistics).

In conclusion, it should be emphasized that if the examined company found on the basis of the audit of innovation management, diagnostics and level of innovation dimension of management and also with the contribution of a separate supporting strategic SWOT analysis its specific innovation position and capacity and its vitality – based on a detailed analysis of the main components of its activity then these graphs and methods allow the company to accurately plan for changes and measures in the company's strategy and management in the future.

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